

SYMONS'S

MONTHLY

METEOROLOGICAL

MAGAZINE.

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VOLUME THE THIRTY-FIFTH.

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1900.

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LONDON:

EDWARD STANFORD, 12, 13 & 14, LONG ACRE, W.C.

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1901.

*Wm. L. L. L.*  
*for Lancelot*



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# SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

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CCCCIX.]

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## Henry A. Hazen.

SIRUR, INDIA, 1850—WASHINGTON, U.S.A., 1900.

WE regret having to record the premature death of our frequent correspondent, Prof. Hazen, who was knocked down by a bicycle on January 22nd. He was the son of a missionary in India, was educated in the United States, became a Professor in connection with Yale College in 1872, and resigned that appointment on obtaining one in the U.S. Weather Bureau. His overflowing energy is attested by the fact that in the ten years during which he was in the Weather Bureau service, we have the titles of more than 60 memoirs and papers from his pen—irrespective of short notes such as he has sent to the *Met. Mag.* He devoted much attention to thermometer exposure, but his most important publication was his useful *Handbook of Meteorological Tables*.

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## OUR CLIMATOLOGICAL RECORDS FOR THE BRITISH EMPIRE FOR 1898.

WE have to preface the above title with the word "Our," because the title without it, did not indicate with sufficient clearness that the remarks were based solely on the results of the 19 typical stations from which we publish summaries monthly. We shall perhaps make the point clear, if we mention one of the criticisms. In our Summary for 1897 we quoted, "Highest temperature in shade  $110^{\circ}8$  at Adelaide." This was strictly true as regarded the records published by us, because India is represented only by Bombay and Calcutta, at which the max. were respectively  $93^{\circ}7$  and  $104^{\circ}6$ . But a correspondent pointed out that, far from  $110^{\circ}8$  being the highest temperature in the shade in the British Empire in 1897, that distinction probably belonged to Jacobabad with  $123^{\circ}5$  on June 12th. This is quite true, but it is impossible for us, or indeed for all the official meteorologists in the Empire, to give the absolute extremes, for if the temperature rose to  $123^{\circ}5$  at Jacobabad, who can prove that it did not rise to  $124^{\circ}$  in some valley in the neighbourhood, where no thermometer was ever taken?

We do not attempt impossibilities. Years ago we selected the principal cities of some of our colonies as fairly typical of the climates of those colonies; the Directors of the observatories, without a single exception, promised to help us, and have loyally done so for a quarter of a century. It is perhaps not for us to assess the value of the long series of synchronous tables thus compiled and published, but it is on these tables, and on these alone, that our annual summaries have been based.

The feature that has impressed itself most strongly on our mind in preparing the Climatological Table for 1898 is its remarkable similarity to that for 1897, for if we look down the summary of extremes we find only three changes—viz., the dampest station, the least rainfall, and the greatest amount of cloud. As the dampest stations Ceylon and Trinidad appear in place of Esquimalt, the relative humidity not being given in the recent returns for the latter station. Malta in 1898 had a rainfall nearly ten inches above the average of 15 years, nearly double that of 1897, and, we believe, the greatest on record, therefore it gives place to one of the Australian stations—Melbourne. London appears (not for the first time) as the most cloudy station.

The other extremes in the summary seem to be normal, both as regards the stations at which they occur, and the values recorded. We believe that we are correct in saying that not one of them is unprecedented, unless it be the rainfall of 15·61 in. at Melbourne, which is the least for 25 years, and less than half that of 1887.

#### *Summary.*

Highest temp. in shade ...	113°·3 at Adelaide, on Jan. 11th.
Lowest       "       "       " ...	—34°·6 at Winnipeg, on Dec. 31st.
Greatest range in year.....	126°·1 at Winnipeg.
Least       "       "       "       " .....	19°·8 at Grenada.
Greatest mean daily range	22°·7 at Winnipeg.
Least       "       "       "       "       " .....	9°·6 at Grenada.
Highest mean temp.....	81°·6 at Colombo, Ceylon.
Lowest       "       "       "       "       " .....	35°·2 at Winnipeg.
Driest station .....	Adelaide, mean humidity 59.
Dampest       "       "       "       "       " .....	{ Colombo, Ceylon, } { and Trinidad ... } mean humidity 80
Highest temp. in sun .....	173°·7 at Adelaide.
Lowest temp. on grass* ...	—17°·5 at Toronto.
Greatest rainfall .....	103·11 in. at Colombo, Ceylon.
Least       "       "       "       "       " .....	15·61 in. at Melbourne.
Most cloudy station .....	London, average amount 6·4.
Least       "       "       "       "       " .....	Grenada, average amount 2·6.

\* The min. on grass is not recorded at the other Canadian stations.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE FOR 1898.

STATIONS.	ABSOLUTE.			AVERAGE.					ABSOLUTE.		TOTAL RAIN.		AVER- AGE.
	Temp.	Maximum. Date.	Minimum. Temp. Date.	Max.	Min.	Mean.	Dew Point.	Humidity	Max. in Sun.	Min. on Grass.	Depth.	Days.	
Those in <i>Italics are</i> <i>South of the</i> <i>Equator.</i>													
England, London ...	91·2	September 8	24·3	59·6	44·7	52·2	44·5	78	127·7	21·9	in. 17·69	140	0-10
Malta .....	96·3	June 28	41·4	72·6	59·9	66·3	56·8	77	153·6	32·7	29·17	80	6·4
Cape Town.....	95·7	February 22	34·1	69·8	53·4	61·6	51·8	77	...	...	28·80	94	3·5
Mauritius .....	86·8	February 9	56·7	79·6	68·8	74·2	65·2	76	142·1	47·9	47·76	187	3·6
Calcutta .....	103·4	April 8	48·4	86·5	69·9	78·2	67·2	72	160·8	39·0	59·52	87	5·8
Bombay .....	94·9	May 28	62·3	86·7	75·7	81·2	72·2	75	145·5	52·5	74·09	110	4·5
Ceylon, Colombo ...	94·5	March 30	66·8	87·9	75·4	81·6	72·9	80	162·0	58·0	103·11	196	3·6
Melbourne .....	109·4	December 5	32·3	69·0	50·5	59·7	46·7	65	158·5	25·5	15·61	102	5·4
Adelaide.....	113·3	January 11	36·1	73·9	53·6	63·8	47·4	59	173·7	29·2	20·77	116	5·4
Wellington .....	77·3	December 11	31·9	61·7	48·8	55·2	46·2	72	138·0	19·0	41·96	154	4·2
Auckland .....	90·0	January 4	40·0	65·1	52·7	58·9	49·7	72	146·0	36·0	40·76	174	4·4
Jamaica, Kingston..	93·5	January 13	62·6	86·9	70·7	78·8	68·4	74	...	...	34·60	84	5·0
Trinidad.....	95·0	May 11	60·0	87·6	69·2	78·4	70·9	80	171·0	60·0	58·85	185	...
Grenada .....	88·2	{ Mar. 14, 28 Sept. 27 }	68·4	83·2	73·6	78·4	69·8	73	155·2	...	81·77	225	2·6
Toronto .....	97·1	September 2	-15·0	55·8	39·0	47·4	40·7	76	123·5	-17·5	30·97	138	5·9
New Brunswick, } Fredericton.....	93·9	July 3	-31·5	52·0	31·7	41·9	32·3	67	...	...	46·00	145	5·8
Manitoba, Winnipeg } British Columbia, }	91·5	July 13	-34·6	46·5	23·8	35·2	...	...	...	...	27·19	114	5·5
Esquimalt .....	88·0	August 10	26·0	56·7	42·3	49·5	...	...	...	...	26·58	151	6·1

## LOW BAROMETRIC PRESSURE ON DECEMBER 29TH, 1899.

*To the Editor of the Meteorological Magazine.*

SIR,—Referring to the reports which appear in the January number of the *Met. Mag.*, you may be interested in learning that the reading of the barogram of the Falmouth Observatory was (after all corrections had been applied and the original observations reduced to 32° at sea level) 28·254 in. This being from a self-recording instrument, the time of the minimum here can be definitely fixed, viz., 0.30 p.m. I may mention that on only one occasion since 1871, when the barograph was fixed, has this very low reading been exceeded, and that was on the 4th of December, 1876, when it was 28·201 in.

The average velocity of the wind between 1 a.m. and midnight of the 29th December last was 35·5 miles per hour. The maximum occurred at 2 p.m. and was 45 miles. On the 4th of December, 1876, the average velocity for the 24 hours was 29 miles.

I take this opportunity of calling attention to the very mild nature of the climate of the South-West of England when compared with other parts and with the very low temperatures you publish for December, 1899. Such a marked contrast cannot fail to show the desirableness of the Cornish peninsula as a winter resort for invalids. During this winter the temperature in the thermograph screen at the Observatory, which is 167 feet above sea level, has only once been below freezing point, viz., on the 15th of December, when it was 31°·9. The minimum in the Stevenson screen close by was 30°·1, and at St. Cuthbert's, which is three-quarters of a mile nearer to the sea, and at a height of 50 feet, where the thermometer is also in a Stevenson screen and 4 feet over grass, it was 31°·2.

During January instant the lowest temperature recorded by the thermograph at the Observatory has been 34° on the 4th and 5th. The highest minimum was 47°·8 on the 12th.

On the 14th instant I counted 61 plants and shrubs in flower in my garden of 1½ acres. The number would doubtless be more than doubled if the other gardens in this neighbourhood were included.

Yours faithfully,

*Falmouth, January 22nd, 1900.*

WILSON LLOYD FOX.

Mr. J. W. Deane calls our attention to the fact that the statement, attributed to him on p. 178 is altogether incorrect. He says that the min. really occurred at noon—but as he does not state whether his readings are from a standard, whether they are corrected to 32° or reduced to sea level, we cannot usefully quote any other details. He also says that the statement attributed to Col. Magrath is incorrect, but he does not explain in what way.

The following may be regarded as a continuation of the notes on page 178, but of course they should have been in their proper places had they arrived before that page was printed.

*Royal Inst., Truro.*—Min. 28·31 in., lowest for 50 years. R.A. GREGG.

*Cheltenham.*—Lowest S.L. pressure at 6 p.m., 28·291 in. R. TYRER.

# ROYAL METEOROLOGICAL SOCIETY.

AT the ordinary meeting of this Society, held on Wednesday evening, January 17th, at the Institution of Civil Engineers, Great George Street, Westminster, Mr. F. C. Bayard, LL.M., President, in the chair, the following were elected Fellows :—

C. E. CARR.	F. G. LINNELL.
A. E. CHEETHAM.	EUSTACE H. LIPSCOMBE, M.B., B.C.
ADOLPHUS COLLENETTE.	L. S. M. MARSH.
F. N. DENISON.	A. MARSTON.
G. S. EUNSON.	W. E. MILNER.
DANIEL HALL.	A. L. ORMEROD, M.B., M.R.C.P.
CHARLES HAWKSLEY, C.E.	E. J. POYSER, F.Z.S.
A. B. JONES, M.B., M.R.C.S.	C. N. TWEEN, Assoc.M.Inst.C.E.
Prof. G. W. KÜCHLER, M.A.	M. W. ZAMBRA.
W. H. LEETE, Assoc.M.Inst.C.E.	

At the subsequent Annual Meeting the Secretary read the Report of the Council, which showed that the most exceptional event in connection with the Society had been the removal of the offices and library from 22, Great George Street to new rooms at 70, Victoria Street, because of the acquisition of the former premises by the Commissioners of Her Majesty's Works and Public Buildings.

Mr. F. Campbell Bayard in his presidential address discussed the meteorological observations made at the Royal Observatory, Greenwich, during the 51 years 1848–1898, and brought out in a novel way many interesting features in the variability of the readings of the barometer, maximum and minimum temperatures, relative humidity, direction of the wind, and rainfall. These were shown in diagrammatic form on the screen by means of lantern slides. The address was also illustrated by views of the Royal Observatory and of the instruments employed.

The following gentlemen were elected Officers and Council for the ensuing year :—

## *President.*

GEORGE JAMES SYMONS, F.R.S.

## *Vice-Presidents.*

RICHARD BENTLEY, F.L.S., F.R.G.S.  
CAPT. ALFRED CARPENTER, R.N., D.S.O., F.Z.S.  
HENRY NEWTON DICKSON, B.Sc., F.R.S.E., F.R.G.S.  
SIR CUTHBERT EDGAR PEEK, Bt., M.A., F.R.G.S., F.R.A.S.

## *Treasurer.*

CHARLES THEODORE WILLIAMS, M.A., M.D., F.R.C.P.

## *Secretaries.*

FRANCIS CAMPBELL BAYARD, LL.M. | EDWARD MAWLEY, F.R.H.S.

## *Foreign Secretary.*

ROBERT HENRY SCOTT, M.A., D.Sc., F.R.S.

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RICHARD HENRY CURTIS.	RICHARD INWARDS, F.R.A.S.
WILLIAM HENRY DINES, B.A.	BALDWIN LATHAM, M.Inst.C.E., F.G.S.
WILLIAM ELLIS, F.R.S., F.R.A.S.	H. R. MILL, D.Sc., F.R.S.E., F.R.G.S.
MAJOR LAMOROCK FLOWER.	R. COCKBURN MOSSMAN, F.R.S.E.
CAPT. M. W. C. HEPWORTH, F.R.A.S.	CAPT. D. WILSON-BARKER, F.R.S.E.

## THE METEOR OF JANUARY 9TH, 1900.

*To the Editor of the Meteorological Magazine.*

SIR,—Although the occurrence of daylight meteors is not so rare as some of my correspondents suppose,\* yet some of the features of this meteor suggested to me that it was worth while to collect all available information about it. In response to a letter which I addressed to the *Times*, I have received a number of communications from different quarters, and have attempted to harmonize them.

In the result I have come to the conclusion that the meteor first assumed luminosity about 30 miles nearly S. of Dungeness; that it crossed the coast line nearly horizontally, at an elevation of about 13 miles, between Hythe and Folkestone, and about that time began to break up; it split up a little to the east of Canterbury, and then, rapidly falling, disappeared at a point near the Reculvers.

It may be useful to give a short *resumé* of the details which I received. To do more would occupy too much space.

All observers agree that the time was between 2.55 and 3 p.m. It is almost certain that it was 2.59. The sun was shining brightly in a cloudless sky, and the moon was also bright, about 20° above the horizon, and its direction was E. by S.

The Rev. H. A. Day, at Dymchurch, "was conscious of a bright light in the sky, but saw nothing distinctly. This was followed by a sound resembling peals of thunder or reports of distant cannon." His father (Mr. Albert Day, J.P.), at the same time at Hythe, "saw the meteor coming towards him over the sea from the south like a great rocket," and it passed on the Folkestone side of Hythe towards the hills in a north-easterly direction. It was visible for about half-a-minute; left a long trail of smoke which remained for another half-minute, and there was a rumbling noise in the air.

Enquiries at Ramsgate having produced no information, I infer that the meteor passed to the westward of that town, and so, being in the same direction as the sun, escaped observation.

Mr. Edwin Abbott saw it cross the line of the Edgware Road when walking in it towards London. As this line produced cuts the coast at St. Leonards, it follows that he saw it when well over the Channel.

My daughter saw it from Warwick Road, Maida Vale, traversing an angle which would include the coast from Dungeness to Hythe. To her it disappeared as it passed beneath the moon.

The last two observers agree as to its having an elliptical head with long tail, the colour silvery white, and no sparks or explosion.

Miss Holford, walking due east in St. John's Road, Eastbourne, saw it pass from the sea on her right, and lost sight of it when nearly N.E. of that place.

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\* For other instances see *Met. Mag.*, XI., 10; XIII., 48, 64; XXIX., 20; XXXI., 11, 25.

At Brighton, the Rev. R. Hudson saw it first in the S.E. "It fell suddenly vertically just previous to disappearance, with a dipping motion like a bird, over some houses on a hill to the north-east." Here it appeared with a double tail; the lower member silvery white, the upper faint.

Miss Beeching, at Tonbridge, saw it burst when near the moon into four or five golden balls.

From Shooter's Hill Road, Blackheath, Miss Foster saw it N.E.; white, with a bright tail, and one reddish spark behind it.

From West Norwood, Miss Moon saw it leave a long tail of yellow sparks in the S.E. Similar reports from Reigate (two), Weybridge and Dulwich describe it as being seen first to the south, or right, of the moon and disappearing to the north, or left, of the moon.

Mr. Pleydell Bouverie, at Glynde Place, saw it passing away from the moon towards the N.E. and dropping at a steep angle.

Mr. Hussey, of Debden Hall, Saffron Walden, seems to have seen the last of it. To him it appeared as nearly in the S., "its course vertically downwards."

Several correspondents say that the apparent course was from west to east. I think the variance between that and what I have laid down as the true line is due to perspective and to the varying angle of its flight. Mr. Day thought it approached him "with an upward slanting direction." This again would be due to perspective.

A Beckenham correspondent of the *Daily Graphic* describes a meteor at the same time, which must have been a different one, or else there is some confusion in his account. He says "it passed across the sky at about  $60^\circ$  above the horizon in a general direction from a little to the N. of W. to the S. of E. It threw off flakes of flame, leaving a trail of bright light, and vanished low down near the horizon." I think many persons do not appreciate the difficulty of observing anything  $60^\circ$  above the horizon. No one else gave any such elevation, and the direction is plainly inconsistent with all other reports. But it may have been a different meteor altogether. There certainly was another at 6 p.m. on the same day seen from Southbourne (Sussex), passing from S. to N.

JAMES G. WOOD, F.R.Met.Soc.

115, Sutherland Avenue, W., Jan. 29th, 1900.

P.S.—Since writing the above I have seen a paper on the meteor in *Nature*, January 25th. The course there suggested, namely from Cherbourg to Calais, is absolutely inconsistent with the above observations at Hythe, Eastbourne, Brighton and Blackheath. A meteor crossing, and passing to the north of the parallels of those places could not possibly be travelling along the line of the French coast. On the other hand, some of the notes in *Nature* do not agree with mine, either as to direction or time. On the whole, I much incline to the view that there were two meteors.

J. G. W.

## REVIEWS.

*Practical Exercises in Elementary Meteorology*, by ROBERT DE COURCY WARD, Instructor in Climatology in Harvard University. Ginn & Co., Boston, U.S.A. 1899. Royal 8vo, xiii.-200 pages, 53 engravings.

AT present we are not aware of any classes for teaching meteorology or climatology in this country; perhaps such an innovation may spread to England, but as yet we must go to the United States or to the Continent to find either teachers or taught.

Among the former, Mr. R. De C. Ward has long held a prominent place, as several of our previous volumes show. Now, after many years' experience, he has prepared the above-mentioned work, *not* as a text book, but as a truly elementary manual. He starts his readers (pupils) without any instruments, and then gradually carries them on until they leave the book (class) with a very sound and thorough comprehension of the leading principles of meteorology, competent to keep an excellent record, to understand weather maps, cyclones and anticyclones, isobars, gradients, the principles of weather forecasting, the calculation of altitudes, and many other of the simpler problems of meteorology.

Taken as a whole, we think that the book is excellent, well written and well printed. There are a few points which the author will probably alter in the next edition, *e.g.*, on p. 20, "Mercury is the liquid universally employed in barometers." "Universally" is rather severe upon the open-scale glycerine ones. On page 23, writing about aneroid barometers, he says:—"The outer margin of the face, underneath the glass, is graduated into inches and hundredths, and the pressure may thus be read at once." We do not remember seeing an aneroid graduated to hundredths, and the engraving to which the above remarks apply shows the ordinary divisions of tenths and half-tenths, *i.e.*, twentieths. A few additional words in the latter half of the following paragraph would probably be welcomed by a beginner who found himself with (say) S. 6, S.W. 6, W. 6:—

"*Wind*.—Determine the frequency of the different wind directions by counting the total number of times the wind has blown from N., N.E., E., &c., during the month. The wind which you have observed the greatest number of times is the *prevailing* wind. It may, of course, happen that two or three directions have been observed an equal number of times. The number of calms also should be recorded."

Moreover, we are not sure that the instruction is correct. Carry on the illustration which we gave above, S. 6, S.W. 6, W. 6, N.W. 4, N. 1, N.E. 7, E. 1, S.E. 0. According to the author's rule, N.E. would be entered as the prevailing wind, although the winds with a westerly component are 16, and those with easterly only 8. Could N.E. be called the prevailing wind of such a month?



We do not like, or perhaps do not understand, Fig. 7. If the thermometers are "mounted together on a board," we do not see how the very different amount of shaking required by the max. and by the min. is to be given. Probably they are detachable, but they are inclined much more than is usual in this country, and, unless special precautions are taken to ensure absolute rigidity both of the screen and of the thermometers, we fear that the records would be too low whenever there was a gale.

On page 28, Messrs. Green, of New York, have supplied a block, which shows that they are not *au fait* at providing the muslin and wick for a wet bulb. The wick is pinched too tightly at the bottom of the bulb; it is too thick, and hanging as represented it would soon empty the reservoir.

On p. 103 we should insert the word which we have placed in square brackets. "Such a figure is known as a [thermic] *wind rose*."

These, however, are all very small matters, and easily put right. Although specially adapted for school use in the United States, the book would be useful in this country for all who desire to establish a firm basis of knowledge as a preliminary to theoretical investigations.

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*Osservatorio centrale del real Collegio Carlo Alberti in Moncalieri. Annuario Storico Meteorologico Italiano per l'anno 1900.* Vol. II., 1899. Ed. by G. BOFFITO and P. MAFFI, Torino, 1900. Post 8vo, 398 pages, and 4 plates (portraits).

WE spoke highly of the first volume of this serial; we are very glad to be able to speak even more favourably of the present. Of course it has, so to speak, an Italian atmosphere around it, and the editors see things from Italy; but we do not know any publication which gives anything like so good a chronicle of astronomical, meteorological and seismic phenomena all the world over as that on pp. 327-353 under the title "*Cronaca astro-meteorologica dell' anno 1898-99*," and in the "*Notizie varie*" from p. 355 to 379.

The whole book is charming, and it is not easy to give in a few lines an idea of the variety and interest of its contents. It is divided into parts.

Part I. contains articles and memoirs—twelve, of which we may mention a few: Sunshine in Rome, Attempts to drive away Hail, How to observe Meteoric Dust, The Meteorology of Lucretius and of Epicurus, Mistpoeffers, and it concludes with Our meteorologists—biography, bibliography, and excellent portraits of G. V. Schiaparelli, M. Del Gaizo, G. Lais and T. Bertelli.

Part II. A.—Bibliographical notices, Italian. Astronomy, Terrestrial Physics, Meteorology, Observatories, History of Science, Obituary notices. Part II. B.—Bibliographical notices from all other parts of the world.

After all this, comes the excellent Chronicle which we have already mentioned.

And on the back of the book we read L. 3—three lire, say, half-a-crown for 400 pages, beautifully printed. How is it done?

By the bye, we noticed one—and only one!—error, but it is rather funny. Sig. Boffito has copied a paragraph, from *Il Progresso*, as to the **Termometro gigante** of Col. Knight; the paragraph begins by describing our countryman as “uno scienziato americano,” and then keeps up the idea by stating that it is being used “near Winchester in Massachusetts,” whereas the 70 ft. thermometer is really near Winchester, Hampshire, England.

*Waterspouts on the Coast of New South Wales*, by H. C. RUSSELL, C.M.G., F.R.S. [Ex. Jour. R. Soc. of New South Wales.] 8vo, 18 pp., 8 plates. [Sydney, 1898.]

WE have an old engraving which represents about 13 waterspouts as being visible at one moment. With the usual reluctance to believe what we have not personally seen, we have always regarded it as absurdly excessive, thinking that 3 or 4 would be an ample number; yet here is Mr. Russell bringing up an engineer with his theodolite to prove the existence of 20 in the one morning of May 16th, 1898. Apparently they were not all visible at once, so we still have to wait for the evidence of 13 *at once*. The tallest was 5014 ft. high (nearly a mile), whereas another in Congee Bay was only 100 ft. high.

It is an interesting paper and well illustrated, but we are still without a photo *from nature*—these seem to be all photos from sketches or drawings.

## THE SNOW OF FEBRUARY 2ND.

HEAVY, or very heavy, snow fell over the South of England. The following data will illustrate its distribution:—

County.	Station.	Observer.	Depth of Snow. in.	Yield as Rain. in.
Middlesex ...	Camden Square .....	G. J. Symons .....	5½	·87
„ ...	Bycullah Park, Enfield...	J. McEwan .....	7	·87
Surrey .....	Beaconscroft, Chiddingfold	Admiral Maclear.....	7	·50
„ .....	Field Place, Weybridge..	G. A. Yool .....	7	1·17
Sussex .....	Burgess Hill .....	F. H. Phillips .....	3	·16
Hants .....	Fowley, Liphook .....	E. A. Lee .....	8	1·12
„ .....	Farnborough School .....	Rev. G. C. Carter ...	[7½]	·93
„ .....	Hartley Wintney .....	G. Machin .....	12½	1·67
„ .....	Belswood, Winchfield ...	F. Walkinshaw .....	9	1·15
Herts .....	The Grange, St. Albans..	J. Hopkinson .....	9	·75
Bucks .....	Upton, Slough .....	R. Bentley .....	6½	·65
Norfolk .....	Brundall, Norwich.....	A. W. Preston.....	0	·00

# METEOROLOGICAL SOCIETY OF THE MAURITIUS.

WE are glad to say that, thanks to Mr. Claxton, we have received for gratuitous distribution the surplus copies of the following publications. There are very few of some of them, but we shall do our best to distribute them where they will be most generally useful, especially where they will tend to complete existing sets. We are not aware that a *perfect* set exists anywhere—even in Mauritius.

All applications must be addressed to the undersigned, and it is to be understood that no correspondence on the subject can be undertaken. The applications will all be filed, but the only reply will be the sending, post free, of such of the pamphlets (if any) as may be available.

G. J. SYMONS.

62, Camden Square, N. W.

## *Publications of the Meteorological Society of the Mauritius.*

Notice of Meeting, May 12th, 1853.	...	...	...	...	4to.
Proceedings of the Second Annual Meeting, October 20th, 1853.	...	...	...	...	8vo.
Transactions, published in 1853, 1859	...	...	...	...	"
Proc. and Trans. „ „ 1861, 1864	...	...	...	...	"
Proceedings, 1861, 1862, 1863, 1866	...	...	...	...	"
Notices of Meetings, 1882 to 1885 ...	...	...	...	...	fol.

## WEATHER FORECASTS BY BALLOON.

(From the Berlin Special Correspondent of *The Standard*.)

PROFESSOR ASSMANN states that the Royal Prussian Meteorological Institute in Berlin is about to make arrangements for the systematic examination of the higher strata of the atmosphere by means of special apparatus. In the grounds of the Aeronautical Observatory at Tegel—a suburb of Berlin where Alexander and William von Humboldt were buried—registrations of atmospheric conditions at a height of three to five thousand mètres will be carried on, if possible, day and night, with kites and kite-balloons. The registering apparatus, which automatically notes the pressure, temperature, humidity, and wind velocity, at these heights, is taken up by a kite-balloon connected with the earth by piano wire. It is inflated with hydrogen, and can take fifteen hundred mètres of wire. Under favourable conditions a kite of the Hargrave type, with a surface of three square mètres, is attached to the lower end, and this can lift five hundred mètres of wire. To it a second kite is attached, and to this latter a third, and so on; until the balloon reaches a height of four thousand or more mètres. An elevation of four thousand five hundred mètres has been attained by kites even without balloons, when there was sufficient wind. The control of the kites is effected by means of electrically driven windlasses. Judging from the experience hitherto gained in casual experiments, the regular investigations, which it is proposed to conduct, should lead to important results.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, AUGUST, 1899.

STATIONS.	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.										
<i>(Those in italics are South of the Equator.)</i>	°		°		°	°	°	0-100	°	°	inches			
London, Camden Square	91·2	15	48·6	21	79·4	56·6	55·5	68	130·2	40·9	·70	6	3·8	
Malta.....	92·5	9	66·2	25	86·6	70·2	65·7	66	149·5	59·4	·00	0	0·7	
Cape of Good Hope ...	87·0	17	42·7	27	61·6	50·9	49·6	87	...	...	8·83	18	7·7	
Mauritius.....	76·1	29	58·3	15	73·5	64·0	59·5	75	145·6	51·9	3·40	24	5·8	
Calcutta.....	94·3	6	75·1	19	89·8	79·6	78·8	85	156·0	74·6	8·90	24	8·4	
Bombay.....	87·2	2	75·0	7	85·6	77·8	75·0	80	135·8	73·0	5·23	23	6·9	
Ceylon, Colombo .....	91·2	5	75·0	1	89·4	77·9	73·3	77	157·5	72·0	·62	8	4·7	
Melbourne.....	71·7	29	31·6	1	58·6	42·8	44·0	80	124·7	26·0	2·51	7	5·6	
Adelaide .....	77·8	29	36·6	2	62·3	45·3	42·3	68	134·0	25·9	1·59	8	4·7	
Sydney .....	74·0	31	38·8	10	59·5	48·8	81·0	46	140·1	27·8	14·89	23	6·2	
Wellington .....	59·0	18	34·0	6, 7	53·9	40·5	38·5	79	105·0	24·0	2·43	14	4·2	
Auckland .....	65·0	27	41·0	1	57·2	46·6	42·3	73	121·0	37·0	2·78	12	6·7	
Trinidad .....	93·0	15	70·0	Sev.	90·8	71·9	75·2	84	170·0	68·0	8·45	17	...	
Grenada.....	86·8	27	72·0	2a	83·6	75·4	72·3	72	150·4	...	8·99	20	3·0	
Toronto .....	92·1	19	46·3	9	82·3	58·3	58·6	70	114·0	41·5	·27	2	3·7	
New Brunswick, Fredericton .....	84·9	19	43·0	9	75·1	52·7	53·6	63	...	...	·76	3	4·4	
Manitoba, Winnipeg .....	87·0	19	31·5	31	75·7	50·8	...	78	...	...	3·42	10	5·4	
British Columbia, Esquimalt.....	...	...	...	...	...	...	...	...	...	...	...	...	...	

a—and 23.

## REMARKS.

MALTA.—Adopted mean temp. 77°·7, or 0°·4 below average. Mean hourly velocity of wind 5·7, or 1·6 below average. Mean temp. of sea 81°·3. L on 4th, 5th, and 6th. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·4 below, of dew point 0°·2 above, and rainfall ·96 in. above, their respective averages. Mean hourly velocity of wind 13·8 miles, or 2·3 above average; extremes, 31·8 on 7th and 1·6 on 2nd; prevailing direction, E.S.E. A. WALTER.

CEYLON, COLOMBO.—Mean temp. of air 82°·5, or 1°·9 above, of dew point 0°·2 above, and rainfall 3·15 in. below, their respective averages. Mean hourly velocity of wind 7·4 miles; prevailing direction S.W. H. O. BARNARD.

Adelaide.—Mean temp. of air 0°·2 above, and rainfall ·77 in. below, the average of 42 years. C. TODD, F.R.S.

Sydney.—Temp. equal to the average; humidity 7·6 above, and rainfall 11·72 in. above, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Generally fine, with frequent frosty nights, and clear sky, very fine in the early part, but showery in the latter part. Very slight earthquake on 6th. Temp. 0°·8 below, and rain 2·77 in. below, their respective averages. R. B. GORE.

Auckland.—Very violent N.E. gale, gradually shifting to S.E. during the period from the 14th to the 19th, the rest of the month fine and dry, excepting heavy rain on 30th. Mean temp. and rainfall much below average. T. F. CHEESEMAN.

TRINIDAD.—Rain 1·87 in. below the average of 30 years.

J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,  
 JANUARY, 1900.

Div	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	3.42	XI.	Builth, Abergwesyn Vic.	7.86
II.	Dorking, Abinger Hall.	4.10	„	Rhayader, Nantgwillt...	7.55
„	Birchington, Thor .....	2.98	„	Lake Vyrnwy .....	5.85
„	Hailsham .....	3.88	„	Corwen, Rhug .....	3.39
„	Ryde, Thornbrough .....	3.87	„	Criccieth, Talarvor .....	4.79
„	Emsworth, Redlands ...	3.76	„	I. of Anglesey, Lligwy..	4.82
„	Alton, Ashdell .....	...	„	I. of Man, Douglas .....	4.71
III.	Oxford, Magdalen Coll..	2.20	XII.	Stoneykirk, Ardwell Ho.	...
„	Banbury, Bloxham .....	3.49	„	New Galloway, Glenlee	7.58
„	Northampton, Sedgebrook	3.30	„	Moniaive, Maxwellton Ho.	4.78
„	Alconbury .....	3.27	„	Lilliesleaf, Riddell .....	3.72
„	Wisbech, Bank House...	3.25	XIII.	N. Esk Res. [Penicuik]	4.30
IV.	Southend .....	2.80	XIV.	Glasgow, Queen's Park..	5.08
„	Colchester, Lexden .....	2.51	XV.	Inverary, Newtown .....	9.53
„	Saffron Waldon, Newport	3.00	„	Ballachulish, Ardsheal...	10.47
„	Rendlesham Hall .....	3.79	„	Islay .....	...
„	Scole Rectory .....	2.69	XVI.	Dollar .....	6.27
„	Swaffham .....	4.00	„	Balquhider, Stronvar...	11.57
V.	Salisbury, Alderbury ...	3.40	„	Coupar Angus Station...	3.83
„	Bishop's Cannings .....	3.01	„	Blair Atholl .....	2.98
„	Blandford, Whatcombe.	5.14	XVII.	Keith H.R.S. ....	3.04
„	Ashburton, Holne Vic...	7.63	„	Forres H.R.S. ....	3.09
„	Okehampton, Oaklands.	6.47	XVIII.	Fearn, Lower Pitkerrie..	2.46
„	Hartland Abbey .....	5.01	„	S. Uist, Askernish .....	...
„	Lynton, Glenthorne ...	5.53	„	Invergarry .....	9.17
„	Probus, Lamellyn .....	6.33	„	Aviemore, Alvie Manse.	3.40
„	Wellington, The Avenue	4.43	„	Loch Ness, Drumnadrochit	4.76
„	North Cadbury Rectory	3.47	XIX.	Invershin .....	4.01
VI.	Clifton, Pembroke Road	4.54	„	Durness .....	5.98
„	Ross, The Graig .....	2.97	„	Watten H.R.S. ....	2.40
„	Wem, Clive Vicarage ...	2.27	XX.	Dunmanway, Coolkelure	7.30
„	Wolverhampton, Tettenhall	2.87	„	Cork, Wellesley Terrace	3.43
„	Cheadle, The Heath Ho.	4.73	„	Killarney, Woodlawn ..	5.31
„	Coventry, Priory Row...	3.63	„	Caher, Duneske .....	4.11
VII.	Market Overton .....	...	„	Ballingarry, Hazelfort...	4.55
„	Grantham, Stainby .....	3.80	„	Limerick, Kilcornan ...	...
„	Horncastle, Bucknall ...	2.36	„	Miltown Malbay .....	5.06
„	Worksop, Hodsck Priory	2.93	XXI.	Gorey, Courtown House	2.86
VIII.	Neston, Hinderton .....	3.47	„	Moynalty, Westland ...	3.88
„	Southport, Hesketh Park	4.30	„	Athlone, Twyford .....	4.38
„	Chatburn, Middlewood.	6.32	„	Mullingar, Belvedere ...	4.27
„	Duddon Val., Seathwaite Vic.	10.87	XXII.	Woodlawn .....	5.87
IX.	Melmerby, Baldersby ...	2.89	„	Crossmolina, Enniscoe ..	6.43
„	Scalby, Silverdale .....	...	„	Collooney, Markree Obs.	4.77
„	Ingleby Greenhow Vic..	3.56	XXIII.	Belturbet, Redhills .....	...
„	Middleton, Mickleton ...	3.93	„	Warrenpoint .....	3.97
X.	Haltwhistle, Unthank H.	4.39	„	Seaforde .....	2.37
„	Bamburgh .....	2.43	„	Belfast, Springfield .....	3.95
„	Keswick, The Bank .....	6.27	„	Bushmills, Dundarave..	4.47
XI.	Llanfrechfa Grange .....	5.66	„	Stewartstown .....	3.59
„	Llandovery .....	4.84	„	Killybegs .....	6.66
„	Castle Malgwyn .....	4.14	„	Horn Head .....	4.85
„	Brecknock, The Barracks	4.16			

## JANUARY, 1900.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.						No. of Days on which 10 or more fell.	TEMPERATURE.				No. of Nights below 32°.	
		Total Fall.	Differ- ence from average 1880-9.	Greatest Fall in 24 hours.		Deg.	Date		Deg.	Date	Deg.	Date		
				Dpth	Date									
													inches.	inches.
I.	London (Camden Square) ...	2·92	+ 1·30	·47	1	21	53·9	24	25·8	14	10	21		
II.	Tenterden .....	3·31	+ 1·41	·58	6	22	52·0	2	28·0	6, 21	9	19		
III.	Hartley Wintney .....	2·73	...	·66	6	20	53·0	24	25·0	6	13	21		
	Hitchin .....	3·11	+ 1·57	·74	6	23	52·0	24	27·0	20	16	...		
IV.	Winslow (Addington) .....	3·42	+ 1·61	1·07	6	22	54·0	23	23·0	21	14	21		
	Bury St. Edmunds (Westley) ..	2·86	+ 1·39	·57	6	19	51·0	24	27·0	13	...	...		
V.	Norwich (Brundall) .....	2·74	...	·32	21	23	50·2	24	26·0	14	13	26		
	Winterbourne Steepleton ...	5·71	...	1·40	6	22	51·1	8a	25·1	6	3	14		
VI.	Torquay (Cary Green) ...	5·36	...	1·45	6	23	55·2	8	32·2	6	0	9		
	Polapit Tamar [Launceston].	5·64	+ 2·62	1·03	6	25	52·1	21	27·2	6	4	9		
VII.	Stroud (Upfield) .....	3·73	+ 1·53	1·02	6	24	50·0	24	30·0	5, 20	10	...		
	Churchstretton (Woolstaston)	3·11	+ ·95	·59	1	24	51·5	23	30·0	5	9	23		
VIII.	Worcester (Diglis Lock) .....	3·60	+ 1·80	·84	6	24	...	...	...	...	...	...		
	Boston .....	3·32	+ 1·93	·78	7	15	50·0	23	24·0	28	17	...		
IX.	Hesley Hall [Tickhill] .....	2·64	+ ·87	·90	6	21	52·0	23a	26·0	28	9	...		
	Breadsall Priory .....	4·10	...	·60	1	27	...	...	...	...	...	...		
X.	Manchester (Plymouth Grove)	4·34	+ 1·88	·78	6	26	53·0	23	28·0	10	6	10		
XI.	Wetherby (Ribston Hall) ...	4·03	+ 2·14	1·25	6	23	...	...	...	...	...	...		
	Skipton (Arnccliffe) .....	8·30	+ 2·66	1·51	6	28	...	...	...	...	...	...		
XII.	Hull (Pearson Park) .....	2·89	+ 1·12	·58	1	20	52·0	23	24·0	28	16	26		
	Newcastle (Town Moor) .....	3·65	+ 1·84	·82	31	18	...	...	...	...	...	...		
XIII.	Borrowdale (Seathwaite) .....	17·89	+ 5·71	4·05	6	27	...	...	...	...	...	...		
	Cardiff (Ely) .....	5·78	+ 2·49	1·38	6	22	...	...	...	...	...	...		
XIV.	Haverfordwest .....	5·82	+ 1·40	1·03	6	25	52·1	8	28·8	21	3	14		
	Aberystwith (Gogerddan) ...	5·09	+ 1·56	·75	6	22	48·0	15b	21·0	20	15	...		
XV.	Llandudno .....	3·46	+ 1·18	·51	6	22	54·5	21	34·0	6	0	...		
	Cargen [Dumfries] .....	4·37	+ ·60	·56	14	21	53·0	23	29·0	1	4	...		
XVI.	Edinburgh (Blacket Place) ...	3·38	...	·91	2	29	51·9	23	29·8	28	6	16		
	Colmonell .....	6·00	...	·62	13	25	50·0	23	25·0	4	...	...		
XVII.	Tighnabruach .....	8·92	...	1·24	21	25	48·0	23	27·0	4	10	...		
	Mull (Quinish) .....	7·58	+ 1·91	·88	5	25	...	...	...	...	...	...		
XVIII.	Loch Leven Sluices .....	5·10	+ 2·20	1·60	3	17	...	...	...	...	...	...		
	Dundee (Eastern Necropolis) ..	3·60	+ 1·63	1·70	2	23	55·2	22	27·2	28	8	...		
XIX.	Braemar .....	3·98	+ 1·29	·82	2	25	48·9	26	22·0	28	21	30		
	Aberdeen (Cranford) .....	3·97	...	1·25	2	20	55·0	22	26·0	27	19	...		
XX.	Cawdor (Budgate) .....	3·61	+ 1·44	·62	3	24	...	...	...	...	...	...		
	Strathconan [Beaully] .....	10·15	+ 5·27	1·10	3	16	...	...	...	...	...	...		
XXI.	Glencarron Lodge .....	12·84	...	1·64	22	29	51·1	22	28·0	17	11	...		
	Dunrobin .....	4·42	+ 1·96	·74	19	21	53·0	23	28·0	28	11	...		
XXII.	S. Ronaldshay (Roeberry) ...	3·24	+ ·29	·37	6a	30	50·0	22	30·0	8	7	...		
	Darrynane Abbey .....	3·56	...	·48	2	27	...	...	...	...	...	...		
XXIII.	Waterford (Brook Lodge) ...	5·26	+ 1·70	2·23	1	25	54·0	22	27·0	5	6	...		
	Broadford (Hurdlestown) ...	4·65	...	1·30	1	29	...	...	...	...	...	...		
XXIV.	Carlow (Browne's Hill) .....	2·86	— ·04	·43	1	25	...	...	...	...	...	...		
	Dublin (FitzWilliam Square) ..	2·58	+ ·72	·33	1	27	55·7	21	32·0	5	2	16		
XXV.	Ballinasloe .....	5·43	+ 2·35	1·32	1	23	51·0	16	28·0	28	8	...		
	Clifden (Kylemore) .....	7·99	...	1·56	5	25	...	...	...	...	...	...		
XXVI.	Waringstown .....	2·48	— ·17	·58	5	20	45·0	14d	20·0	4	...	...		
	Londonderry (Creggan Res.) ..	4·28	+ ·86	·59	27	29	...	...	...	...	...	...		
XXVII.	Omagh (Edenfel) .....	4·53	+ 1·51	·52	1	27	50·0	12e	24·0	4	9	21		

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

a—and 24.

b—and 17, 24.

c—and 22.

d—and 15, 19.



## METEOROLOGICAL NOTES ON JANUARY, 1900.

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.

**TENTERDEN.**—A wet month, helpful in raising the level of water in wells and ponds. Duration of sunshine 41 hours. Nearly all the lowest temps. were with wind from S. or S.E. The min. on grass fell to 20° on 12th, 13th, 14th and 21st.

**HARTLEY WINTNEY.**—A black January. Most variable weather, with R on 20 days and slight frost on 21 days. Rainfall about an inch above the average, and springs rising sparingly. Cold E. wind on the last 4 days, with an average max. temp. of 37°. Fogs on 1st, 12th, 16th and 21st. Parhelia on 11th. Ozone on 23 days, with an average of 5·1. Prevalence of light S.W. winds.

**WINSLOW, ADDINGTON.**—There has been no such rainfall in January since 1877, and the only other exceeding it in 30 years was 1872. The heavy R on 6th caused a very large flood, the brook overflowing the meadows to a great extent. The temp. only once fell below 29°, the only sharp frost being on 21st. S on 12th, 27th and 28th.

**BURY ST. EDMUNDS, WESTLEY.**—Mild and dull with little S, and great variation of bar. pressure. S on 27th and 28th.

**NORWICH, BRUNDALL.**—A humid month, with much dark cloud and frequent R. Less mild than in 1898 and 1899, but very little S, and frosts slight. R about 1·00 in., and temp. about 1°·0 above the average. S on 15th, 27th and 31st. N.E. gale on 28th.

**WINTERBOURNE STEEPLETON.**—Wet and mild and very much like January, 1899, when 5·59 in. of R fell on 23 days, the mean temp. being 42°, while the mean for this month is 41°·3. S on 28th.

**TORQUAY, CARY GREEN.**—R 2·15 in. above the average. Mean temp. 44°·4, or 2°·5 above the average. Duration of sunshine 61 hrs. 50 mins., being 30 mins. below the average; 12 sunless days. Ozone mean 6·7; greatest 9·0 on 8th and 17th, with S. and W. winds; least 1·0 on 6th, with N. or E. winds.

**POLAPIT TAMAR [LAUNCESTON].**—A very wet month, the total fall being, with the exception of 1899, the largest fall in January since 1886. H on 2nd, 17th and 27th. S on 28th.

**CHURCH STRETTON, WOOLSTASTON.**—R fell nearly every day, and there was frost on grass on most nights. Gale on 22nd. S on 27th, 29th and 31st. Mean temp. 39°·1.

**SEATHWAITE.**—S an inch deep on the ground at 9 a.m. on 28th.

### WALES.

**HAVERFORDWEST.**—A mild, wet month, with very little sunshine and only one bright day. The wind reached the force of a gale on four days, and fog occurred on six days. There was not much frost, the lowest reading on grass being 23°·0 on 6th and 21st. Vegetation in sheltered places is very forward, and frost is much needed to check it. L at night on 28th; S on the mountains on 28th.

**AERYSTWITH, GOGERDDAN.**—A very wet, cold and sunless month.

**LLANDUDNO.**—H on 10th, 27th and 30th. Lunar halos on 10th and 15th.

## SCOTLAND.

CARGEN [DUMFRIES].—A month of cloudy, wet and unsettled weather. The means of bar. pressure, temp. and R do not deviate considerably from the averages of 41 years, the bar. being '028 in. lower, the temp.  $1^{\circ}5$  higher, and the rainfall '36 in. more, than the average. There was a remarkable absence of frost, the min. temp. falling below  $32^{\circ}$  on only 4 nights. Westerly winds prevailed on 15 days, and only 49 hours of sunshine were recorded. The wet weather proved very trying to farm-stock wintered out, but ploughing was well advanced. S showers on 28th.

EDINBURGH, BLACKET PLACE.—Mean temp.  $2^{\circ}4$  above, and mean pressure '017 in. below, the average. Rainfall 41 per cent. above the average. The number of rainy days (29) is the highest recorded in any month during 45 years; July, 1882, having the same number. S on 6 days, heavy on 9th and 26th. H on 15th. TS with H on 19th, and aurora on the same day.

COLMONELL.—R  $1.50$  in. above, and mean temp.  $3^{\circ}3$  above, the average for 23 years. T and L on 9th, L on 28th. H on 27th and 28th. Gales on 14th, 15th and 16th.

TIGHNABRUACH, CRAIGANDARAICH.—It is suitable that under the sign of Aquarius we should have a record rainfall, the heaviest in any month for many years. T and L on 24th.

ABERDEEN, CRANFORD.—The month was very free from S, but with strong W. winds.

S. RONALDSHAY, ROEBERRY.—Mean temp.  $39^{\circ}$ , being  $0^{\circ}7$  above the average of ten years.

## IRELAND.

DARRYNANE ABBEY.—Constantly wet, but no heavy falls of R except on the afternoon of 13th, when '36 in. fell in three-and-a-half hours.

BROADFORD, HURDLESTOWN.—A wet and unhealthy month. R  $1.77$  in. above, and rainy days 7 above, the average for 15 years. Fog on 4 days. T and sleet on 28th.

DUBLIN, FITZWILLIAM SQUARE.—Like January, 1899, this was a cloudy, rainy and generally open month. The weather was essentially of a cyclonic type. R fell on 29 days, but on two the fall was almost inappreciable. The dulness and dampness of the weather were equalled only by the unsteadiness of pressure and temp. The mean temp.,  $42^{\circ}8$ , is  $1^{\circ}4$  above the average. Fog on 6 days. High winds on 17 days, reaching the force of a gale on 5. S and sleet fell on 27th, 28th and 29th; H on 5th, 15th, 24th, and 27th to 30th. The temp. exceeded  $50^{\circ}$  on 9 days.

OMAGH, EDENFEL.—A wet, raw and unpleasant month, and although the temp. on grass fell below freezing-point on 21 nights, the day temp. was uniformly above  $40^{\circ}$ , and it was accordingly R and wet S that fell on the 27 wet days.



# SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

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**George James Symons. F.R.S.**

LONDON, 6TH AUGUST, 1888—10TH MARCH, 1900.

THE Founder of the British Rainfall Organization and of this Magazine has passed away after a life, long in good work, though short of the allotted threescore years and ten.

In 1857 he started an organization for observing and recording thunderstorms, and soon after began the great work of his life in connection with British Rainfall. The first published volume contained the records for the year 1860, while the fortieth will be issued within a few months of his death. With 1866 he commenced the publication of the *Meteorological Magazine*, and this is the first number which has contained no article written by him.

For forty-four years he was a Fellow of the Royal Meteorological Society, and for twenty-seven years was its Honorary Secretary, except during three years when he occupied the presidential chair, to which he had this year been again elected as being best fitted to support the Society in the celebration of its jubilee. For forty-two years he supplied monthly records of meteorological observations to the Registrar-General; for forty years he was a member of the General Committee of the British Association, and served on many Committees; and for nearly forty years he was a member of the Scottish Meteorological Society. For twenty-seven years he was a member of the Société Météorologique de France, and served three times on the Council.

There is no need here to enlarge upon his work, but in illustration of his widespread activity may be mentioned "Notes on the Solar Eclipse of July 18th, 1860," "Meteorological Statistics and Bibliography of the Colonial Empire," "Inquiry into the Temperature of the Thermal Springs of the Pyrenees," "The Floating Island in Derwentwater," "The Lightning Rod Conference," "The Eruption of Krakatoa," and "Cowe's and Merle's Meteorological Registers," besides his great contributions to the bibliography of meteorology.

The honours of work fell to his share more than those of mere compliment, and he was elected president of innumerable congresses and committees at home and abroad, and Juror at meteorological exhibitions both in England and on the Continent. He received

a Telford premium of the Institution of Civil Engineers in 1876 ; in 1878 was elected a Fellow of the Royal Society, was created a Chevalier de la Légion d'Honneur in 1891, and was selected by the Prince of Wales to receive the Albert Medal of the Society of Arts for 1897.

His great kindness and genial personality were known almost the world over, and among his innumerable colleagues on the Councils of the Royal Society, the Royal Meteorological Society, the British Association, the Société Mét. de France, the Royal Botanic Society, the Sanitary Institute, and on numerous other bodies, he is not known to have made a single enemy. The great majority will sincerely mourn his loss as that of a true friend, and will be able in some measure to appreciate what it must be to the writer of this brief memoir who has worked with him daily and hourly for nearly thirty years, and who is proud to have been selected by him as his successor in the work.

H. SOWERBY WALLIS.

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### THE SNOW AND FLOODS OF FEBRUARY, 1900.

THE disorganization of ordinary means of traffic and communication, not to mention the inconvenience, suffering and serious danger to health caused by the snow and floods of February, have been so great and general over vast areas of the United Kingdoms, that we feel called upon to devote a very considerable amount of space to their description.

Nature in the distribution of her favours was singularly impartial, for the dwellers on high land were isolated by the snow and drifts, which later on flooded out the dwellers by the streams and rivers, while even those at intermediate heights did not escape, for they suffered the trials of utterly disorganized railway systems and a perhaps unprecedented breakdown of the telegraphic and telephonic services.

Dwellers in the S.W. counties generally liken their experiences to the time of the blizzard in the west on March 9th, 1891, while in other parts of the country reference is made to the great snowstorms of January, 1881, and although the depth of snow and the resultant damage was far greater on those historic occasions, most reports agree that the havoc of 1900 has been unequalled at any other time. Dwellers in the Thames Valley compare with the great flood of 1894, and again 1900, to some extent, sinks into insignificance. In short the scientist is perhaps most charmed with the way in which Nature arranged a maximum display of damage with something like a minimum of material. The ground was first frozen that no water might soak in, dry snow fell, not in unprecedented quantity, and by a gale of only normal force, was heaped up into great drifts, which, perhaps exhibit man's impotence better than anything else. Snow of the right temperature to adhere to telegraph wires was provided in sufficient quantity to break them down by its weight, and finally

rain, heavy, but again not unprecedented, carried the accumulations off the frozen ground almost as from the roof of a house.

We have prepared a table giving various details of the rainfall of February, in addition to the *Regular* Table which appears every month, and reference to them will show that, as regards the max. fall on any day, there is nothing exceptional far less unprecedented, again, the total fall for the wet fortnight, from 13th to 26th, though large, does not reach a phenomenal figure except in special cases and in this connection the most striking column is that giving the number of consecutive wet days, which speaking generally is very exceptional.

To speak of the snow is very difficult, for the rainfall observer was as much baffled as the railway and telegraph engineer, and it would be almost hopeless to attempt to summarize the descriptions received from rainfall observers, and taken from the newspaper press. In selecting the latter we have, as far as possible, taken definite statements only, and are satisfied that, though there is occasional exaggeration, the great majority are as near as possible to the truth.

When we turn to the total rainfall for the month, we have values which for February are very remarkable, but which have, we believe, in nearly every instance been equalled in a wet October, November or December.

Over the country included between lines running from Hereford to the Wash and from Bristol to Brighton the fall was more than double the February average of the 10 years, 1880-89; at Newport, Essex, reached 307 per cent.; at Castle Ashby, Northampton, 275 per cent.; at Llanfrechfa Grange, Monmouth, and Upfield Stroud, Gloucester, 266 per cent.; at Cookham Vicarage, Berks, 259 per cent.; and at Clifton, Bristol, 252 per cent. In the S.W. counties the excess was rather less, but was generally more than 75 per cent. In South Wales the excess was slight, and in North Wales generally disappeared, but Llandudno recorded twice the average.

Another large area with more than twice the average fall, stretches from Newcastle through Yorkshire, Notts and Lincoln, joining the before described area at the Wash. The most exceptional values are 424 per cent. at East Layton, Yorks; 388 per cent. at Newcastle; 365 per cent. at Ribston, Wetherby, Yorks; and 304 per cent. at Thorp Perrow, Bedale, Yorks. East and west of this belt the fall was less, and as a whole, was, we believe, rather less than 50 per cent. above the average.

Over Scotland and Ireland the total fall varied from moderate excess to moderate deficiency, but nowhere was it sufficiently remarkable to call for special notice.

We cannot do better than leave the description of the floods to the rainfall observers and to the press; but generally speaking they were far from unprecedented. Perhaps the most striking effect was the destruction of the bridge at Guildford; and the flood there was very exceptional—but whether the bridge would have withstood the flood if the timber stacks had not existed we cannot say.

## FEBRUARY, 1900.

*Additional Rainfall Records.*

Div.	STATIONS.	Total Rain-fall.	Max. Fall.		Diff. from Aver		No. of consecutive Wet Days.	Total Rain-fall, 13-26.
			Amount	Date.	Amount	Per cent.		
		in.	in.		in.			in.
I.	Muswell Hill .....	4.16	.83	2	+2.05	97	16	2.62
II.	Reigate, Woodhatch Lodge .....	4.46	.73	15	+2.20	97	15	3.23
"	Red Hill, Oxford Road.....	4.85	.86	15	+2.43	100	16	3.46
"	Seven Oaks, Riverhead Vic. ....	3.86	.52	15	+1.60	71	11	2.98
"	Steyning .....	6.17	.71	15	+3.41	123	15	4.54
"	West Dean .....	4.84	1.19	15	+2.06	74	16	3.85
"	Alton, Ashdell .....	6.34	1.65	15	+3.55	128	16	5.31
"	Newbury, Welford Park ...	4.83	1.10	15	+2.17	81	16	3.66
"	Maidenhead, Cookham Vic. ....	4.65	...	...	+2.86	159	...	...
III.	Broxbourne .....	4.03	.72	2	+2.06	104	10	2.65
"	Kensworth [Dunstable] ...	4.51	.96	15	+2.38	111	7	3.36
"	Slough, Upton .....	3.57	.65	2	+1.49	72	16	2.72
"	Oxford, Magdalen Coll. Lab. ....	4.49	1.04	13	+2.41	115	11	3.42
"	Banbury, Bloxham Grove... ..	4.52	1.10	15	+2.26	100	10	3.75
"	Castle Ashby .....	4.97	.77	15	+3.16	175	16	3.66
"	Northampton, Sedgebrook.. ..	4.75	.87	15	+2.76	138	7	3.39
"	Wisbech, Bank House ...	3.70	.60	3	+2.06	126	7	2.73
IV.	Saffron Walden, Newport.. ..	5.53	1.60	13	+3.73	207	16	3.55
"	Ipswich, Bishop's Hill .....	3.10	...	...	+1.53	98	...	...
"	Rendlesham Hall .....	3.74	.76	24	+2.19	141	6	3.01
"	Swaffham.....	3.83	.81	15	+2.12	123	7	3.15
V.	Alderbury .....	4.65	1.17	15	+2.16	87	16	3.58
"	Bishops Cannings .....	4.70	.75	15	+2.38	102	16	3.86
"	New Swindon .....	4.82	.70	15	+2.57	114	16	3.85
"	Blandford, Whatcombe.....	6.16	1.34	15	+2.81	84	16	4.81
"	Holne Vicarage .....	8.36	1.52	15	+1.60	24	16	7.88
"	Ashburton, Druid .....	11.07	2.44	15	+5.73	107	16	10.56
"	Okehampton, Oaklands.....	7.66	1.02	15	+3.51	85	16	6.25
"	Barnstaple Athenæum .....	5.85	.94	15	+2.79	91	16	5.21
"	Lynmouth, Glenthorne ...	8.36	1.43	16	+4.42	112	7	7.73
"	Probus, Lamellyn .....	6.47	1.50	14	+2.60	67	15	5.98
VI.	Clifton, Pembroke Road ...	6.40	1.00	13	+3.86	152	16	5.59
"	Great Barrington .....	5.48	1.21	13	+2.72	98	15	4.52
"	Cheltenham, Southam Villa ..	5.91	1.41	15	+3.39	134	16	5.14
"	Ross, The Graig.....	6.42	1.26	15	+3.76	141	16	5.52
"	Cheadle, The Heath House ..	3.84	.60	10	+1.60	71	15	3.07
"	Coventry, Priory Row .....	4.32	.56	19	+2.10	94	15	3.76
VII.	Hodsock Priory .....	3.94	.97	15	+2.22	129	6	3.29
VIII.	Neston, Hinderton.....	3.60	.89	15	+1.95	118	10	2.94
"	Southport, Hesketh Park... ..	3.00	.56	26	+ .76	34	6	2.52
IX.	Ripon, Mickley .....	4.57	1.10	26	+2.26	97	5	3.62
"	Bedale, Thorp Perrow .....	5.63	1.25	26	+3.78	204	6	4.13
"	East Layton .....	6.71	1.49	27	+5.13	324	3	3.91
"	Mickleton .....	3.78	1.00	26	+1.25	49	8	2.98
"	Limekiln Pasture .....	3.85	...	...	+1.31	52	...	...
X.	Unthank Hall.....	4.51	.75	15, 26	+2.33	106	4	3.58
"	Keswick, The Bank .....	6.54	2.55	15	+ .88	16	10	5.42
XI.	Llanfrehfa Grange .....	9.31	1.25	18	+5.81	166	16	8.42
"	Llandovery .....	4.80	1.00	15	+ .76	19	16	4.30
"	Castle Malgwyn .....	6.88	1.65	15	+2.28	50	10	5.60
"	Llandefaelog-fach Rectory.. ..	5.07	1.36	15	+1.30	35	16	4.32

MUSWELL HILL.—The R, 4·16 in., exceeds that of any other February since the gauge was started in January, 1872; February, 1881, with 4·03 in., having been the wettest hitherto. The 4·16 in. exceeds the average of 28 years by 2·35 in., or 130 per cent. There were heavy falls of S on 2nd (·83 in.), 10th (·46 in.) and 13th (·53 in.). R or S was recorded every day from 13th to 28th, amounting to 2·84 in. *S. Abethell.*

FINCHLEY, ETCHINGHAM PARK.—The wettest February since the gauge was started at the beginning of 1886, 3·12 in. in 1891 being the largest previously recorded. The total, 4·68 in., is 3·33 in. more than (or nearly  $3\frac{1}{2}$  times) the average of 14 years. There were heavy falls of S, on 3rd being 8 in. deep and yielding ·83 in.;  $3\frac{1}{2}$  in. deep on 10th, yielding ·44 in.; and on 13th  $5\frac{1}{2}$  in. deep, yielding ·76 in., making altogether 2·03 in. R or S was recorded on every one of the last 16 days, amounting to 3·37 in. *J. W. Scott.*

CHIDDINGFOLD, BEACONSCROFT.—On the 10th the R was ·74 in., 13th ·41 in., 14th ·17 in., 15th 1·45 in. = 2·77 in. On the evening of 14th a thaw set in, followed by a freezing night and thaw in morning, and this with the heavy R of the next day melted the S which had fallen early in the month, and caused a sudden flood. Here the flood was, I think, the highest remembered by the oldest inhabitant; it was bottled up above the bridges, but no damage was done. *J. P. Maclear.*

RED HILL, OXFORD ROAD.—The greatest fall in February recorded during 34 years. R 2·78 in., and rainy days 8, above the average. S on 5 days. *W. H. Tyndall.*

WALLINGTON.—Exceedingly wet; R 2·93 in. above the average, and the greatest on record. The R for the two months of this year is nearly one-third of the annual mean. S on 10th, 13th and 14th, that on 10th being 5 in. deep at 11 p.m. S on the ground from 2nd to 15th inclusive. *F. Campbell Bayard.*

TENTERDEN.—A wonderful February, and adding 4 days of January to 27 of February to make an average month, makes up 6·32 in. of R, equal to some of the wet autumn and winter months of the past. *J. Ellis Mace.*

ACRISE, SCHOOL HOUSE.—R 7·23 in., the greatest in February in 30 years, and 4·70 in. above the average. The fall of the three winter months, December to February, 16·02 in., has only once been exceeded in the same time, namely, in 1876–77. *G. C. Woollett.*

CROWBOROUGH.—S on 1st, S or sleet all day on 2nd (8 in.), S on 5th, 10th (heavy), 13th (5 in.) and 14th. The month was remarkable for heavy rainfall, the total, 6·73 in., being the greatest in 29 years. *J. T. S. Driberg.*

WEST DEAN.—A very stormy and excessively wet month, with intense cold till the 15th. A blizzard prevailed on 13th and 14th, the S drifting to a great depth and stopping all traffic on the roads. This was followed by very heavy R. S on 7 days, it lying 3 ft. deep in places on 18th. *E. Wells.*

MAIDENHEAD, COOKHAM VIC.—R 4·65 in. on 17 days. Flooded fields, &c., since 16th and 17th, and all sluices open since the night of 15th. Greatest height above the normal level 4 ft. 6½ in., but that normal level is here about 4 ft. above the natural level.

*R. W. Rogers.*

KENSWORTH [DUNSTABLE].—The heaviest rainfall recorded in any February, the nearest being 4·32 in. in 1883. The springs are rising rapidly. S on 2nd, 3rd, 10th, 13th, 14th, 16th and 17th.

*S. Grace Jones.*

SLOUGH, UPTON.—Floods began to rise in this district on February 16th, culminated at 7 a.m. on 22nd, and have been steadily subsiding since, but a considerable body of water was still out on March 1st. The depth of S was on 2nd 6½ in., on 10th 2½ in., and on 13th 4 in.

*R. Bentley.*

WENDOVER, HALTON GARDENS.—S 9½ in. deep on 2nd, 2½ in. on 11th, 3 in. on 13th, and 7 in. on 14th.

*R. C. Sanders*

WINSLOW, ADDINGTON MANOR.—We had a very heavy S storm at night on 13th, just about 9 in. deep on the level. The surface of the S next morning was all dotted over with large balls of S from 6 to 12 in. in diameter. I saw lots of them in course of formation just rolled along by the force of the wind. They have a very singular appearance on the smooth surface of the S. Measured as R I have only ·58 in., whereas the fall of S on 2nd gave ·75 in., when there was only 7 in., but it was much damper and heavier.

*J. Mathison.*

GORING-ON-THAMES, ELMCROFT.—The S on 2nd and 3rd was very heavy; it fell in still air, and I was able to measure it as almost uniform in depth over a very large area. The two days together gave 1·19 in. The floods on 22nd were the second highest in 12 years.

*E. Gambier Parry.*

ABINGDON, CULHAM.—Very cold from 7th to 14th, with two heavy falls of S. The wettest February since 1883. High floods in the Thames; very high from 18th to 21st. S on 7 days.

*F. C. Clutterbuck.*

OXFORD, ST. GILES'.—A notable month. The heaviest S since 1888 in February, and I think in any month. Six and a half in. of S at 9 a.m. on 3rd, and still snowing. Eight in. at 9 a.m. on 14th. By far the wettest February I have any record of. The floods are the heaviest since 1894.

*E. M. Tawney.*

SWERFORD.—On Saturday, 3rd, the S was 8 in. deep, and the ground was still covered on 9th. S began to fall at 4.30 p.m. on Tuesday, 13th, and reached an average depth of about 10 in. by the morning. Owing to drifts, some of the roads were impassable. S and R fell heavily all day yesterday (15th), and registered this morning 1·49 in.

*W. Hall.*

BANBURY, WEST BAR.—The fields on the morning of the 14th were strewn with cones and balls of S varying in size from an ordinary snowball to that of a man's head, and at times attaining

the size of a small barrel. Enquiries made of residents in the neighbourhood show that there was no variation in the conditions of drift over an area stretching from the Avon Dasset Hills in the N. to Charlbury and Woodstock in the S. The storm was accompanied by a high wind, and I think by a falling temperature on the morning of the 14th. One observer quotes 4° of frost only in the early morning, hence it may be that the substratum of S was harder than the upper 2 in. The wind was from N.W., varying a point or two towards N., judging by the S tracks. Each ball was preceded by its track or slide, and though the tracks were from 12 to 20 ft. in normal length, slides were to be seen of nearly 40 ft. in length. They were all curved—"comet-form" describes them best. The banded or cycloidal structure of the ball shewed clearly the way in which it was formed. *E. A. Walford.*

GRIMSBURY [BANBURY].—On the night of the 13th we had heavy S with a fresh gale from E. and N.E. Next morning the fields were covered with lumps of S, many 15 in. long and 9 in. in diameter, and the ends like a roll of paper. The wind evidently took small pieces, rolling them up until they got too heavy to move. I have lived here nearly 50 years and have never seen it before. The water from S caught in the rain-gauge gave .73 in. S drifts in places are heavy. *A. B. Field.*

COLCHESTER, HILL HOUSE, LEXDEN.—Typical as regards "fill dyke," and floods have been out a good deal in this neighbourhood. Springs and ponds filling up. *S. F. Hurnard.*

BISHOPS CANNINGS.—R 2.47 in., and rainy days 7, above the average. S 2½ in. deep on 2nd, and 2 in. on 10th. The depth could not be measured on 13th owing to drifts. *C. W. Hony.*

ASHBURTON, DRUID HOUSE.—S on 2nd, 3rd, 10th and 13th. Great and very destructive floods on 15th, caused by 4.87 in. of R on 13th, 14th and 15th. *Fabian Amery.*

TAVISTOCK, STATSFORD, WHITCHURCH.—Rainfall more than double the mean; in 16 days, from 13th to 28th, 8.66 in. fell; in the 7 days ending 19th, 5.13 in. fell; and in the 13 days ending 25th, 8.50 in. fell. In the 15 hours ending at 4 p.m., on 15th, 2.74 in. fell, and in the 20 hours ending 9.20 p.m., 2.97 in., causing (with the melting S) high floods in the rivers Tavy and Walkham. S on 8 days. *E. E. Glyde.*

OKEHAMPTON, OAKLANDS.—A heavy storm of S on 13th, and an extraordinarily rapid thaw on 15th, flooding the river to a great height. *W. H. Holley.*

WELLINGTON, THE AVENUE.—During the latter half there were excessive R and heavy gales. The last 16 days had S or R on each. R about 1.25 in. above the normal. S on 1st, 2nd, 3rd, 10th, and heavy on 13th. *F. J. Burnett.*

NORTH CADBURY RECTORY.—February 2nd, S with N.E. wind, from the small hours till nearly midnight. It would have lain, possibly, 3 in. deep, if none had melted. That in the gauge pro-

duced ·19 in., but this being clearly under the truth I have put down ·27 in. February 10th, thaw began at 11 a.m.; S at 12.30, with strong wind till about 3 p.m., when it gradually turned to R (wind dropping), which lasted till 7 p.m. Sky then cleared, but S again at dawn on 11th, lasting till 8.45 a.m. The gauge yielded ·36 in., of which quite ·25 in. must have been R; again evidently below the truth, so ·40 in. was adopted. February 13th, S, with E. wind, began at 2.30 p.m., and continued driving and drifting till about 7 p.m., when it turned to sleet. There had been a thaw in the morning, then as the S came on it froze, and about 9.30 p.m. it thawed again for a short time. It then froze again, forming an ice crust over the S. Later another  $1\frac{1}{2}$  in. of S fell. Next morning there was an average depth of 3 or 4 inches, with the ice crust in the middle. The S was very dense. The gauge yielded ·42 in.; I have adopted ·50 in. February 15th, the wind rose in the very early morning, and R followed; by 9 a.m. there was almost a gale from S.E., and ·48 in. of small driving R had fallen. The R kept on, with high wind, all day; by 6 p.m. another ·75 in. had fallen. But little fell after that, till in the small hours a shower fell making ·88 in. to be measured next morning. Roughly speaking 1·75 in. of R fell in 18 hours, on ·50 in. of S upon frozen ground. The flood that followed was the biggest by far that I have seen since my first coming, and in the Somerset lowlands must have been very bad indeed.

*H. A. Boys.*

CLIFTON, PEMBROKE ROAD.—By far the heaviest rainfall for February for 45 years, the nearest approach being 4·94 in. in 1876. The aggregate of 6 inches on 16 consecutive days is very unusual, though not quite unprecedented. About 2 inches of S on 2nd, and 9 inches on 13th.

*R. F. Sturge.*

CIRENCESTER, DOLLARWOOD.—Very heavy daily R continued to the 20th, and with the rapidly melting S will cause serious floods down the Thames. I have in 15 years never known the hill brooks so swollen.

*C. P. Hooker.*

CIRENCESTER, FURTHER BARTON.—Excessively wet. The blizzard of the afternoon and night of the 13th and 14th will be long remembered; almost all the roads were blocked. The heavy R which followed caused severe floods. Three inches of S on 2nd, and S on four other days.

*J. E. A. Brown.*

CHELTENHAM, SOUTHAM VILLA.—S on 1st, 2nd, 3rd, 9th, 10th and 13th, that on 13th being the heaviest since January, 1881. In the afternoon S, very fine, began to fall, and by evening there was a regular blizzard, the fine S penetrating everywhere. On the morning of the 14th it was 9 in. deep on the level, and yielded ·70 in. of water. The week ending 19th was almost a record week for R, the total being 4·05 in. At 4 p.m. on the 19th the barometer reading was 28·438 in. (corr. and red.)

*R. Tyrer.*

ROSS, THE GRAIG.—Rainfall three times the average, and larger by far than in any year since 1833, which had a record of 6·86 in.



Six in. fell in 15 days, an amount reached only once or twice in my experience. The excessive R caused many landslips in the neighbourhood, but the River Wye has been unusually little affected. S on 2nd and 3rd, 1 in. to 2 in. deep. On Thursday (13th) S began at 4 p.m. and lasted for three hours; on Wednesday morning I registered .76 in. The depth outside my house was  $8\frac{1}{2}$  in., but generally I think it was not much above 6 in. except in drifts. *H. Southall.*

WOLVERHAMPTON, TETTENHALL.—The wettest February in 27 years, being 2.04 in. above the average. S on 10 days. *R. T. Smith.*

COVENTRY, PRIORY ROW.—Great rains and floods. S all day on 3rd, and 2 or 3 inches on 13th; Great floods on 16th. *J. Gulson.*

COVENTRY, KINGSWOOD.—The enormous rainfall produced enormous floods in the district. S on 4 days. *R. B. Caldicott.*

WORKSOP, HODSOCK PRIORY.—The wettest February for at least 25 years. S on 7 days, *H. Mellish.*

BOLTON, THE PARK.—The amount of R and S has not been exceeded in February since 1894, when 5.55 in. fell. There has not been such a heavy fall of S as that of 10th for 19 years. R or S fell on 19 days, amounting to 3.78 in., or 1.28 in. above the average. *W. W. Midgley.*

BROUGHTON-IN-FURNESS.—The first half was cold, with S on the ground. The latter half was milder, the S soon disappearing and a good deal of heavy R falling. S on 1st, 7th, 9th (12 in.), 10th, 12th, and a fearful blizzard on 15th. *C. P. Chambers.*

DUDDON VALLEY, SEATHWAITE VIC.—The most wintry month of the season, with a snowfall heavier than has been known for years. S on 8 days. *S. R. M. Walker.*

MELTHAM, HAREWOOD LODGE.—It commenced to snow about midday on Saturday, 10th; by 11 p.m. between 8 and 9 inches had fallen, and by 9 a.m. on 11th the total depth was 14 in., of which somewhat less than an inch belonged to a previous fall; the yield of water for the first  $8\frac{1}{2}$  in. was .54 in., but for the total fall I have not been able to get a very accurate figure, owing to the gauge being buried in the morning; by inverting a cylinder and melting the contents I got 1.04 in. for 14 in., of which about 1 in. was hard old S. I therefore decided to adopt .95 in. as the yield for 13 in. I have only two instances in my record of nearly 20 years to compare with this—*viz.*, January 29th, 1882, when I recorded the fall as between 12 in. and 14 in., and December 6th, 1882, on which day there fell about 16 in. There are drifts on the high ground exceeding 6 ft., and on Sunday about noon the S could be seen blowing off the moors in clouds at least two miles away. On 15th S began to fall at about 8.45 a.m., and continued for  $8\frac{1}{2}$  hours; for this time the gauge gave 1.02 in. of water, and a cylinder placed close beside it gave .97 in., notwithstanding the S was so wet that it did not lie more than 3 in. deep on the top of the old S, ascertained by careful measurement. During this time the wind blew very strongly from S.E. and S.S.E., and in exposed places amounted to a full gale. After 5.15 p.m. the

wind veered to S.S.W., the S ceased, and scarcely any R fell between that time and 9 a.m. on 16th. From 9 a.m. to 9 p.m. the bar. fell from 29·791 in. to 28·902 in., or 0·889 in. in 12 hours, and at 11 p.m. (the lowest) was 28·820 in. *C. L. Brook.*

GOLDSBOROUGH HALL.—Heavy falls of S on 10th (from 12 to 13 in.) and 15th. On 26th 1·17 in. of R fell. *R. Goodall.*

RIPON, MICKLEY.—Very heavy falls of S, about 18 in. deep from 10th to 15th. *E. E. Harrison.*

BALDERSBY.—S 12 in. deep from 10th to 16th. *W. Gregson.*

EAST LAYTON.—A blizzard of unusual severity raged the whole of the 15th, roads were blocked in all directions, and other damage was done. *E. O. Proud.*

HALTWHISTLE, UNTHANK HALL.—Violent S storms, with wind and heavy drifts from 8th to 22nd. Snowed up from 11th to 15th. *D. Dixon Brown.*

MELMERBY.—S drifts prevented the record from being taken from 8th to 10th. *W. Y. Craig.*

MONMOUTH, SCHOOL HOUSE.—R measured on February 15th, at 9 a.m., ·75 in.; at 3 p.m., 2·10 in.; at 5 p.m., ·33. Total, 3·18 in. S fall on Monday night (12th) about 9 or 10 in., yielding 1·00 in. *E. H. Culley.*

RHIWBRYFDIR.—S 8 in. deep on 9th, and 10 in. deep on 11th. S storms on 12th, 13th and 14th. *R. Roberts.*

LLANBERIS, GLYN PADARN.—Nine inches of S on 9th, 5 in. on 10th, and 2 in. on 13th. *F. Muckleton Allen.*

PENMYNYDD VICARAGE.—On Friday, the 9th inst., there was a very heavy fall of S in the afternoon, from 5 to 6 in. falling in about two hours. On Saturday, the 10th, there was more S, and I was told that the depth was again quite 6 in. *H. D. Owen.*

MONIAIVE, MAXWELTON HOUSE.—Seven in. of S fell on 8th, 3 in. on 9th, and 1 in. on 15th, followed by heavy R. *E. Laurie.*

LILLIESLEAF, RIDDELL.—One of the most disagreeable months ever experienced. S storms were many and heavy, and roads were often blocked for days. The great storm of 15th destroyed all telegraphic and much railway and road communication for days. This was the heaviest storm and highest wind I can recollect for 60 years; it came on at 11 a.m. and lasted till midnight; at its height the wind was travelling at 45 miles an hour (5.40 p.m.) On 19th S fell again very heavily and we were again blocked up. On 24th when the thaw came it was followed by the highest flood for many years. R 2·18 in. above the average. S on 12 days. *J. Sprat.*

ISLAY, EALLABUS.—The heaviest S storm for 5 years occurred on 9th and 10th. *J. Laughton.*

BALQUHIDDER, STRONVAR.—S 3 in. deep on 8th, 2 in. on 12th, 9 in. on 15th, 1½ in. on 19th and 1½ in. on 21st. *J. Dickson.*

COUPAR ANGUS STATION.—Sixteen days R or S. Total 3·57 in or 1·62 in. above the average. On 15th there was a very severe storm of sleet and S, whereby the telegraph wires were cased with ice, the

wires having the appearance of ropes about two inches in diameter, and causing destruction never before experienced. *J. Robertson.*

KEITH H.R.S.—Heavy S storms from 1st to 13th. *J. Lyon.*

DUNMANWAY, COOLKELURE.—A very heavy fall of S took place during the night of 8th, 12 to 13 in. falling and remaining on the ground for several days. *E. A. Shulldham.*

CORK, WELLESLEY TERRACE.—An unusual amount of S; that of the 8th and 9th was the greatest since February 18th and 19th, 1892, when it reached a depth of 18 in. S on 7 days. R .88 in. over the average. *W. Miller.*

KILLARNEY, WOODLAWN.—S 3 or 4 in. deep on 8th, which was increased to 8 or 10 in. on the 11th. *G. R. Wynne.*

CAHIR, DUNESKE.—S on 1st (3 in. deep) 3rd, 9th and 10th.

*R. W. Smith, Junr.*

MILTOWN MALBAY.—The month opened with sharp frost, which ended about the middle with 5 successive days of S, the ground remaining covered for a week. *M. Molohan.*

## NOTES ON THE SNOW FROM THE NEWSPAPER PRESS.

### FRIDAY, FEBRUARY 2ND.

LONDON.—The snowfall played havoc with telephone and telegraph wires all over London, and at Islington dragged down with them a chimney stack to which they were fixed. Big Ben stopped at 1.30 a.m. on Saturday morning. The average depth in the outskirts was 4 inches.

KEMPTON PARK.—An average of 6 inches covered the race-course.

WEST SURREY.—Snowfall of 8 or 9 inches, and drifts.

WINDSOR AND ETON.—S 4 to 7 inches deep, and much more in drifts.

HATFIELD.—An engine was derailed by the S, and the tender thrown on its side.

NORTHAMPTON DISTRICT.—S from 8 to 12 inches deep in places.

PETERBOROUGH.—Drifts in the country round 4 ft. to 5 ft. deep.

BEDFORDSHIRE.—The worst S storm for years; S over a foot deep, and drifts to the tops of the hedges. The chalk cutting on the G.N.R. near Dunstable Downs was partially blocked, and the 6 a.m. train from Dunstable to Luton was unable to get through.

SWINDON.—S fell for 12 hours and reached a foot in depth.

LEICESTERSHIRE.—Newspaper trains were delayed several hours, and in Leicester tram and omnibus traffic was stopped.

### WEDNESDAY, FEBRUARY 7TH.

BEAULY, AIRD AND BLACK ISLE DISTRICTS.—S 5 to 6 inches deep on the lower levels. Mail trains running with snow-ploughs.

DUNBEATH, N.B.—S fell steadily all day, making the depth on the ground fully 8 inches. The mail cart from Ord to Helmsdale could not proceed beyond Berriedale.

THURSO.—S fell all day. The roads, though heavy, remained open, and the trains were running nearly to time.

*(To be continued.)*

## ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, Feb. 21st, at the Institution of Civil Engineers, Gt. George Street, Westminster, Mr. R. Bentley, Vice-President, in the chair.

Mr. E. Mawley, F.R.H.S., read his report on the Phenological observations for last year, in which he showed that the weather for the year ending November, 1899, was chiefly remarkable for its high temperatures, scanty rainfall, and splendid record of sunshine. The winter and summer were singularly warm seasons, while the autumn was also warm, but during the three spring months rather low temperatures prevailed. In the early part of the flowering season wild plants came into blossom in advance of their mean dates, but after March they were mostly late in coming into bloom. Taking the country as a whole, the best farm crop of the year was wheat, the yield of barley proved also good, while oats were slightly under average. The crops mostly affected by the dry weather were those of hay and turnips, the latter being in most districts exceptionally poor. The only part of the British Isles where the summer drought was not severely felt was in Ireland, throughout a great part of which there was abundant keep in the pastures during the whole summer. The year was a very bad one for fruit. The yield of apples, pears, plums and strawberries varied greatly in different localities, but was in most of them much under average.

Dr. R. H. Scott, F.R.S., read a paper giving the results of the percolation experiments which have been carried on at Rothamsted by Sir J. B. Lawes and Sir J. H. Gilbert, from September, 1870, to August, 1899. Three gauges were used, with 20 inches, 40 inches and 60 inches depth of soil respectively; the area of each gauge being one-thousandth of an acre. The amount of water collected at the depth of 40 inches is always in excess of that collected at 20 inches, and also of that collected at 60 inches. In the winter months more than half the amount of rain penetrates into the soil and is available for springs, while in summer this amount only reaches a quarter that of the rain.

The Society will attain its jubilee on Tuesday, April 3rd, when it is proposed to observe the 50th anniversary in a special manner. The Council have arranged for a commemoration meeting to be held at 3 p.m. at the Institution of Civil Engineers, at which the President will deliver an address, and delegates from other societies will be received. In the evening a conversazione will be held at the Royal Institute of Painters in Water Colours. On the following day, April 4th, the Fellows will visit the Royal Observatory, Greenwich, and in the evening will dine together at the Westminster Palace Hotel. In view of this jubilee celebration, Mr. G. J. Symons, F.R.S., was elected President at the annual meeting of the Society on January 17th, but owing to illness he was obliged to resign this office. Under these circumstances the Council at their last meeting appointed Dr. C. Theodore Williams as the President of the Society.

SUPPLEMENTARY TABLE OF RAINFALL,  
 FEBRUARY, 1900.

Div	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	3.69	XI.	Builth, Abergwesyn Vic.	6.11
II.	Dorking, Abinger Hall.	6.44	„	Rhayader, Nantgwilt ...	5.96
„	Birchington, Thor .....	4.54	„	Lake Vyrnwy .....	5.75
„	Hailsham .....	5.17	„	Corwen, Rhug .....	5.19
„	Ryde, Thornbrough .....	5.56	„	Criccieth, Talarvor .....	3.52
„	Emsworth, Redlands ...	4.92	„	I. of Anglesey, Lligwy..	4.05
„	Alton, Ashdell .....	6.34	„	I. of Man, Douglas .....	4.25
III.	Oxford, Magdalen Coll..	4.49	XII.	Stoneykirk, Ardwell Ho.	2.98
„	Banbury, Bloxham .....	4.52	„	New Galloway, Glenlee	5.28
„	Northampton, Sedgebrook	4.75	„	Moniaive, Maxwellton Ho.	4.81
„	Alconbury .....	3.29	„	Lilliesleaf, Riddell .....	4.48
„	Wisbech, Bank House...	3.70	XIII.	N. Esk Res. [Penicuik]	4.45
IV.	Southend .....	3.54	XIV.	Glasgow, Queen's Park..	2.68
„	Colchester, Lexden .....	2.81	XV.	Inverary, Newtown .....	3.64
„	Saffron Waldon, Newport	5.53	„	Ballachulish, Ardsheal...	3.95
„	Rendlesham Hall .....	3.74	„	Islay .....	4.63
„	Scole Rectory .....	2.35	XVI.	Dollar .....	3.37
„	Swaffham .....	3.83	„	Balquhider, Stronvar...	4.66
V.	Salisbury, Alderbury ...	4.65	„	Coupar Angus Station...	3.57
„	Bishop's Cannings .....	4.70	„	Blair Atholl ... ..	2.07
„	Blandford, Whatcombe ..	6.16	XVII.	Keith H.R.S. ....	1.49
„	Ashburton, Holne Vic...	8.36	„	Forres H.R.S. ....	2.95
„	Okehampton, Oaklands.	7.66	XVIII.	Fearn, Lower Pitkerrie..	...
„	Hartland Abbey .....	6.88	„	S. Uist, Askernish .....	...
„	Lynton, Glenthorne ...	8.36	„	Invergarry .....	1.30
„	Probus, Lamellyn .....	6.47	„	Aviemore, Alvie Manse.	1.40
„	Wellington, The Avenue	4.20	„	Loch Ness, Drumnadrochit	1.41
„	North Cadbury Rectory	4.29	XIX.	Invershin .....	1.28
VI.	Clifton, Pembroke Road	6.40	„	Durness .....	2.21
„	Ross, The Graig .....	6.42	„	Watten H.R.S. ....	1.75
„	Wem, Clive Vicarage ...	3.42	XX.	Dunmanway, Coolkelure	5.91
„	Wolverhampton, Tettenhall	4.03	„	Cork, Wellesley Terrace	4.36
„	Cheadle, The Heath Ho.	3.84	„	Killarney, Woodlawn ..	6.13
„	Coventry, Priory Row ..	4.32	„	Caher, Duneske .....	3.95
VII.	Market Overton .....	4.35	„	Ballingarry, Hazelfort...	2.34
„	Grantham, Stainby .....	4.85	„	Limerick, Kilcornan ...	1.94
„	Horncastle, Bucknall ...	3.16	„	Miltown Malbay .....	3.32
„	Worksop, Hodsck Priory	3.94	XXI.	Gorey, Courtown House	7.29
VIII.	Neston, Hinderton .....	3.60	„	Moynalty, Westland ...	2.45
„	Southport, Hesketh Park	3.00	„	Athlone, Twyford .....	2.41
„	Chatburn, Middlewood.	5.05	„	Mullingar, Belvedere ...	2.34
„	Duddon Val., Seathwaite Vic.	9.84	XXII.	Woodlawn .....	2.44
IX.	Melmerby, Baldersby ...	6.59	„	Crossmolina, Enniscoe ..	...
„	Scalby, Silverdale .....	...	„	Collooney, Markree Obs.	3.43
„	Ingleby Greenhow Vic..	5.48	XXIII.	Enniskillen, Model Sch.	3.04
„	Middleton, Mickleton ...	3.78	„	Warrenpoint .....	3.24
X.	Haltwhistle, Unthank H.	4.51	„	Seaforde .....	4.18
„	Bamburgh .....	5.99	„	Belfast, Springfield .....	3.34
„	Keswick, The Bank .....	6.54	„	Bushmills, Dundarave..	2.83
XI.	Llanfrechfa Grange .....	9.31	„	Stewartstown .....	3.30
„	Llandovery .....	4.80	„	Killybegs .....	2.90
„	Castle Malgwyn .....	6.88	„	Horn Head .....	4.18
„	Brecknock, The Barracks	6.31			



## FEBRUARY, 1900.

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.		Max.		Min.					
				Dpth	Date				Deg.	Date	Deg.	Date.	In shade.
		inches.	inches.	in.									
I.	London (Camden Square) .....	3.99	+ 2.11	.87	2	20	57.0	24	17.7	9	12	20	
II.	Tenterden .....	5.57	+ 3.45	1.01	15	19	58.0	25	18.0	10	12	17	
	Hartley Wintney .....	5.85	...	1.67	2	19	56.0	26	8.0	9	18	20	
III.	Hitchin .....	4.49	+ 2.74	1.07	15	16	57.0	23	14.0	7, 8	16	...	
	Winslow (Addington) .....	4.54	+ 2.38	.75	2	17	58.0	23	11.0	8, 9	17	20	
IV.	Bury St. Edmunds (Westley) .....	2.60	+ 1.04	.52	15	19	52.0	25	20.0	8	...	...	
	Norwich (Brundall) .....	2.92	...	.63	15	19	57.0	24	18.4	13	12	19	
V.	Winterbourne Steepleton .....	6.09	...	1.09	15	19	54.6	26	17.3	9	15	17	
	Torquay (Cary Green) .....	5.89	...	1.13	14	20	54.2	22	25.8	7	8	16	
"	Polapit Tamar [Launceston] .....	5.62	+ 2.35	1.04	14	19	55.4	25	16.1	9	15	16	
VI.	Stroud (Upfield) .....	6.82	+ 4.26	1.04	19	20	55.0	23	22.0	8	16	...	
	Churchstretton (Woolstaston) .....	3.69	+ 1.24	.53	26	23	54.5	24	18.0	8	18	23	
"	Worcester (Diglis Lock) .....	4.49	+ 2.52	1.11	15	22	...	...	...	...	...	...	
VII.	Boston .....	4.04	+ 2.36	.63	19	16	55.0	23c	15.0	13	18	20	
	Hesley Hall [Tickhill] .....	3.54	+ 2.04	.80	15	18	55.0	23	17.0	8e	17	...	
"	Breadsall Priory .....	4.04	...	.57	24	18	...	...	...	...	...	...	
VIII.	Manchester (Plymouth Grove) .....	2.77	+ .72	.93	10	15	57.0	24	14.0	11	16	18	
IX.	Wetherby (Ribston Hall) .....	5.76	+ 4.18	1.30	26	19	...	...	...	...	...	...	
	Skipton (Arncliffe) .....	7.13	+ 2.44	1.22	16a	19	...	...	...	...	...	...	
"	Hull (Pearson Park) .....	3.40	+ 1.60	.71	15	19	57.0	23	18.0	8	20	22	
X.	Newcastle (Town Moor) .....	5.43	+ 4.03	1.40	26	20	...	...	...	...	...	...	
	Borrowdale (Seathwaite) .....	8.30	+ 4.34	2.02	15	18	...	...	...	...	...	...	
XI.	Cardiff (Ely) .....	6.19	+ 3.00	1.00	18	22	...	...	...	...	...	...	
"	Haverfordwest .....	6.33	+ 2.21	1.31	14	22	53.4	23	19.3	8	13	17	
"	Aberystwith (Gogerddan) .....	2.96	+ .30	.50	13b	14	53.0	22	10.0	7	18	...	
XII.	Llandudno .....	3.67	+ 1.75	.92	15	17	54.8	23	26.5	7	11	...	
	Cargen [Dumfries] .....	5.65	+ 2.00	1.15	9	14	49.0	23d	5.0	12	19	...	
XIII.	Edinburgh (Blacket Place) .....	3.57	...	1.28	19	12	52.7	24	17.0	8	18	23	
XIV.	Colmonell .....	4.40	...	1.46	15	16	53.0	25	9.0	10	...	...	
XV.	Tighnabruaich .....	4.24	...	1.68	15	13	45.0	24	19.0	9	20	...	
	Mull (Quinish) .....	4.24	+ 1.23	1.04	15	17	...	...	...	...	...	...	
XVI.	Loch Leven Sluices .....	4.00	+ 1.25	1.40	23	8	...	...	...	...	...	...	
	Dundee (Eastern Necropolis) .....	2.90	+ .80	.55	15	17	50.2	25	17.4	12	23	...	
XVII.	Braemar .....	3.73	+ .37	1.50	15	16	46.3	25	2.8	11	25	27	
"	Aberdeen (Cranford) .....	5.22	...	1.41	19	22	55.0	24	11.0	8	19	...	
	Cawdor (Budgate) .....	1.47	+ .76	.31	27	13	...	...	...	...	...	...	
XVIII.	Strathconan [Beaul] .....	2.45	+ 2.26	.72	17	8	...	...	...	...	...	...	
	Glencarron Lodge .....	2.31	...	.28	16	17	49.0	24	10.5	10	22	...	
XIX.	Dunrobin .....	1.19	+ .90	.38	19	10	49.0	24	17.0	8	...	...	
	S. Ronaldshay (Roeberry) .....	2.47	+ .17	1.09	15	20	49.0	25	20.0	6	18	...	
XX.	Darrynane Abbey .....	3.07	...	.48	15b	20	...	...	...	...	...	...	
"	Waterford (Brook Lodge) .....	5.34	+ 1.26	1.06	14	16	54.0	24	8.0	12	...	...	
	Broadford (Hurdlestown) .....	...	...	...	...	...	...	...	...	...	...	...	
XXI.	Carlow (Browne's Hill) .....	2.94	+ .14	.70	18	19	...	...	...	...	...	...	
	Dublin (Fitz William Square) .....	3.16	+ .81	.54	26	23	55.9	24	21.7	8	12	23	
XXII.	Ballinasloe .....	2.52	+ .26	.40	14	15	51.0	22	15.0	12	17	...	
	Clifden (Kylemore) .....	4.83	...	1.17	21	13	...	...	...	...	...	...	
XXIII.	Waringstown .....	2.78	+ .33	.46	21	12	50.0	25	12.0	13	9	16	
	Londonderry (Creggan Res.) .....	2.54	+ .49	.65	15	23	...	...	...	...	...	...	
"	Omagh (Edenfel) .....	2.49	+ .20	.77	15	18	50.0	23d	15.0	7	19	24	

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

a—and 22. b—and 18. c—and 25. d—and 24. e—and 12, 13.

# METEOROLOGICAL NOTES ON FEBRUARY, 1900.

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.

LONDON, CAMDEN SQUARE.—The wettest February for more than 40 years, the total R being 2·38 in. (or 148 per cent.) more than the average of that period. The next wettest February was in 1879 with a fall of 3·77 in. The max. fall, ·87 in. on 2nd, is also unprecedented the next largest being ·76 in. in 1879. R fell on 20 days but this number has been exceeded by 24 in February, 1879 and 22 in February, 1893. The 16 consecutive days, 13th to 28th, were all wet with a total of 2·77 in., the next longest wet period in February being 10 days in 1880 with 1·40 in. of R.

TENTERDEN.—The wettest February in 37 years, 1866 with 4·06 in. and 1879 with 4·21 in. being the only others with more than 4·00 in., though 1883 and 1893 had nearly as much. Much S on 2nd, 10th and 13th, but it mostly melted as it fell or soon after. The second week was very cold and the last week warm. Duration of sunshine 72 hours 30 mins. Gales from N.N.W. on 11th, N. on 14th, S.S.E. on 15th, W. on 16th and S.W. on 19th. Fog on 3rd and 4th.

HARTLEY WINTNEY.—A veritable February “fill-dyke” with R every day except from 4th to 13th, during which period the most intense frost was recorded, the min. temp. being as low as 0°·3 on 9th. The rainfall is 4·10 in. above the average and exceeds all previous records. More S fell than in any other month recorded. For the first four days the max. and min. temps. varied only 4°, with a keen E. wind. The honey bee was out on 25th and the Brimstone butterfly on wing on 26th.

HITCHIN.—The wettest February recorded in 40 years. S on 2nd, 13th and 15th.

WINSLOW, ADDINGTON.—A cold wet month, the wettest February in 30 years. Very large floods on 16th and 17th and again on 27th. Intense frost from 7th to 9th and on 12th and 13th. S seven inches deep on 3rd and nine inches on 14th. Dense fog on 13th.

BURY ST. EDMUNDS, WESTLEY.—Cold and wintry to the 16th with much S on seven days.

NORWICH, BRUNDALL.—An exceedingly damp, gloomy and unpleasant month. Heavy S storms, gales and severe frosts about the middle of the month. During both the cold and the mild periods a general excess of humidity prevailed. Fog on 26th.

WINTERBOURNE STEEPLETON.—The early part was cold; the mean temp. of the week ending 10th being 30°·8 only, whereas that of the month was 41°·3. S and much R about the middle of the month. The springs were very high all down the valley and they broke in places much higher than usual. S on five days and fog on four.

TORQUAY, CARY GREEN.—R 3·22 in. above the average. Mean temp. 41°·1, or 2°·3 below the average. Duration of sunshine 81 hours 25 mins. being 1 hour 35 mins. above the average; 9 sunless days. Ozone mean 5·3 the greatest being 8·5 on 20th and 23rd with S. and W. winds, and the least 0·5 on 8th, 13th and 14th with N. or E. winds.

POLAPIT TAMAR [LAUNCESTON].—The largest amount of R for February since 1883. Frosts every night for the first fortnight. A heavy fall of S on the afternoon and during the night of 13th, there being five-and-a-half inches of S on the ground on the following morning. S also on 2nd, 10th and 11th. S. gale on 15th and heavy floods. Heavy T on 17th.

STROUD, UPFIELD.—About one inch of S on 1st and two inches on 2nd. On 13th S fell in the afternoon and night to a depth of about ten inches, and in the morning little snowballs were to be seen all over the lawn and field so lightly made that they collapsed and sank into the S about midday.

CHURCH STRETTON, WOOLSTASTON.—A severe winter month. S fell on 11 days. The river Severn and many brooks were frozen over on 8th. Violent gales on 10th and 14th. Mean temp. 40°·8.

BOSTON.—During 13 days there was an average daily fall of ·23 in. of R, which is equal to that of any of the 21 great floods that have occurred in the fens during the last half century, except those in 1880, 1883 and 1885. S on 4 days.

ARNCLIFFE VICARAGE.—A very wild and snowy month but drifts were not quite so large as in March, 1886.

NEWCASTLE, TOWN MOOR.—The greatest monthly fall since October, 1896, when 5·68 in. fell.

#### WALES.

HAVERFORDWEST.—The first half was cold with more or less S on the ground nearly every day and sharp frosts at night, but with a strong tendency to thaw during the day. On 13th a heavy fall of S took place followed on 14th by a rapid thaw and at 5.30 a.m. on the next day a strong gale sprang up lasting all day and accompanied by heavy R. From 15th to the end it was generally mild and damp. Gales on 6 days; not much fog. Agricultural operations backward.

AEERYSTWITH, GOGERDDAN.—A cold sunless month. A little S on 9th, 10th and 11th, three inches in all.

#### SCOTLAND.

EDINBURGH, BLACKET PLACE.—Mean temp. 4°·2 below, and rainfall nearly double, the average. S on 11 days. S.E. gale on 15th.

COLMONELL.—R 63 in. above, and temp. 3°·0 below, the average of 24 years. S on 10 days; on 9th six-and-a-half inches fell in less than three hours.

TIGHNABRUAICH, CRAIGANDARAICH.—A cold wintry month.

ABERDEEN, CRANFORD.—Cold and wet with high wind. Gales on six days.

S. RONALDSHAY, ROEBERRY.—A very coarse cold month. Mean temp. 33°·8 or 4°·7 below the average of ten years.

#### IRELAND.

DARRYNANE ABBEY.—Rather dry, but with many days of small rainfall. About one inch of S on 9th, slight S showers on 10th, 11th and 12th.

DUBLIN, FITZWILLIAM SQUARE.—Not since 1895 has so severe a February been experienced. The mean temp. 37°·9 was 4°·9 below the average and below that of January. During the first half S or H fell almost daily, often in large quantities and the ground was more or less covered with S on 10 days. High winds on 9 days, reaching the force of a gale on 3 days. Fog on 6 days, S on 13 and H on 9.

OMAGH, EDENFEL.—A month of two quite distinct characteristics. Till the 14th a dry hard frost prevailed with little or no S and temp. lower than since February, 1895. During the remaining 14 days there were rains bringing up the monthly fall to the average, accompanied by higher day temp. but there were only four nights without frost on the grass.

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#### PRESENTATION TO DR. R. H. SCOTT.

AT the Meteorological Office, on February 26th, Mr. Robert H. Scott, M.A., D.Sc., F.R.S., who is retiring after many years' service, was presented by the staff of the office with a massive silver bowl, bearing a suitable inscription. The presentation was made by Captain Toynbee, late Marine Superintendent, who entered the service of the Meteorological Council on the same day as Mr. Scott, thirty-three years ago.



# SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

CCCCXI.]

APRIL, 1900.

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

## The late G. J. Symons, F.R.S.

It is impossible to reply individually to the many hundreds of letters which I have received expressing admiration for the life and work of the late Editor of this Magazine and personal sorrow for his loss. I would therefore ask all readers to accept my heartfelt thanks for their expressions of affection for my dear friend and for the cordial manner in which they have consented to aid me in carrying out his wishes.

H. S. W.

## THE JUBILEE OF THE ROYAL METEOROLOGICAL SOCIETY.

ON Tuesday, the 3rd of April, the Royal Meteorological Society celebrated its Jubilee, having been founded on the corresponding day in 1850. A Commemoration Meeting was held at 3 p.m., at the Institution of Civil Engineers, Great George Street, Westminster, Dr. C. Theodore Williams in the chair. There was a large attendance, including delegates from a number of other scientific societies. In view of the Jubilee, the late Mr. G. J. Symons, F.R.S., was elected President at the Annual Meeting on January 17th, but owing to a paralytic seizure was obliged to resign the office; he had, however, prepared an address giving a brief history of the Society, which Dr. Williams read, and then added some remarks of his own in appreciation of Mr. Symons, and also on the work of the Society. The address, after referring to early authors and observers, stated that the first English Meteorological Society was founded in 1823, but soon languished and died. A second Society was formed in 1836, which likewise remained in existence only for a few years. The present Society was founded at a meeting at Hartwell House, on April 3rd, 1850, attended by Mr. James Glaisher, Dr. J. Lee, Adl. Smyth, and others, mostly members of the Royal Astronomical Society. This was called the "British Meteorological Society," but in 1866, when a Royal Charter was obtained, the name was changed to "The Meteorological Society." In 1882, Her Majesty the Queen accorded the Society permission to adopt the prefix "Royal." Both Mr. Symons and Dr. Williams referred in some detail to the work done by the Society, and to the investigations which had been

carried out under its auspices. The Society had no habitation of its own until 1872, when a room was engaged at 30, Great George Street, and Mr. W. Marriott became the Assistant Secretary. Owing to the increase of work and the growth of the library, additional accommodation was obtained from time to time, the Society now having a convenient suite of rooms at 70, Victoria Street, Westminster. Dr. Williams, in concluding his address, stated that Mr. Symons had bequeathed to the Society £200, as well as the bulk of his large and valuable meteorological library.

Brief congratulatory addresses were delivered by Prof. J. J. Thomson, F.R.S., on behalf of the Royal Society; by Mr. E. B. Knobel, President, on behalf of the Royal Astronomical Society; by Mr. J. J. H. Teall, F.R.S., President, on behalf of the Geological Society; by Mr. R. C. Mossman, F.R.S.E., on behalf of the Scottish Meteorological Society; and by Mr. A. Wynter Blyth, M.R.C.S., on behalf of the Sanitary Institute. Prof. Dr. G. Hellmann, presented an address from the German Meteorological Society, and also spoke in appreciation of the valuable work done by the Royal Meteorological Society.

As a Memento of the Jubilee, the Council had caused a Bronze Medal to be struck, bearing on the obverse a portrait of Luke Howard, and on the reverse the date of the celebration. A copy of this medal was presented to each of the delegates from the various Scientific Societies.

In the evening a *Conversazione* was held at the Royal Institute of Painters in Water Colours, in Piccadilly, the guests being received by the President and Mrs. Theodore Williams. An Exhibition was arranged in the Banqueting Room, comprising:—Meteorological instruments: Photographs of lightning, clouds, frost, snow, hail, &c.; Apparatus illustrating the formation of a tornado cloud; Alleged "Thunderbolts;" The first Rainfall Map; A Meteorologist's Library, A.D. 1500, &c.

Lantern demonstrations were given in the East Gallery by Mr. T. C. Porter, of Eton, showing the Eclipse of the Shadow of the Peak of Teneriffe by the Shadow of the Earth; by Colonel H. M. Saunders, Clouds; and by Mr. W. Marriott, Meteorological phenomena, and Portraits of Presidents of the Society. The Royal Artillery String Band played during the evening, and short concerts by the "Schartau" Part Singers were given at intervals.

On Wednesday a large party of the Fellows was shown over the Royal Observatory, Greenwich, by the Astronomer Royal, after which they paid a visit to the Painted Hall and Naval Museum at Greenwich Hospital.

In the evening a Dinner was held at the Westminster Palace Hotel, which was numerously attended, the President being in the chair. The toast of "The Royal Meteorological Society" was proposed by Mr. W. N. Shaw, F.R.S. General Sir H. W. Norman responded for the Army; Professor Silvanus Thompson, F.R.S., for "The Delegates," and Dr. Pavy for "The Visitors."

# A CURIOUS FACT ABOUT LONDON SUMMERS.

*To the Editor of the Meteorological Magazine.*

SIR,—The mean temperature of summer at Greenwich (*i.e.*, June, July, August) has fluctuated since 1841 between the extremes  $57^{\circ}\cdot4$  (in 1860) and  $65^{\circ}\cdot1$  (in 1868), giving an average of  $61^{\circ}\cdot2$  for those fifty-nine years.

Suppose we select all summers reaching or exceeding  $63^{\circ}$ , on the one hand, and all summers reaching or falling below  $60^{\circ}$ , on the other. Then we obtain the following lists of the nine hottest and the fifteen coolest summers.

## *Nine Hottest Summers.*

Mean Temp.				Mean Temp.			
1.	1868	.....	$65^{\circ}\cdot1$	6.	1876	.....	$63^{\circ}\cdot5$
2.	1859	.....	$65^{\circ}\cdot0$	7.	1893	.....	$63^{\circ}\cdot5$ } <i>e</i>
3.	1846	.....	$64^{\circ}\cdot4$ }	8.	1887	.....	$63^{\circ}\cdot3$
4.	1857	.....	$64^{\circ}\cdot4$ }	9.	1870	.....	$63^{\circ}\cdot2$ <i>e</i>
5.	1899	.....	$64^{\circ}\cdot1$				

## *Fifteen Coolest Summers.*

Mean Temp.				Mean Temp.			
1.	1860	.....	$57^{\circ}\cdot4$	9.	1854	.....	$59^{\circ}\cdot5$
2.	1841	.....	$58^{\circ}\cdot0$	10.	1843	.....	$59^{\circ}\cdot7$ }
3.	1879	.....	$58^{\circ}\cdot5$ } <i>e</i>	11.	1848	.....	$59^{\circ}\cdot7$ } <i>e</i>
4.	1888	.....	$58^{\circ}\cdot5$ } <i>e</i>	12.	1891	.....	$59^{\circ}\cdot8$
5.	1862	.....	$58^{\circ}\cdot8$	13.	1892	.....	$59^{\circ}\cdot8$ }
6.	1882	.....	$59^{\circ}\cdot0$	14.	1844	.....	$60^{\circ}\cdot0$ }
7.	1890	.....	$59^{\circ}\cdot1$	15.	1853	.....	$60^{\circ}\cdot0$ }
8.	1845	.....	$59^{\circ}\cdot3$ <i>e</i>				

Now, it will be observed that the hottest summers are nearly all in years ending with the figures 5 to 9 ; only two exceptions (marked *e*), viz., 1893 and 1870. On the other hand, the coolest summers are mostly in years ending 0 to 4 ; there being four exceptions, 1879, 1888, 1845 and 1848. The exceptions amount to about a fourth in either case. We may note, further, that each of the six decades is represented in both lists.

It would appear that the earlier summers in a decade tend to be cooler, the later summers hotter.

The data previous to 1841 are not so reliable ; but if we admit their evidence, it might be shown (from Buchan's estimated temperatures) that as far back as 1810 at least the same contrast is indicated.

I should be glad, Sir, of some enlightenment as to the cause or causes of this feature in our summer weather.

Yours faithfully,

ALEX. B. MacDOWALL.

## ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, March 21st, at the Institution of Civil Engineers, Great George Street, Westminster; Dr. C. Theodore Williams, President, in the chair.

Reference was made to the loss which the Society had sustained by the death of Mr. G. J. Symons, F.R.S., who had held the office of Secretary from 1873 to 1899, except for the two years 1880-81, when he was President. At the Annual Meeting in January last he was elected President for the second time in order to preside over the Jubilee Celebration of the Society in April. Owing to an attack of paralysis in February, he had to resign, and he succumbed to the disease on March 10th. A vote of condolence with his relatives was passed by the meeting.

Twenty-seven new Fellows were elected, many of them proposed by Mr. Symons. Two Honorary Members were also elected: Mons. Albert Lancaster, Director of the Belgian Meteorological Service, Brussels, and Gen. M. A. Rykatcheff, Director of the Central Physical Observatory, St. Petersburg.

The papers read were:—

THE ETHER SUNSHINE RECORDER, *by W. A. Dines, B.A.*

The instrument is an electrical one, and consists of two parts—the one to be exposed to the sun, and the other, which registers on ordinary paper the amount of sunshine, to be put indoors in any convenient position. A week's trace is registered on each chart, and consists of a series of parallel lines lying over each other on the paper. The recorder can be put on a pole, and when once set up requires no attention. The expense of working the instrument is trifling, and, only requiring 52 charts per year instead of 365, is a very great advantage.

REMARKS ON THE WEATHER CONDITIONS OF THE STEAMSHIP TRACK BETWEEN FIJI AND HAWAII, *by Capt. M. W. C. Hepworth.*

The track followed by steamships differs very largely from that of sailing vessels, but no appreciable difference is found in the weather conditions. In making the passage between the Straits of Juan de Fuca and Honolulu, the first indication of the expected north-east trade wind is found, and preceding it, often by as much as 300 miles, is a long swell from the north-eastward, although the wind previously experienced is frequently from a westerly point. The swell has no wind at its back, and not infrequently it is quite a heavy one. The average rainfall at Honolulu is 35·4 in.; at Fiji considerable more, the mean being 100·6 in. Fiji is also greatly the warmer, the mean temperature being 79°.

COMPARISON BY MEANS OF DOTS, *by A. B. MacDowall, M.A.*

This is a simple method which does not seem to have been much used by meteorologists, but is capable of many useful applications.

# THE SNOW AND FLOODS OF FEBRUARY, 1900.

## NOTES ON THE SNOW FROM THE NEWSPAPER PRESS.

(CONTINUED).

### THURSDAY, FEBRUARY 8TH.

**NORTH WALES.**—The heaviest fall of S for many years, and a depth of about 7 inches.

**DUMFRIESSHIRE.**—Heavy fall of S on Thursday night, covering the ground to a depth of 9 inches.

**PERTSHIRE.**—S began to fall at night on 8th, and covered the ground to an average depth of about 7 inches. At Grantown, the depth is reported as 12 inches, and at Dava as 16 inches.

**FORFARSHIRE.**—Uniform depth of about 4 inches.

### FRIDAY, FEBRUARY 9TH.

**NORTHAMPTON.**—S began between 10 and 11 on Friday night, and by 10 a.m. on 10th was 6 to 8 inches deep.

**BARROW-IN-FURNESS.**—The streets were covered with from 8 inches to 1 foot of S, and tramway traffic was completely stopped. Between Barrow and Whitehaven a passenger train stuck fast in a large drift.

**WORKINGTON.**—Heavy S storm, with L and T. In some streets drifts were 6 ft. deep.

**KENDAL.**—A S storm of unusual severity, and by 3 p.m. the depth was close upon a foot.

**VALENCIA.**—On Thursday and Friday S fell to the depth of about 14 inches.

**LIMERICK.**—Owing to S, the train service was delayed several hours, and telegraphic communication was cut off.

### SATURDAY, FEBRUARY 10TH.

**MANCHESTER.**—S started falling about 11 a.m., and scarcely ceased for 24 hours, and drifts in the streets were 2 and 3 feet deep. On the moorland roads in North Derbyshire there were drifts 6 and 8 ft. deep.

**BLACKBURN.**—In the afternoon S was lying 6 inches deep, and at Great Harwood it was 8 inches.

**HUDDESFIELD.**—From shortly after noon on Saturday until early next morning S fell and exceeded a foot in average depth.

**BRIGHOUSE.**—S commenced at noon on Saturday, and continued until 8 a.m. on Sunday; the average depth being about 18 inches.

**HALIFAX.**—S 12 inches deep. At Denholme Station an engine had to be dug out of a drift.

**BRADFORD.**—S began about 1 p.m. on Saturday, and by next morning the roads were covered with not less than 8 inches, and there were drifts more than 3 ft. deep.

**KEIGHLEY.**—From Saturday noon to Sunday morning S fell to a depth of nearly a foot.

**SKIPTON.**—During Saturday and Sunday the fall of S was 9 or 10 inches.

**YORK.**—By midnight, S lay on the ground to a depth of about 8 inches.

**HARROGATE.**—S began about 11 a.m., and fell for 24 hours, yielding 1'02 in. of water, equivalent to about 12 inches of S.

SCARBOROUGH.—S in many places is a foot deep, and even the sands on the sea shore are covered.

NORTHALLERTON AND WENSLEYDALE.—S began on Friday (9th) afternoon, and fell almost continuously till Sunday afternoon, reaching a depth of 18 inches on the level, and rising in drifts to the tops of the hedges. A good deal of S cutting will have to be done before Thirsk, Osmotherley, Bedale and Stokesley can be reached. A light engine was kept running between Northallerton and Hawes to keep the line open.

SANQUHAR.—Since Saturday there has been much drifting in Upper Nithsdale, and on Monday morning many of the principal roads were completely blocked.

ESKDALE AND LIDDESDALE.—The Langholm branch of the North British Railway had in places as much as 6 ft. of S on it, but was cleared for traffic.

DUNS.—It is about 14 years since such a severe S storm was experienced. The S lies to a depth of fully 20 inches, and many roads are blocked.

GREENLAW.—During Saturday night and Sunday morning there was the heaviest S storm for many years. Great wreaths accumulated in many places, besides the even fall of 7 or 8 inches.

FERMOY.—S fell heavily on Friday night and Saturday, covering the roads to a depth of 10 or 12 inches.

CARRICK-ON-SUIR.—S began on Friday night, and on Saturday drifts were 2 ft. deep.

WEXFORD.—On Saturday morning, about 9.30, a regular blizzard commenced, and in a comparatively short time drifts accumulated to the depth of 7 or 8 feet. The trains had great difficulty in ploughing through the S, and were much delayed.

#### TUESDAY, FEBRUARY 13TH.

From many parts of the country it was stated that this was the most severe storm since 1881, and mail carts were stopped at innumerable places. The Postal Telegraph authorities gave notice of delay in transmission to all parts of the United Kingdom.

HERTFORDSHIRE.—Light engines had to be kept running to and fro on the Hertford, Luton and St. Albans branch; and on the L. & N.W. main line trains were much impeded, the S being in places 6 ft. deep. The G.N.R. from Hitchin to Cambridge was blocked for several hours by a goods train stuck fast in a drift.

OXFORDSHIRE.—Throughout North Oxfordshire and borders of the four shires the fall of S was very heavy, averaging fully 15 inches, while in the lanes there were drifts from 5 to 10 ft. deep.

OXFORD.—S began about 5 p.m., and 8 or 9 inches had fallen by the morning. Near Woodstock a mail van was abandoned in a deep drift. A drift 5 ft. deep formed on the Witney and Fairford branch rail, and the 7.15 train from Fairford could not run.

CHIPPING NORTON.—S commenced about 4 p.m., and continued till early in the morning, when it lay to a depth of about 9 inches.

NORTHAMPTON.—S began about sunset, and continued till 3 a.m., when the average depth was at least 8 inches, and there were drifts 3 ft. deep.

WILTSHIRE.—Tuesday night's S storm was the most severe for 19 years. The train on the Midland and S.W. junction which left Swindon at 8 o'clock was snowed up near Collingbourne, and the passengers had to remain in it

all night. On the Great Western main line there was no interruption, but the Highworth branch was snowed up. A train ran off the line between Devizes and Savernake, where it became imbedded in a drift.

**BLANDFORD.**—S following the heavy S caused a serious landslip on the Somerset and Dorset line near Blandford, completely blocking the line.

**CAMBORNE.**—S commenced about noon, and by 5 p.m. 3 or 4 inches had fallen.

**NORTH CORNWALL.**—The S on the roads was 8 to 10 inches deep, and drifts were from 3 ft. to 4 ft. deep.

**WESTON-SUPER-MARE.**—S began about 3 p.m., and fell for several hours. The fall did not exceed 9 inches, but drifts were several feet deep.

**BATH.**—The snowfall on Tuesday night was quite a foot in depth, and several mail carts could not reach the city.

**GLOUCESTERSHIRE.**—Four military trains from the North to Southampton were diverted via Bath and Templecombe, the line between Cheltenham and Andover being blocked at Andoversford by a train imbedded in drifts.

**BISHOPTON, BRISTOL.**—S began about 3 p.m., and continued far into the night, the average depth being 8 inches.

**THORNBURY.**—The S averaged about a foot deep.

**FOREST OF DEAN.**—S began early in the afternoon and continued for 12 hours.

In the morning it lay about 18 inches deep.

**GLOUCESTER.**—S began to fall about 5 p.m., and by morning was a foot deep.

**EVESHAM.**—S fell nearly all evening and night to the depth of 8 or 9 inches.

**LEAMINGTON.**—S at night and in morning of 14th, covering the ground to a depth of from 6 to 8 inches.

**MID CHESHIRE.**—On Tuesday night there was a fall of 2 inches more S, making a total of 13 inches in 4 days.

**BEWCASTLE.**—The roads were blocked for miles with S 6 ft. to 8 ft. deep, and cannot be opened for a fortnight.

**MONMOUTHSHIRE** was visited by a heavy S storm, which covered the ground to a depth of 5 or 6 inches.

**NEWPORT (MON.)**—S began about 3 p.m., and in 4 hours the streets were covered with a layer 5 inches deep.

**BLAENAVON.**—About 10 inches of S fell.

**PENARTH.**—S began early in the afternoon and fell all the evening, covering the ground to a depth of from 6 to 8 inches.

**CARDIFF.**—In a couple of hours 3 or 4 inches of S fell, and about 6 p.m. the tram-cars ceased running.

**PONTYPRIDD AND RHONDDA.**—Five or 6 inches of S fell.

**ABERDARE.**—S fell all the afternoon and evening, covering the ground to the depth of a foot.

**DOWLAIS.**—A G.W. locomotive was snowed up at Vochriw, and the L. and N.W. train from Merthyr to Abergavenny was unable to proceed beyond Dowlais Top for many hours.

**WALES.**—S fell heavily in Wales, rendering many roads impassable. Two men were found dead in the S between Aberystwith and Rhayader.

#### THURSDAY, FEBRUARY 15TH.

Telegraphic communication of London with York, Middlesborough, West Hartlepool, Sunderland and S. Shields ceased at 10.45 a.m.; with Bradford, Leeds and Sheffield at 11 a.m.; and with the Scotch offices and Newcastle at 0.20 p.m.

**SOUTH NOTTS.**—In the country districts the S lies to a depth of 9 inches.

**PEAK DISTRICT.**—S fell for 15 consecutive hours, and drifts on the roads are 10 ft. deep. At Dove Holes, on the L. and N.W., an engine stuck in a drift and had to be dug out. The 10.15 from London to Buxton ran into a drift and remained embedded all night.

**YORKSHIRE.**—Much delay of trains, and the railway up to Rosedale, which had been blocked since Sunday and only just cleared, was again drifted up. The general delay of trains appears to have been due to destruction of telegraph wires as much as to S drifts. For 31 hours there was no telegraphic communication between Edinburgh or Glasgow and London.

**SHEFFIELD.**—S began about 7 a.m., and fell continuously till 6 p.m., when 7 inches had fallen, making a total depth on the ground of 16 inches.

**LEEDS.**—At Roundhay six tram-cars were snowed up all night.

**SWALEDALE.**—A passenger train was snowed up for 6 hours at Catterick.

**WENSLEYDALE.**—The afternoon mail train was embedded at Aysgarth, and only released after 5 hours' labour by a large gang of men. At Hawes junction the line was blocked about midday and remained closed till next morning.

**WHITBY.**—The afternoon train from Scarborough failed to get through, and the passengers had to remain in it all night.

**TEESDALE.**—Roads were blocked in many places on Sunday, Monday and Tuesday, and again on Thursday.

**DURHAM.**—The passenger train due at Consett at 3.22 stuck fast at East Castle colliery, and a snow plough sent to clear the line and a light engine to help the train also became blocked. The 3.54 p.m. train from Newcastle could not proceed beyond Lintz Green. The afternoon train from Durham to Blackhill was embedded till 2 a.m., and the train which left Blackhill at 2.45 p.m. for Durham was reported stormbound till late on Friday.

**SHILDON.**—The 2 p.m. train from Shildon was snowed up between Tow Law and Burnhill, and the 3.30 from Shildon stuck in a drift between Bishop Auckland and Etherley.

**CARLISLE.**—The drift on the Midland Railway near Dent was on the average 6 ft. deep, and traffic was stopped for 19 hours. Two day expresses from Carlisle to London were blocked at this point for 12 hours. The N.E.R. was blocked at Low Row. The most serious block occurred on the North British near New Castleton; both lines were impassable for nearly 10 miles, the S being between 6 and 8 ft. deep. Traffic was suspended at midday, and there seemed little prospect of resuming it before Saturday.

**KIRKBY STEPHEN.**—The 12.42 train from Darlington was stopped to clear the brakes before running down the descent to Kirkby Stephen, and while this was being done, the train was snowed up. The line from Darlington to Tebay was completely blocked.

**BORDERS.**—The North British line was blocked by drifts 8 ft. deep near New Castleton. The Border Counties line between Hexham and Newcastle also remained blocked.

**HELENSBURGH.**—A train from Fort William was snowed up at Corrour, and the afternoon train from Helensburgh ran into a drift at Glendouglas and left the metals.



NOTES ON THE FLOODS FROM THE NEWSPAPER PRESS.

THURSDAY, FEBRUARY 15TH.

**TONBRIDGE.**—The lower part of the town was flooded by the Medway.

**STAVERTON.**—A horse and 6 pigs were drowned and much damage was done.

**BUCKFASTLEIGH.**—The Merdle overflowed and wrought great destruction to property; many works were stopped, the Ashburton branch railway was much damaged, and traffic was stopped for two days. Between Staverton and Buckfastleigh over 200 sheep were drowned. Church Bridge was damaged, and the water was 4 ft. deep on the roads.

**ASHBURTON.**—Heaps of stones and mud were deposited in the main street, shops were flooded, and the water on the railway was level with the platform.

**TAVISTOCK DISTRICT.**—All along the Tavy and Tamar the floods did considerable damage. At New Quay and Morwellham the Tamar rose within a few inches of the great flood of 1891, houses being flooded to a depth of 4 ft. The river was highest about 2 a.m. on Friday.

**TEIGNMOUTH.**—Many low-lying houses in the town were flooded.

**TEIGN VALLEY.**—At Trusham Station the rails were covered, and trains stopped running after noon. At Kingsteignton the road to Newton Abbott was 4 ft. under water, the greatest depth in living memory.

**NEWTON ABBOTT.**—The river Lemon overflowed, and nearly every street in the town was flooded. At Richard's Court, which adjoins the Lemon, a man was carried off his feet by the flood and nearly drowned. The road between Newton and Kingsteignton was washed out to a depth of 5 ft.

**BOVEY TRACEY.**—Mails were delayed from midday, the railway at Teigngrace being destroyed.

**CHUDLEIGH.**—The Teign overflowed to an extent not seen for many years, and trains had difficulty in getting along the Teign Valley line. The Clam bridge at Bella Marsh was swept away and no trains could pass over the Teign Valley line on Friday until 6 p.m., when the line was repaired.

**EXETER.**—Many streets in St. Thomas are under water. Communication with Plymouth on the S.W.R. was resumed early on Friday morning, the water at Newbridge, just above Cowley Junction having fallen; but the Budleigh Salterton line was closed all day, the damage to the permanent way being considerable. Parts of Lympstone were submerged by the rush of water from Woodbury Hills.

**CREDITON.**—The rivers Yeo, Creedy and Culver were much flooded. At Culverley Bridge the road was covered to a depth of 4 ft. At Neaporday the railway was covered. At Creedy Bridge the roadway was submerged to a depth of 3 ft., and the main road at Downes Mills was covered with 4 ft. of water. The last train to Exeter which got through was that passing Crediton at 3.54, the line being submerged for 600 yards between St. Cyres and Cowley Junction.

**OTTERY ST. MARY.**—The river Otter was much swollen, and at Butt's Bridge there was 3 ft. of water on the road.

**AXMINSTER.**—The rivers Axe and Yart have not been so high for 15 years. The S.W.R. was blocked for some hours and traffic diverted over the G.W.R. The Simlix Bridge on the S.W.R., near the junction of the Axe and Yart, had its piles carried away, and the centre subsided. The bridge and permanent way were covered by the flood.

**DARTMOOR.**—Following the heavy S, a S.W. gale and heavy R set in. The rivers quickly overflowed. A large bridge near the workhouse at Okehampton was washed away.

**HATHERLEIGH.**—The roads to Highampton, North Lew, Okehampton and Meeth were impassable.

**ST. COLOMB.**—The river Retew, which runs parallel with the Retew branch of the G.W.R., washed the ballast from the line, and traffic was suspended. The new double-arched bridge at Retin fell, and a bridge belonging to the Wheal Remfry Clay Co. was washed down.

**WALES.**—The Towy overflowed and did much damage. At Llanelly cellars and kitchens in the main streets were flooded. The G.W.R. line was washed away at Whitland; Fishguard branch was also partially destroyed at Goodwick. A large pond at Crumlin overflowed and brought down a lot of debris on to the G.W.R., derailing a train, and blocking both lines for some hours.

**ABERDARE.**—The Dare overflowed, filling cellars and warehouses in the centre of the town. Two feet of water covered the main street between the Taff Vale and Great Western stations.

#### FRIDAY, FEBRUARY 16TH.

**FARNHAM.**—The river was greatly swollen, and rushed over the bridge in Bridge Square, the water stretching away through the meadows to Moor Park. In Church Lane the water rushed through the lower floor windows, and in Downing Street and Union Street the water covered the whole roadway.

**GODALMING.**—Bridge Road, for a distance of 50 yards, was submerged to a depth of 3 ft. In Borough Road the depth of water in places could not have been less than 5 or 6 ft. The flood reached up to the top of the old Boarden Bridge, and much of the Vicarage garden was under water.

**GUILDFORD.**—According to the records of the river Wey Navigation Compy., the river has not been so high since 1824, but in that year it rose 2 ft. higher. On Thursday night the river rose very rapidly, and by Friday morning many houses in Millmead were flooded, the water in some cases is said to have risen nearly to the ceiling of the lower rooms. Between 7 a.m. and 9 a.m. the water is said to have risen 2 ft., and invaded the High Street. The premises both sides of the road, and both sides of the bridge, were inundated. Only the crown of the bridge showed above water. Later in the morning the crown of the bridge was damaged by timber washed against it by the flood, and at 6 30 p.m. the bridge practically collapsed. The river rose between 9 and 10 ft. above the normal level. The water appears to have reached its highest point after 4 p.m., and by midnight had fallen a foot. Early in the day it was decided to suspend running the trains on the Brighton line between Guildford and Bramley, as the line was submerged, and traffic was suspended till Saturday afternoon.

**SHALFORD.**—The roadway between the Parish Church and the Vicarage was covered with 2 ft. 6 in. of water, and Broadford Bridge was demolished.

**WOKING.**—The whole length of the main street was submerged between 3 and 4 ft. Two bridges on the Send road, over the Wey, and a back-water, were so much damaged that temporary structures had to be erected.

ADDLESTONE.—All the lower portions of Addlestone were under water.

NORTHAMPTONSHIRE.—Floods prevail along the whole course of the Nene.

WIMBORNE.—The Wimborne magistrates could not sit, the court house being flooded.

KINGSBRIDGE.—On the Kingsbridge rail, at Garabridge Station, the water was 3 ft. deep. Traffic was suspended between Kingsbridge and Brent, after the 2.35 train on Thursday, and was not resumed until Monday.

BARNSTAPLE.—The Taw swept over the roadway at New Bridge, and rendered the road to Barnstaple impassable.

BATH.—The Avon rose 13 ft. in 24 hours, and reached its highest point about noon; 12 ft. above its ordinary level, or 4 ft. lower than in 1894. In the Dolemeads over 300 houses were flooded,

BRISTOL.—Several streets in the Baptist Mills district were flooded, and in Mina road the water was 3 ft. deep.

EVESHAM.—The Avon rose 7 ft. 3 in. above summer level.

WALES.—The river Severn is much swollen, and miles of land between Welsh-pool and Pool Quay are flooded.

#### SATURDAY, FEBRUARY 17TH.

WEST MOLESEY.—The Mole overflowed and entered many cottages. Along Walton Road there is 2 feet of water in the shops.

MAIDENHEAD.—The Thames rose more than a foot on Saturday night, to 5 feet above ordinary level. Bridge Road was flooded from Moor Arches to near the toll-gate. The promenade from Wilder's boathouse to Boulters Lock was submerged.

#### MONDAY, FEBRUARY 19TH.

STAINES.—The Thames has risen 5 feet above the ordinary level, and is higher than it has been since 1894.

MAIDENHEAD.—On Saturday night the water nearly reached the high water mark of 1894.

ST. IVES.—The Ouse rose so rapidly that many houses were flooded, the flood exceeding in height that of 1877.

BUDLEIGH SALTERTON.—Traffic on the Salterton and Tipton line was still suspended, a small bridge at East Budleigh having been swept away.

SOUTH LINCOLNSHIRE.—At Swaton the river Eau overflowed, and the water near the post-office was from 2 to 3 ft. deep.

#### TUESDAY, FEBRUARY 20TH.

EAST MOLESEY.—The river is level with the top of the lock, both gates of which are open, and the water has commenced to flow on to the road. At West Molesey the water is nearly 2 feet deep in the High Street.

WINDSOR.—At 9 a.m. the Thames was 5 ft. 6 in. above head water mark, which is about 18 in. below the great flood of 1894. At night the water was reported to have risen to 5 ft. 8 in.

MAIDENHEAD.—The tow-path from below Clieyden to Bray is for the most part under water. The Bath Road is flooded to a depth of 2 or 3 feet, and the floods are almost up to the Dumb Bell Hotel.

YORK.—There is over 10 ft. of water in the Ouse at York, the walks on the river banks are submerged, and some cellars are inundated.

MALTON.—The Rye and the Derwent are in full flood. At the County Bridge, Malton, the water is 10 ft. above summer level.

## WEDNESDAY, FEBRUARY 21ST.

MAIDENHEAD.—Nearly 300 houses are more or less flooded.

ETON.—At Barnes Pool the official register showed that the flood was only about 2 ft. lower than in 1894.

MALTON.—At 8 p.m. the Derwent reached a height of 12 ft. 9 in. In Ryedale the roads are 3 to 4 ft. under water, and the N.E.R. is covered.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, SEPTEMBER, 1899.

STATIONS.	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
<i>(Those in italics are South of the Equator.)</i>	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	88·1	5	36·4	29	68·4	50·4	48·4	69	136·4	35·1	2·65	14	5·5
Malta .....	91·5	3	61·7	28	83·7	68·5	67·2	79	146·3	55·1	1·87	7	1·4
Cape of Good Hope ...	83·2	16	41·5	30	64·9	50·0	49·7	80	...	...	1·33	13	5·6
Mauritius .....	79·0	24	60·2	22	75·4	65·0	60·7	75	153·0	51·5	1·68	18	6·4
Calcutta .....	94·6	9	76·7	13b	90·8	79·1	77·7	81	155·5	71·0	8·94	11	6·9
Bombay .....	87·8	29	74·1	10	85·8	77·3	74·4	78	136·2	69·8	3·49	14	5·1
Ceylon, Colombo .....	...	...	...	...	...	...	...	...	...	...	...	...	...
Melbourne .....	77·5	3	35·0	25	64·0	47·3	44·5	71	135·0	30·5	1·11	11	6·2
Adelaide .....	81·6	3	39·1	24	67·5	48·3	45·2	66	146·1	30·9	1·88	14	4·9
Sydney .....	82·5	16	49·0	29	68·8	54·8	51·3	69	130·9	39·2	1·90	9	4·5
Wellington .....	64·0	22a	38·0	29	58·8	46·2	41·9	69	118·0	30·0	3·62	10	4·0
Auckland .....	...	...	...	...	...	...	...	...	...	...	...	...	...
Trinidad .....	93·0	29	68·0	Sev.	91·0	70·1	74·3	77	168·0	66·0	2·18	7	...
Grenada .....	88·8	7	69·8	21	84·9	75·5	71·8	75	154·0	...	5·31	13	1·5
Toronto .....	84·6	5	31·4	23	67·1	48·8	50·9	78	102·4	26·3	5·15	12	5·9
New Brunswick, Fredericton	79·2	18	24·9	24	66·1	44·1	45·2	64	...	...	2·34	8	5·5
Manitoba, Winnipeg ..	82·5	9	17·0	29	65·9	39·5	...	72	...	...	·91	8	5·7
British Columbia, Esquimalt	...	...	...	...	...	...	...	...	...	...	...	...	...

a—and 26. b—and 24.

## REMARKS.

MALTA.—Adopted mean temp. 74°·7, or 0°·3 below average. Mean hourly velocity of wind 7·2 miles, or 0·6 below average. Mean temp. of sea 77°·8. TSS on 17th, 24th and 26th. L on 10th, 13th, 22nd and 29th. H on 17th. J. F. DOBSON.

Mauritius.—Mean temp. of air equal to, of dew point 0°·8 above, and rainfall ·24 in. above, their respective averages. Mean hourly velocity of wind 11·8 miles, or 0·2 below the average; extremes, 28·9 on 5th, and 1·6 on 12th, 20th and 21st; prevailing direction, E.S.E. L and T at 4.40 a.m. on 21st. A. WALTER.

Adelaide.—Mean temp. of air 0°·8 above average; rainfall ·14 in. above average. Good rains and growing weather over the agricultural areas. C. TODD, F.R.S.

Sydney.—Temp. 3°·0 above, humidity 1·0 below, and rainfall 1·93 in. below, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Fine in the early part of the month, with variable winds; the latter half showery, with prevailing N.W. winds, frequently strong. Severe hailstorm on 30th. Mean temp. 1°·6 above, and rainfall ·64 in. below, the average. R. B. GORE.

SUPPLEMENTARY TABLE OF RAINFALL,  
MARCH, 1900.

Div	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	'60	XI.	Builth, Abergwesyn Vic.	1'73
II.	Dorking, Abinger Hall .	1'02	"	Rhayader, Nantgwilt ...	1'30
"	Birchington, Thor .....	'99	"	Lake Vyrnwy .....	1'35
"	Hailsham .....	1'35	"	Corwen, Rhug .....	1'34
"	Ryde, Thornbrough .....	1'04	"	Criccieth, Talarvor .....	'96
"	Emsworth, Redlands ...	'78	"	I. of Anglesey, Lligwy..	'67
"	Alton, Ashdell .....	'94	"	I. of Man, Douglas .....	1'07
III.	Oxford, Magdalen Coll..	'44	XII.	Stoneykirk, Ardwell Ho.	'87
"	Banbury, Bloxham .....	'51	"	New Galloway, Glenlee	'40
"	Northampton, Sedgebrook	'64	"	Moniaive, Maxwellton Ho.	'32
"	Alconbury .....	'49	"	Lilliesleaf, Riddell .....	1'10
"	Wisbech, Bank House...	'60	XIII.	N. Esk Res. [Penicuik]	1'60
IV.	Southend .....	'88	XIV.	Glasgow, Queen's Park..	'28
"	Colchester, Lexden .....	'98	XV.	Inverary, Newtown .....	'55
"	Saffron Waldon, Newport	'84	"	Ballachulish, Ardsheal...	'48
"	Rendlesham Hall .....	'78	"	Islay .....	'40
"	Scole Rectory .....	1'09	XVI.	Dollar .....	1'53
"	Swaffham .....	'95	"	Balquhiddier, Stronvar...	'90
V.	Salisbury, Alderbury ...	1'35	"	Coupar Angus Station...	'91
"	Bishop's Cannings .....	1'61	"	Blair Atholl ...	...
"	Blandford, Whatcombe ..	1'12	XVII.	Keith H.R.S. ....	2'44
"	Ashburton, Holne Vic...	2'76	"	Forres H.R.S. ....	2'09
"	Okehampton, Oaklands.	2'48	XVIII.	Fearn, Lower Pitkerrie..	1'28
"	Hartland Abbey .....	1'59	"	S. Uist, Askernish .....	1'04
"	Lynton, Glenthorne ...	1'22	"	Invergarry .....	'94
"	Probus, Lamellyn .....	2'92	"	Aviemore, Alvie Manse.	...
"	Wellington, The Avenue	1'12	"	Loch Ness, Drumnadrochit	1'31
"	North Cadbury Rectory	1'53	XIX.	Invershin .....	3'23
VI.	Clifton, Pembroke Road	1'28	"	Duness .....	2'47
"	Ross, The Graig .....	1'20	"	Watten H.R.S. ....	1'68
"	Wem, Clive Vicarage ...	'93	XX.	Dunmanway, Coolkelure	2'20
"	Wolverhampton, Tettenhall	'75	"	Cork, Wellesley Terrace	'78
"	Cheadle, The Heath Ho.	'65	"	Killarney, Woodlawn ..	1'31
"	Coventry, Priory Row ..	'69	"	Caher, Duneske .....	'73
VII.	Market Overton .....	...	"	Ballingarry, Hazelfort...	'57
"	Grantham, Stainby .....	1'11	"	Limerick, Kilcornan ...	1'00
"	Horncastle, Bucknall ...	'23	"	Miltown Malbay .....	1'59
"	Worksop, Hodsock Priory	'65	XXI.	Gorey, Courtown House	'75
VIII.	Neston, Hinderton .....	1'11	"	Moynalty, Westland ...	'65
"	Southport, Hesketh Park	'94	"	Athlone, Twyford .....	'45
"	Chatburn, Middlewood.	'87	"	Mullingar, Belvedere ..	'69
"	Duddon Val., Seathwaite Vic.	1'19	XXII.	Woodlawn .....	'69
IX.	Melmerby, Baldersby ...	'81	"	Crossmolina, Ennisiscoe..	2'03
"	Scalby, Silverdale .....	1'37	"	Collooney, Markree Obs.	'96
"	Ingleby Greenhow Vic..	1'93	XXIII.	Enniskillen, Model Sch.	'61
"	Middleton, Mickleton ...	'45	"	Warrenpoint .....	'95
X.	Haltwhistle, Unthank H.	'90	"	Seaforde. ....	1'20
"	Bamburgh .....	2'14	"	Belfast, Springfield .....	1'12
"	Keswick, The Bank .....	'44	"	Bushmills, Dundarave..	'83
XI.	Llanfrechfa Grange .....	1'11	"	Stewartstown .....	'83
"	Llandovery .....	'84	"	Killybegs .....	1'61
"	Castle Malgwyn .....	1'70	"	Horn Head .....	1'27
"	Brecknock, The Barracks	...			

## MARCH, 1900.

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.				
				Dpth	Date			Deg.	Date.			
inches.	inches.	in.			Deg.	Date	Deg.	Date.	In shade.			
I.	London (Camden Square) ...	·79	— ·82	·41	18	7	58·6	12	23·4	18	9	
II.	Tenterden .....	1·17	— ·62	·88	18	7	56·5	10	23·5	18	8	
"	Hartley Wintney .....	1·21	— ...	·36	27	11	57·0	12	18·0	30	12	
III.	Hitchin .....	·86	— ·48	·25	18	10	55·0	10 <sup>d</sup>	21·0	17	20	
"	Winslow (Addington) .....	·66	— 1·06	·18	18 <sup>a</sup>	11	57·0	10	21·0	18	14	
IV.	Bury St. Edmunds (Westley) ..	1·05	— ·50	·58	18	11	51·0	11	25·0	18	...	
"	Norwich (Brundall) .....	1·09	— ...	·43	18	22	55·4	12	23·2	18	15	
V.	Winterbourne Steepleton ...	2·13	— ...	·83	19	10	55·1	12	18·7	18	10	
"	Torquay (Cary Green) .....	1·91	— ...	...	...	...	...	...	...	...	...	
"	Polapit Tamar [Launceston]..	1·85	— ·68	·42	18	14	56·0	12	23·8	18	14	
VI.	Stroud (Upfield) .....	1·22	— ·97	·32	21	13	56·0	13	27·0	17	11	
"	Churchstretton (Woolstaston) ..	1·00	— 1·13	·30	19	11	52·0	11	21·5	18	19	
"	Worcester (Diglis Lock) .....	·83	— ·95	·26	19	9	...	...	...	...	...	
VII.	Boston .....	·38	— 1·16	·10	18	7	56·0	12 <sup>e</sup>	25·0	18 <sup>f</sup>	18	
"	Hesley Hall [Tickhill] .....	·56	— 1·34	·15	27	13	54·0	31	25·0	17	13	
"	Breadsall Priory .....	·83	— ...	·23	19	10	...	...	...	...	...	
VIII.	Manchester (Plymouth Grove) ..	·66	— 1·56	·17	27	8	61·0	11	23·0	16 <sup>g</sup>	12	
IX.	Wetherby (Ribston Hall) ...	·73	— 1·33	·34	18	8	...	...	...	...	...	
"	Skipton (Arneliffe) .....	·88	— 4·22	·29	18	13	...	...	...	...	...	
"	Hull (Pearson Park) .....	·48	— 1·57	·16	26	10	53·0	12	23·0	30	15	
X.	Newcastle (Town Moor) .....	1·84	— ·79	·28	26	13	...	...	...	...	...	
"	Borrowdale (Seathwaite) .....	·83	— 9·67	·24	15	10	...	...	...	...	...	
XI.	Cardiff (Ely) .....	1·12	— 1·86	·33	19	6	...	...	...	...	...	
"	Haverfordwest .....	1·43	— 1·81	·53	18	14	57·6	11	25·4	29	6	
"	Aberystwith (Gogerddan) ...	·68	— 2·30	·29	27	5	62·0	11	15·0	17 <sup>h</sup>	25	
"	Llandudno .....	·88	— 1·20	·21	27	10	56·5	11	25·0	18	3	
XII.	Cargen [Dumfries] .....	...	— ...	...	...	...	...	...	...	...	...	
XIII.	Edinburgh (Blacket Place) ...	1·06	— ...	·26	19	10	54·8	14	21·1	18	14	
XIV.	Colmonell .....	·37	— ...	·27	27	4	59·0	11	23·0	17 <sup>i</sup>	...	
XV.	Tighnabruaich .....	·69	— ...	·41	27	5	50·0	14	25·0	16	18	
"	Mull (Quinish) .....	·39	— 3·45	·08	11 <sup>l</sup>	10	...	...	...	...	...	
XVI.	Loch Leven Sluices .....	1·10	— 1·87	·40	21	4	...	...	...	...	...	
"	Dundee (Eastern Necropolis) ..	1·25	— 1·15	·45	19	9	55·1	15	23·3	18	20	
XVII.	Braemar .....	2·33	— ·31	·50	21	13	47·0	11	4·0	18	27	
"	Aberdeen (Cranford) .....	2·62	— ...	·60	19	25	56·0	11	8·0	17	16	
"	Cawdor (Budgate) .....	1·79	— ·25	·33	19	19	...	...	...	...	...	
XVIII.	Strathconan [Beaulj] .....	4·14	— 1·8	1·65	15	7	...	...	...	...	...	
"	Glencarron Lodge .....	2·66	— ...	·60	14	19	50·9	31	11·0	18	20	
XIX.	Dunrobin .....	2·51	+ ·26	·82	19	17	52·5	14	19·0	18	10	
"	S. Ronaldshay (Roeberry) ...	1·94	— ·60	·60	19	25	50·0	11	21·0	17	11	
XX.	Darrynane Abbey .....	1·64	— ...	·34	20	16	...	...	...	...	...	
"	Waterford (Brook Lodge) ...	·99	— 1·91	·51	17	9	54·0	11	23·0	29	9	
"	Broadford (Hurdlestown) ..	·60	— ...	·19	31	10	...	...	...	...	...	
XXI.	Carlow (Browne's Hill) .....	1·00	— 1·37	·47	17	13	...	...	...	...	...	
"	Dublin (Fitz William Square) ..	·96	— 1·05	·23	19	13	53·5	11	27·1	17	6	
XXII.	Ballinasloe .....	·80	— 1·83	·23	18	15	53·0	31	27·0	17 <sup>c</sup>	12	
"	Clifden (Kylemore) .....	2·70	— ...	...	...	...	...	...	...	...	...	
XXIII.	Waringstown .....	1·00	— 1·35	·30	17 <sup>c</sup>	5	52·0	8	21·0	18	13	
"	Londonderry (Creggan Res.) ..	1·59	— 1·14	·33	15	15	...	...	...	...	...	
"	Omagh (Edenfel) .....	·79	— 1·72	·16	15	9	52·0	11	21·0	16	14	

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

a—and 27. b—and 14. c—and 19. d—and 13. e—and 31. f—and 29, 30.  
g—and 17. h—and 26. i—and 28.



# METEOROLOGICAL NOTES ON MARCH, 1900.

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.

TENTERDEN.—A dry, cold month, with one very wet night. Less wind and sunshine than usual, yet the ground dried up in excellent condition for working. Duration of sunshine 110 hours 25 mins. Vegetation backward.

HARTLEY WINTNEY.—A remarkably cold, wintry month. For the first fortnight bitterly cold N.E. winds prevailed with sunless days. From 16th to 29th 8 storms occurred with a distant TS on 20th. Sharp frosts on 17th and 18th, and from 29th to 31st. There was absence of fog. R .56 in. below the average. Ozone on 14 days, with a mean of 4.

WINSLOW, ADDINGTON.—A dry, cold month, and only twice has there been less R in March during the last 30 years. A S storm occurred on the afternoon of 18th, and there was a covering of S on the mornings of 26th, 27th and 28th. Severe frosts occurred on 29th and 30th. Foggy on 21st.

BURY ST. EDMUNDS, WESTLEY.—A cold, wintry month with Northerly winds for 30 days. S on 18th, 25th and 27th.

NORWICH, BRUNDALL.—A monotonously cold month, and vegetation had hardly started at the close. Mean temp. 38°·4, being the lowest recorded since 1892, when it was 36°·6. S on 1st, 2nd, 17th, 19th, 26th and 27th. Distant T on 20th.

WINTERBOURNE STEEPLETON.—The month was excessively cold and ungenial. Mean temp. 38°·7 or 3°·8 below the average of 7 years. Everything is extremely backward, and spring apparently made no advance. S on 17th, 18th and 19th.

POLAPIT TAMAR [LAUNCESTON].—A dry, cold month. S on 16th, 17th and 18th, the fall on the latter day yielding .42 in.

STROUD, UPFIELD.—S fell daily from the 16th to the 19th, the fall being heavy on the 18th.

WOOLSTASTON.—A cold, backward month, with much frost. S fell on 8 days, being two inches deep on 16th. Mean temp. 37°·0.

MANCHESTER, PLYMOUTH GROVE.—The coldest March for 32 years, with the exception of 1883 and 1887, and the driest in the same period, with the exception of 1893, when the rainfall was .65 in.

ARNCLIFFE VICARAGE.—The driest March for several years.

SEATHWAITE.—S 4 inches deep at 9 a.m. on the 18th, and 1½ inches deep on 28th.

## WALES.

HAVERFORDWEST.—The weather was generally cold and damp, with low night temp., the min. on grass falling below 32° on 19 nights, and there was very little bright sunshine. S fell on 4 days, being about five inches deep on 18th. The wind was mostly moderate to light in force. Agricultural operations are backward, and the country is not showing much sign of spring.

AEERYSTWITH, GOGERDDAN.—A very dry and cold month, with N. or N.E. wind almost throughout. Very little sunshine.

## SCOTLAND.

EDINBURGH, BLACKET PLACE.—Mean temp.  $1^{\circ}\cdot8$ , rainfall 46 per cent., and sunshine 33 hours, below their respective averages. S on 8 days, heavy on 19th. Lunar halo on 17th. Solar halos on 27th and 31st.

COLMONELL.—E  $2\cdot98$  in. below the average of 24 years, and the least in March during that period. Mean temp.  $5^{\circ}\cdot4$  below average. S on 16th, 18th, 19th, 27th (heavy), and 28th.

TIGNABRUACH, CRAIGANDARAICH.—A month of low temp.; the mean max. being  $43^{\circ}\cdot0$ , and the mean min.  $31^{\circ}\cdot6$ . The bar. was above 30 in. on 22 days, and the rainfall was very small.

MULL, QUINISH.—A very cold month from first to last, with persistent N. and E. winds. The R is the smallest ever recorded here in any month, the nearest approach being May, 1876, when  $\cdot66$  in. fell on 7 days.

ABERDEEN, CRANFORD.—The month was very cold, wet and stormy.

S. RONALDSHAY, ROEBERRY.—The first part of the month was fine, the middle and latter parts were rough and cold with S storms. Mean temp.  $37^{\circ}\cdot5$ , or  $1^{\circ}\cdot9$  below the average of 10 years.

## IRELAND.

DARRYNANE ABBEY.—A fine, but cold month on the whole; wild with S from the 15th to the 26th.

WATERFORD, BROOK LODGE.—A very cold month, with harsh E. winds. Heavy S on the night of the 17th.

DUBLIN, FITZWILLIAM SQUARE.—A very dull and cold month. The earlier part was dry, but there were frequent falls of S, sleet or H after 15th; the total, however, is less than one inch. The amount of cloud was unusually large, being  $7\cdot4$ . Mean temp.  $40^{\circ}\cdot8$ , or  $2^{\circ}\cdot3$  below the average. The temp. rose above  $50^{\circ}$  on only 5 days, the average being about 16. Fog on 6 days. High winds on 7 days, reaching the force of a gale on 15th and 18th. S or sleet on 5 days, and H on 6. T and L on 11th, and L on 19th and 25th.

WARINGSTOWN.—Dry, but very cold, with E. and N.E. winds.

OMAGH, EDENFEL.—The driest March, with the exception of 1892, in 35 years at least. Accompanied by a continuance of the polar or easterly winds, which have prevailed for 78 out of the 90 days of this quarter, and by a temp. some  $3^{\circ}$  below the average for the same period, this has proved trying alike to animal and vegetable vitality, and probably accounts for the unusual depression in the public health. It was, however, an unrivalled seed-time, and in this respect was fully taken advantage of.

## ITALIAN METEOROLOGICAL SERVICE.

PROF. P. TACCHINI, having completed 40 years' service on September 1st, 1899, has retired from the office of Director of the Ufficio Centrale Meteorologico e Geodinamico, and is succeeded by Prof. Luigi Palazzo. Prof. Tacchini retains the control of the Osservatorio Astronomico dell Collegio Romano.



# SYMONS'S

## MONTHLY

# METEOROLOGICAL MAGAZINE.

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### METEOROLOGICAL EXTREMES III.—WIND FORCE.

WE have already pointed out the difficulty of collecting the information given in these articles, due to the fact that it is scattered through the records of many observers and of many lands; but great as the difficulties were in the case of pressure and temperature, they are far greater when we come to deal with the present subject.

In the case of wind-force observations no homogeneity exists, either as regards the instruments employed, or the units of the various scales in which results, either instrumental or estimated, are expressed; indeed, as regards instrumental observations, it becomes a most difficult matter to compare satisfactorily, not only the records of anemometers of different kinds, but also those of similar instruments used at different places.

The anemometer which has been most generally used for many years past is the "cup" anemometer, with which is always associated the name of the late Dr. Robinson, of the Armagh Observatory. There have been in use a few pressure-plate instruments, designed by Mr. Osler, and a few other anemometers of various designs, but their total number has always been small.

The cup anemometer consists of a set of four hemispherical cups, placed at the end of a horizontal cross, the centre of which is fixed to a vertical spindle. The greater effective pressure of the wind upon the insides than upon the outsides of the cups causes them to revolve in a horizontal plane, but it is obvious that the resistance of the cups to the wind, as well as the work which has to be done in registering their revolutions, will cause their rate of movement to be always less than that of the wind that drives them. But how much less? is the question on which the value of the results depends.

The answer which Dr. Robinson accepted was that the movement of the cups was always one-third that of the wind; in other words, that the speed of the cups must be multiplied by three to get the speed of the wind,—whence arose the "factor 3."

Since Dr. Robinson's experiments were made, the question has been attacked from the experimental side by many observers in

England, on the Continent, and in America, and the general result may be stated briefly thus: the "factor" depends upon the size of the cups used, and also upon the length of the arms upon which they are placed, but for large instruments, in which the cups are 9 inches in diameter and their centres 4 feet apart, the speed of the cups should be multiplied by 2·2, rather than by 3, in order to get the speed of the wind.

But having determined the true factor, there arises the question: where was the anemometer placed, and was it exposed in such a way that its records may be taken as a true measure of the wind's real strength? These questions involve considerations which appear to have been overlooked by the users of anemometers, and we often find the instruments put quite close to the roofs of big buildings. Occasionally they are stuck up against the thermometer screen in the garden, or in some other "convenient" spot, but seldom indeed are they in a position where they are clear of disturbing influences, and where their indications can be of real value.

But, after all, it is only for a comparatively few places that anemometrical data are available. The great majority of observations of the wind force being made by *estimation*, and for this purpose all sorts of scales are in use. Some consist of 13 points, as the "Beaufort" (0—12), others of more, and the majority of less. In many places only words or descriptive phrases are used, and Mr. S. A. Hill, the Meteorological Reporter for the North-West Provinces, in his account of the Moradabad storm, May, 1888, quotes some cases in which the strength of the wind was expressed as being equal to that of so many elephants, or of so many horses!

From this it will be clear that the task of comparing reports of wind force from widely separated parts of the globe is one of considerable difficulty.

It is a common belief that the strength of the wind in tropical hurricanes much exceeds that experienced in any other part of the world, and there is no doubt that occasionally in the storms, known as cyclones in the West Indies and in the Indian Ocean, as typhoons in the China Seas, and so on,—the wind does attain tremendous power. But so it does upon our exposed western coasts, and we doubt whether the force reached in some of the gales which sweep in from the Atlantic has been much, if at all, exceeded in other regions.

The evil reputation of tropical storms rests upon the *extent* of the damage, rather than upon its *character*, and upon the number of houses or trees overthrown, rather than upon the amount of resistance those obstacles could offer to the wind.

If houses in the Scilly Islands, on the west coast of Ireland, or in the Hebrides were built as they are in the tropics, with open jalousies, large verandas, and other contrivances called for by the climate, but well adapted to give the wind a good hold upon them,

we think their list of damages nearly every winter would be as large as we hear of in many tropical cyclones.

We will now proceed to quote a few instances of exceptional wind force, which, if not the actual maxima on record, are, we believe, amongst the highest.

In April, 1892, a severe hurricane, which did a full quota of mischief, occurred in Mauritius. Fortunately, there is at the Royal Alfred Observatory a cup anemometer exactly similar to that used at Kew Observatory, so that its records can be compared directly with several others. Dr. Meldrum observed the indications of this instrument very closely, and for short periods throughout the storm, and the maximum rate of movement of the wind which he obtained was 88 miles per hour for five minutes; for an entire hour his highest record was 76 miles.\*

In January, 1899, a very severe gale was experienced over the Irish Sea and adjoining coasts, and at Southport a rate of 90 miles per hour was recorded in one gust, and rates of between 80 and 90 in several others; gusts of almost equal strength were also reported from Holyhead and Liverpool. The maximum *mean* force of the wind for an hour was 75 miles at Fleetwood, and for half-an-hour, 73 miles at Southport; and these are, we believe, as high as any ever registered by anemometers in our islands.

The comparison of these records with those quoted for Mauritius is interesting, because it supports what we have already said as to the relative strengths of gales here and in the tropics, and is one of the grounds upon which we based our suggestion that we experience wind forces as strong as those which suffice to overturn whole villages of "native houses," and to uproot numbers of quick-growing, but not deep-rooted, trees in tropical lands.

Newspaper reports of storms have generally to be discounted considerably, because of the vivid imaginations of the gentlemen who write them, and especially is this the case when they deal with foreign measures. Thus the "*Times*," reporting a storm experienced in Paris in November, 1890, quoted M. Mascart as responsible for the statement that on the Eiffel Tower the wind had reached a rate of 630 miles per hour! The account in the "*Comptes Rendus*" is given in metres per second, and puts it more modestly at 76 miles per hour, which is not so high as that reached in the short gusts already quoted for our western coast.

The highest velocity in a gust which we have seen recorded is that registered by Sir Cuthbert Peek, at his Rousdon Observatory in South Devon, in March, 1897, by a Dines' pressure tube anemometer, which amounted to a rate of 101 miles per hour, and is absolutely the strongest gust of which we have any anemometrical record at

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\* All the velocities quoted here, unless the contrary is expressly stated, are believed to be *true* velocities, got by using the correct factors for the instruments.

present. At Scilly, in the same gale, a rate of but 84 miles was reached, but although this gale was a disastrous one all over the west of England, it was especially remarkable for the amount of damage it wrought in South Devon, and particularly in the valley of the Exe.

The tornados which frequently occur in certain parts of the United States, produce remarkable wind pressures, although it is probable that much of the damage is caused by the lifting effect of the uprush of air in and towards their centres. We have no authentic instrumental records of the wind force in these storms, but we have many accounts of the extraordinary occurrences for which they are so remarkable. Of these the following are quoted by Dr. Wadsworth and Francis Nipher, in their "Enquiry into the Kansas tornado of April 14th, 1879," printed in the Transactions of the St. Louis Academy of Science :—

"At Collinsville, as the result of not far from one minute's work, we find 24 buildings were entirely destroyed, 25 were partially swept away or crushed, and 60 others were more or less injured; one person was killed and seven were wounded. A horse and buggy standing outside a Church at which a funeral was being conducted, was taken up into the air to a height estimated by some who witnessed it, at 50 feet, and was whirled away to a distance of 260 feet, and dashed to the ground. 'On the west front of the Temperance Hall a number of nails were driven in to various depths head first;' and a rafter which was torn from one building, was driven against, and through the walls of another, a considerable distance away." Many other equally remarkable occurrences might be quoted, did our space permit.

Of this class of storm, however, we have had some experience in this country, and accounts of them have appeared from time to time in this Magazine; we will now mention only one which occurred several years ago in the Isle of Wight, by which the whole of the houses on one side of the principal street of Cowes were injured or entirely destroyed. They constitute, however, a special phenomenon, and, perhaps, are not strictly comparable with the cyclonic storms which cover so much larger an area.

Of several Indian cyclones Lord Roberts describes a good example in his "Forty-one Years in India." He says: "Huge branches of trees were being driven through the air like thistle-down." In the morning, when the worst of the storm was over, "The native bazaar was completely wrecked, looking as if it had suffered a furious bombardment, and great havoc had been made amongst the European houses, not a single verandah or outside shutter being left in the station" (Dum-Dum). "I found the road almost impassable from fallen trees; and dead birds, chiefly crows and kites, were so numerous that they had to be carried off in cartloads." This storm occurred in 1852.

There are not, however, so far as we are aware, many very high

anemometrical records of Indian cyclones, and the fact is a remarkable one. For example, in the Madras cyclone of May 1874, in which a great deal of damage was done on sea and land, the maximum velocity reported by the Government Astronomer was only 49 miles per hour! (The "factor" of this instrument we do not know). Yet accounts of the storm speak of "frightful gusts of wind," and of ships dismasted and wrecked. Perhaps the apparent discrepancy would be explained if we knew more about the position of the anemometer? At Calcutta, however, in April, 1870, and again in March, 1877, wind pressures of \*40lbs. per square foot were recorded.

We have already spoken of the difficulty there is in putting a proper value upon reports of damage done to buildings in tropical hurricanes, but there can be no doubt as to the intensity of the wind when it is capable of the following feats reported by a West Indian lighthouse keeper, in his official weather report, respecting a hurricane which occurred about twenty years ago, but the exact date of which we are unfortunately not able at the moment to find. A mass of stone, estimated to weigh 25 cwt., was blown inland (how far is not stated), and projecting pieces of rock were torn from the solid mass to which they belonged. A man who ventured to put his head and shoulders out of the lighthouse door had to be held on to by three others to prevent him being blown away.

But here again we have nothing which cannot be matched by somewhat similar occurrences within our own islands. In an account of maximum wind forces some reference ought to be made to De Foe's great storm of 1703,—"*The Storm*" in which in London city alone 21 persons were killed, besides an unknown number who were drowned, and above 200 were much wounded and maimed. The roofs of "the houses were so universally stript, that all the tiles in fifty miles round would be able to repair but a small part of it," and accordingly the price of tiles rose from 21 shillings per 1,000 to six pounds per 1,000. "Seventy trees were blown down in Moorfields and above 100 elms in St. James' Park, some whereof . . . . . were very great trees; about Whitmore House above 200 trees were blown down and some of extraordinary size were broken off in the middle." But the damage wrought by the storm was general all over the South of England, and we will only further quote, for comparison with the note just given respecting the West Indian hurricane, part of the reports of the Rev. Henry Head, vicar of Berkeley in Gloucestershire; and of Mr. Ben Bullivant, of Northampton. The former says: "twenty-six sheets of lead hanging all together were blown off from the middle aisle of our Church, and were carried over the north aisle, which is a very large one, without touching it; and into the churchyard, ten yards distance from the Church; and they were took up all joined together as they were on the roof; the plumber told me that the sheets weighed

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\* See footnote p. 54.

each three hundred and a half, one with another ;" so that the total weight of the mass of lead thus lifted was over four and a half *tons* !

At Northampton, "the weathercock of All-Saints' Church, being placed on a mighty spindle of iron, was bowed together and made useless. Many sheets of lead on that Church rolled up like a scroll. . . . . In Sir Thos. Samwell's park a very great headed elm was blown over the park wall into the road, and yet never touched the wall, being carried some yards."

Such feats, however, could be easily understood if the records of some of our pressure plate anemometers could be accepted as correct. Thus, at the Greenwich Observatory, a pressure of \*51½ lbs. on the square foot was recorded on January 18th, 1881, and on December 8th, 1872, "there is reason for thinking that the maximum pressure . . . . . approached \*60 lbs. on the square foot." At Liverpool, on March 9th, 1871, the extraordinary pressure of \*90 lbs. per square foot was recorded, and a pressure of \*80 lbs. per square foot on December 27th, 1868.

We have left ourselves no space to deal with the typhoons of China and Japan ; and, indeed, the subject is such a wide one that the limits of a single article will not allow of its being treated in anything like a comprehensive way, but at some subsequent time we may perhaps return to it. In the meantime, we shall be glad if what we have already said leads any of our readers to express their views on the question—What is the strongest force the wind ever attains ?

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## TEMPERATURE AND RAINFALL AT HITCHIN FOR HALF-A-CENTURY.

OUR old correspondent, Mr. Lucas, of Hitchin, whose returns have been published monthly in this Magazine from its commencement in 1866 to the present time, has sent us a summary of his records of temperature and rainfall for the 50 years 1850 to 1899, from which we have compiled the following abstract.

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\* According to Sir Hy. James's formula the velocities corresponding to these pressures would be :—

40 lbs.	=	89	miles per hour.
51½ "	=	101	" " "
60 "	=	110	" " "
90 "	=	134	" " "

But James's formula is now very generally regarded as inaccurate, and the true velocity equivalents of the pressures quoted are probably :—

40 lbs.	=	115	miles per hour.
51½ "	=	131	" " "
60 "	=	142	" " "
90 "	=	173	" " "

There is, however, very good reason for believing that in strong winds the records of these pressure-plate anemometers are occasionally much too high ; it is scarcely credible that the anemometer could have resisted such a pressure as 90 lbs. per square foot !

*Mean Temperature and Rainfall for Fifty Years, 1850-1899, at Hitchin.*

Month.	MEAN TEMPERATURE.					RAINFALL.				
	Mean.	Highest	Year.	Lowest.	Year.	Mean.	Highest	Year.	Lowest.	Year.
						in.	in.		in.	
Jan....	35°8	42°1	1890	28°1	1881	1·98	4·56	1852	·26	1880
Feb. ...	37°3	45°1	1869	26°5	1895	1·48	3·79	1883	·01	1891
March	39°6	44°8	1893	30°8	1886	1·51	4·14	1864	·24	1850
April..	45°4	50°7	1869	41°1	1879	1·59	3·31	1877	·20	1855
May ..	50°8	56°1	1895	45°9	1877	1·98	4·69	1878	·32	1896
June...	57°5	62°5	1888	54°5	1860 & 1882	1·95	5·22	1879	·42	1868
July ..	60°6	65°3	1859	55°9	1875	2·56	6·24	1875	·10	1885
Aug. ...	59°9	64°7	1899	55°1	1885	2·38	5·79	1878	·43	1861
Sept....	55°0	60°5	1865	49°1	1877	2·15	5·85	1896	·26	1890
Oct. ....	46°3	52°3	1886	42°0	1881	2·70	7·07	1865	·61	1879
Nov. ...	40°5	46°3	1888	35°0	1851 & 1871	2·35	5·60	1852	·61	1867
Dec. ...	36°8	45°0	1852	27°0	1890	1·89	5·57	1876	·40	1857
Year.	47·1	49·5	1868	43·7	1879	24·52	34·11	1852	17·16	1854 & 1864

It may prove interesting to compare the results of the 50 years at Hitchin with those for the 40 years 1858-1897 at Camden Square, and the most notable fact is that the annual mean temp. at the latter station is 49°8, or 2°7 higher than at Hitchin. The difference is fairly uniform throughout the year, as will be seen from the following :—

*Excess of Temperature at Camden Square above Hitchin.*

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Mean Temp....	2°3	2°5	2°5	2°7	3°2	2°9	2°7	2°2	2°7	3°5	2°5	2°4	2°7

Taking the mean temperatures for each month for the whole period, we find that the difference varies from 2°2 for August to 3°5 for October, and that for the summer six months it is 2°7, and for the winter six months 2°6.

Turning now to the individual months with the highest mean

*Excess of Temperature at Camden Square above Hitchin.*

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Highest Month	1°8	0°8	1°5	2°6	2°8	4°0	3°6	1°4	3°1	3°0	2°5	1°0	2°8

temperature, we must bear in mind the fact that the periods are different, and as a result only in four instances out of the twelve months are the records yielded by the same year. Nevertheless, the differences are less than might be expected, and vary from 0°8 in February to 4°0 in June. The average difference for the six summer months is 2°9, and for the six winter months is 1°8, which is what would naturally be expected.

In the case of the individual months with the lowest mean temp., the difference of period comes in in precisely the same way, but in seven instances out of the twelve months the records are yielded by the same years. The difference varies from  $1^{\circ}9$  in June to  $6^{\circ}0$  in

*Excess of Temperature at Camden Square above Hitchin.*

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Lowest Month	$3^{\circ}2$	$2^{\circ}6$	$6^{\circ}0$	$2^{\circ}8$	$3^{\circ}9$	$1^{\circ}9$	$3^{\circ}0$	$3^{\circ}5$	$5^{\circ}0$	$3^{\circ}4$	$2^{\circ}5$	$3^{\circ}0$	$3^{\circ}1$

March, and averages for the six summer months  $3^{\circ}3$ , and for the six winter months  $3^{\circ}4$ , or practically the same amount.

With regard to the rainfall, though the average annual difference is only  $\cdot94$  in., there is more variation in the monthly averages and in the individual wettest and driest months.

*Difference of the Rainfall at Camden Square for 40 years from that at Hitchin for 50 years.*

MONTHLY AVERAGE.

Jan. in.	Feb. in.	Mar. in.	Apr. in.	May. in.	June. in.	July. in.	Aug. in.	Sept. in.	Oct. in.	Nov. in.	Dec. in.	Year. in.
$+04$	$+13$	$+20$	$+07$	$-06$	$+28$	$-17$	$+01$	$+24$	$+01$	$-05$	$+24$	$+94$

The differences vary from  $+28$  in. in June to  $-17$  in. in July, and the six summer months show a total excess of  $\cdot37$  in., and the six winter months an excess of  $\cdot57$  in.

As regards the months of highest rainfall, although ten instances of wettest months occurred in years common to the period of observation at both stations, in only four instances did the wettest month occur in the same year at both stations. Similarly, though nine

*Difference of the Rainfall at Camden Square for 40 years from that at Hitchin for 50 years.*

WETTEST MONTH.

Jan. in.	Feb. in.	Mar. in.	Apr. in.	May. in.	June. in.	July. in.	Aug. in.	Sept. in.	Oct. in.	Nov. in.	Dec. in.	Year. in.
$+18$	$-02$	$-45$	$+166$	$+10$	$+149$	$-114$	$+93$	$-34$	$-85$	$-95$	$+68$	$-03$

DRIEST MONTH.

$+05$	$00$	$+08$	$+04$	$-18$	$-12$	$+35$	$+02$	$+29$	$-05$	$-08$	$-04$	$-23$
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instances of driest months occurred in years common to both periods of observation, in only three instances did the driest months occur in the same year at both stations.

The wettest months show an excess at Camden Square in the six summer months of  $2\cdot70$  in., and a deficit of  $1\cdot41$  in. in the six winter months, while the driest months show an excess of  $\cdot40$  in. in the six summer months, and a deficit of  $\cdot04$  in. in the six winter months.



## RECORD OF FOG OR HAZE.

*To the Editor of the Meteorological Magazine.*

SIR,—Considering the importance we most of us attach to a clear sky in choosing our health resorts, it has always struck me as singular that a fog scale analogous to the Beaufort wind scale and the cloud scale has never been adopted.

Speaking from experience (having tried the scale proposed below for some time), I have no hesitation in saying that it is much easier to work with reasonable accuracy, than either of the above, in any country station that commands a view in any direction of 4 miles, and it is especially suitable for sea-side stations. The observer has only to note certain conspicuous features in the landscape, measure their distances on the Ordnance map, and note their visibility at 9 a.m.

### *Scale.*

0. Quite clear, sea horizon sharply defined.
1. Objects visible but not clear at 4 miles and over.
2. " " over 3 miles but under 4 miles.
3. " " " 2 " " 3 "
4. " " " 1 " " 2 "
5. " " "  $\frac{1}{2}$  mile " 1 mile.
6. " " " 200 yds. "  $\frac{1}{2}$  "
7. " " " 50 " " 200 yds.
8. " " " under 50 "

Yours truly,

ALFRED O. WALKER.

*Ulcombe Place, nr. Maidstone, April 17th, 1900.*

## A QUESTION OF NOMENCLATURE.

*To the Editor of the Meteorological Magazine.*

SIR,—What name should properly be given to the five-day periods sometimes used in making up meteorological averages?

In America it seems customary to speak of a "pentad" using "pentads" (Davis *Elementary Meteorology*, p. 62), or "pentades" (*Smithsonian Meteorological Tables*, 1893, p. 232), for the plural.

Bearing in mind the analogy of "decades" one would think, unwittingly, that pentades were five-year instead of five-day periods. Or it might be thought that the name must refer remotely to the presence of nitrogen in the atmosphere. Why not leave the pentad to the chemist, and come back to τὸ πενθήμερον without offence to Xenophon? Harvey, half a century ago, in the *Encyclopædia Metropolitana*, Art, "Meteorology," p. 45, used "penthemérons." Perhaps, however, there may be good reasons why pentads or pentades are preferable to penthemérons or penthemera.

Yours truly,

J. R. SUTTON.

## WARM AND COLD SEASONS.

*To the Editor of the Meteorological Magazine.*

SIR,—I have read A. B. McDowall's article in the April *Met. Mag.* with interest, *re* London Summers, and although I do not believe in the potency of numbers with regard to similar records of heat or cold, yet the seasons seem to have a curious habit of repetition or recurrence, and I have often noticed that cold winters or springs may be followed by cool summers or autumns, and *vice versa*. The following record of the past 18 years in a southern county may to some extent confirm this theory :—

Years.	Mean of springs.		Mean of summers.		Mean of autumns.		Mean of winters.	
	Cold.	Hot.	Cold.	Hot.	Cold.	Hot.	Cold.	Hot.
1882.....	...	...	...	...	...	...	...	...
1883.....	...	...	...	...	...	49·5	...	...
1884.....	...	...	...	60·8	...	...	...	40·0
1885.....	43·5	...	58·3	...	45·5	...	...	37·9
1886.....	...	...	58·9	...	...	49·4	33·3	...
1887.....	42·1	...	...	...	44·3	...	33·5	...
1888.....	43·0	...	56·7	...	47·4	...	33·6	...
1889.....	...	...	...	...	47·2	...	35·2	...
1890.....	...	...	56·9	...	47·0	...	...	...
1891.....	42·6	...	57·5	...	47·5	...	30·9	...
1892.....	42·8	...	57·0	...	45·7	...	...	...
1893.....	...	47·9	...	61·0	...	...	...	...
1894.....	...	46·1	...	...	...	49·0	...	...
1895.....	...	47·4	...	61·5	...	50·3	33·2	...
1896.....	...	49·9	...	62·3	...	...	...	39·8
1897.....	...	47·9	...	62·6	...	49·3	...	38·9
1898.....	...	...	...	60·9	...	51·2	...	40·2
1899.....	...	...	...	63·7	...	49·6	...	40·6
Means...	42·8	47·8	57·5	61·8	46·4	49·8	33·3	39·6

Blank spaces equal the average.

The comparison between any of these seasons is striking, especially as regards the averages. The sequence or cycle of years is also worthy of note, the recurrence of heat, cold or average being remarkable.—Yours faithfully,

ARTHUR F. PARBURY.

*Chiddingfold, Godalming, Surrey.*

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, OCTOBER, 1899.

STATIONS.  (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	Cloud.
	Temp.	Date.	Temp.	Date.									
°		°		°	°	°	0-100	°	°	inches			
London, Camden Square	63·4	1	35·5	8	57·4	42·4	44·4	85	107·7	28·9	2·03	10	4·7
Malta	83·1	1	58·1	11	77·3	65·0	63·8	82	138·6	53·1	2·88	7	3·7
Cape of Good Hope	83·8	23	38·0	10	68·4	51·6	51·2	75	...	...	2·30	8	4·6
Mauritius	80·4	27	60·5	20	77·5	66·0	62·8	78	155·1	53·5	2·25	15	5·7
Calcutta	92·1	4	68·4	18	87·0	73·5	72·5	77	150·7	62·5	3·02	2	4·3
Bombay	93·7	21	74·5	30	88·6	78·4	75·3	77	138·4	62·1	·00	0	2·2
Ceylon, Colombo	93·2	6	72·0	20	88·1	75·6	73·5	81	152·0	70·0	12·99	23	4·9
Melbourne	81·0	31	36·1	1	64·5	46·7	43·9	70	139·8	30·0	3·28	13	5·6
Adelaide	94·1	13	36·9	2	72·6	50·6	42·5	53	154·0	30·9	1·23	12	5·3
Sydney	89·9	9	43·3	2	69·7	53·9	49·0	64	140·0	33·0	3·80	15	4·8
Wellington	68·0	25a	39·0	6	60·5	47·6	43·7	68	127·0	27·0	2·52	17	4·3
Auckland	68·0	26	47·6	19	62·9	51·0	46·7	69	126·0	40·0	4·79	22	5·7
Trinidad	93·0	Sev.	67·0	1, 2	91·7	70·5	74·0	86	168·0	66·0	6·34	10	...
Grenada	88·6	3	68·8	9	85·3	75·1	72·6	74	155·4	...	5·68	18	2·5
Toronto	73·7	14	26·7	2	59·3	42·4	46·7	84	88·2	19·8	4·55	15	5·8
New Brunswick, Fredericton	71·3	26	24·3	24	56·4	36·4	34·5	61	...	...	3·15	5	5·3
Manitoba, Winnipeg	73·4	6	18·0	19	52·1	32·3	...	73	...	...	1·85	7	6·6
British Columbia, Esquimalt	...	...	...	...	...	...	...	...	...	...	...	...	...

a—and 30.

REMARKS.

MALTA.—Adopted mean temp. 70°·0, or 1°·7 above average. Mean hourly velocity of wind 6·6 miles, or 2·5 below average. Mean temp. of sea 74°·0. TSS on 12th and 13th. L on 8th and 31st. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·9 below, of dew point 0°·9 above, and rainfall 65 in. above, their respective averages. Mean hourly velocity of wind 9·3 miles, or 1·8 below the average; extremes, 24·4 on 4th, and 1·6 on 18th; prevailing direction, S.E. by E. to E. by N. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 80°·7, or 0°·6 above, of dew point 0°·9 above, and rainfall 1·58 in. below, their respective averages. Mean hourly velocity of wind 8 miles; prevailing directions S.W. and N.W. TSS on 6 days. L on 8 days. H. O. BARNARD.

Adelaide.—Mean temp. of air 0°·4 below, and R 56 in. below, their respective averages for 42 years. The temp. during the month was very variable. C. TODD, F.R.S.

Sydney.—Temp. 1°·7 below, humidity 4·7 below, and rainfall 95 in. above, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Fine, but variable; R below average, and fell chiefly at night; prevailing winds N.W., frequently strong. Temp. 0°·4 above, and rainfall 1·85 in. below, their respective averages. R. B. GORE.

Auckland.—Stormy and wet throughout the greater part of the month. Mean temp. slightly below the average. Rainfall 1·50 in. above the average. T. F. CHEESEMAN.

TRINIDAD. Rainfall 33 in. below the average of 30 years. J. H. HART.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, NOVEMBER, 1899.

STATIONS.  (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max. 1	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
	°		°		°	°	°	0-100	°		inches		
London, Camden Square	61·8	2	29·9	30	53·4	42·3	43·8	87	89·1	25·8	4·13	10	7·5
Malta .....	76·1	8	49·1	18	68·7	57·7	55·2	80	132·9	44·6	4·65	11	3·9
<i>Cape of Good Hope</i> ...	91·9	7	48·1	22	73·7	56·0	53·0	67	...	...	·37	5	4·5
<i>Mauritius</i> .....	83·6	12	64·5	5	81·2	69·6	66·1	75	157·2	55·8	1·73	8	5·6
Calcutta .....	86·2	1	57·7	30	82·9	61·3	60·6	68	142·2	50·0	·00	0	1·3
Bombay .....	91·2	30	71·9	12	87·0	73·8	69·6	70	135·9	59·4	·00	0	0·5
Ceylon, Colombo.....	91·4	13	70·3	11a	88·7	74·1	70·1	76	153·0	67·0	8·58	16	..
<i>Melbourne</i> .....	88·6	1	42·8	16	70·7	51·3	49·0	67	147·5	36·9	2·02	11	6·7
<i>Adelaide</i> .....	97·2	1	44·9	10	78·7	55·2	47·6	52	163·4	34·9	1·96	11	5·0
<i>Sydney</i> .....	98·9	28	53·5	1	75·0	59·9	49·2	63	158·5	44·0	5·06	12	5·0
<i>Wellington</i> .....	74·0	19	38·0	6	62·9	50·0	46·9	70	129·0	29·0	2·25	15	4·4
<i>Auckland</i> .....	72·0	30	48·0	5	65·0	53·5	50·2	72	136·0	41·0	2·05	15	5·8
Trinidad .....	92·0	Sev.	68·0	1, 2	89·3	71·7	74·0	82	164·0	69·0	8·07	15	...
Grenada.....	86·2	3	69·2	1	83·5	74·4	73·9	69	155·0	...	6·03	20	2·7
Toronto .....	61·8	18	21·6	13	47·0	34·5	35·9	81	72·8	15·8	1·02	13	7·5
New Brunswick, Fredericton .....	51·8	9	5·1	18	38·9	23·1	23·2	72	...	...	3·38	8	5·6
Manitoba, Winnipeg. British Columbia, Esquimalt.....	60·2	5	18·0	1	42·9	26·5	...	81	...	...	·55	5	6·4
	...	...	...	...	...	...	...	...	...	...	...	...	...

a—and 12.

## REMARKS.

**MALTA.**—Adopted mean temp. 62°·1, or 0°·1 below average. Mean hourly velocity of wind 8·5 miles, or 0·8 below average. Mean temp. of sea 70°·4. TSS on 7 days. L on 5 days. H on 21st. Several water spouts were seen close to this station over sea and land on 13th. J. F. DOBSON.

**Mauritius.**—Mean temp. of air 0°·6 above, of dew point 1°·4 above, and rainfall 0·8 in. below, their respective averages. Mean hourly velocity of wind 8·6 miles, or 2·1 below average; extremes, 21·6 on 30th, and 1·8 on 11th; prevailing direction ranging from N.E. by N. to S.E., with occasional N.W. breezes. L on 19th and 29th; L and T on 21st and 22nd. T. F. CLAXTON.

**CEYLON, COLOMBO.**—Mean temp. of air 80°·0, or 0°·2 above, of dew point 2°·2 below, and rainfall 4·22 in. below, their respective averages. Mean hourly velocity of wind 8·5 miles; prevailing direction N.W. TSS on 22nd, 23rd and 29th. H. O. BARNARD.

**Adelaide.**—Mean temp. of air just the average, but very changeable throughout the month. Rainfall 97 in. above the average for 42 years. A marked feature of the month is the very small rainfall on the north coast at Port Darwin, and inland. C. TODD, F.R.S.

**Sydney.**—Temp. 0°·7 above, humidity 5·8 above, and rainfall 1·94 in. above, their respective averages. H. C. RUSSELL, F.R.S.

**Wellington.**—On the whole fine, though showery at times, especially during the middle of the month. Prevailing wind N.W., frequently strong. Temp. 0°·1 below, and rainfall 1·92 in. below, their respective averages. R. B. GORE.

**Auckland.**—A cool, dry, and cloudy month, with no storms of importance or heavy falls of rain. Mean temp. and rainfall considerably below the average. T. F. CHEESEMAN.

**TRINIDAD.**—R 1·21 in. above the 30 years' average. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,  
 APRIL, 1900.

Div	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk.	·68	XI.	Builth, Abergwesyn Vic.	2·93
II.	Dorking, Abinger Hall	1·11	„	Rhayader, Nantgwillt...	2·97
„	Birchington, Thor	·54	„	Lake Vyrnwy	2·32
„	Hailsham	1·56	„	Corwen, Rhug	1·97
„	Ryde, Thornbrough	1·26	„	Criccieth, Talarvor	1·91
„	Emsworth, Redlands	1·44	„	I. of Anglesey, Lligwy..	·98
„	Alton, Ashdell	1·43	„	I. of Man, Douglas	2·79
III.	Oxford, Magdalen Coll.	·83	XII.	Stoneykirk, Ardwell Ho.	2·49
„	Banbury, Bloxham	·71	„	New Galloway, Glenlee	3·53
„	Northampton, Sedgebrook	·82	„	Montaive, Maxwellton Ho.	2·52
„	Alconbury	·76	„	Lilliesleaf, Riddell	2·46
„	Wisbech, Bank House...	1·25	XIII.	N. Esk Res. [Penicuik]	2·65
IV.	Southend	·64	XIV.	Glasgow, Queen's Park..	2·14
„	Colchester, Lexden	·90	XV.	Inverary, Newtown	5·30
„	Saffron Waldon, Newport	·90	„	Ballachulish, Ardsheal...	5·30
„	Rendlesham Hall	1·12	„	Islay	3·81
„	Scole Rectory	...	XVI.	Dollar	2·35
„	Swaffham	1·24	„	Balquhider, Stronvar...	4·70
V.	Salisbury, Alderbury	1·68	„	Coupar Angus Station...	1·85
„	Bishop's Cannings	2·30	„	Blair Atholl	2·38
„	Blandford, Whatcombe	1·56	XVII.	Keith H.R.S.	2·17
„	Ashburton, Holne Vic.	1·88	„	Forres H.R.S.	1·65
„	Okehampton, Oaklands	1·86	XVIII.	Fearn, Lower Pitkerrie..	1·68
„	Hartland Abbey	1·77	„	S. Uist, Askernish	2·91
„	Lynton, Glenthorne	1·75	„	Invergarry	2·19
„	Probus, Lamellyn	2·12	„	Aviemore, Alvie Manse.	2·79
„	Wellington, The Avenue	1·10	„	Loch Ness, Drumnadrochit	3·07
„	North Cadbury Rectory	2·52	XIX.	Invershin	3·87
VI.	Clifton, Pembroke Road	1·23	„	Durness	4·46
„	Ross, The Graig	1·06	„	Watten H.R.S.	1·63
„	Wem, Clive Vicarage	·89	XX.	Dunmanway, Coolkelure	4·13
„	Wolverhampton, Tettenhall	·77	„	Cork, Wellesley Terrace	1·55
„	Cheadle, The Heath Ho.	1·78	„	Killarney, Woodlawn	3·27
„	Coventry, Priory Row	1·27	„	Caber, Duneske	2·28
VII.	Market Overton	·97	„	Ballingarry, Hazelfort...	2·00
„	Grantham, Stainby	·65	„	Limerick, Kilcornan	...
„	Horncastle, Bucknall	1·54	„	Miltown Malbay	3 78
„	Worksop, Hodsock Priory	1·14	XXI.	Gorey, Courtown House	1·28
VIII.	Neston, Hinderton	1·08	„	Moynalty, Westland	2·59
„	Southport, Hesketh Park	1·51	„	Athlone, Twyford	2·60
„	Chatburn, Middlewood	3·14	„	Mullingar, Belvedere	3·02
„	Duddon Val., Seathwaite Vic.	5·22	XXII.	Woodlawn	2·89
IX.	Melmerby, Baldersby	1·36	„	Crossmolina, Enniscoe	3·84
„	Scalby, Silverdale	1·39	„	Collooney, Markree Obs.	2·97
„	Ingleby Greenhow Vic.	1·14	XXIII.	Enniskillen, Model Sch.	...
„	Middleton, Mickleton	2·79	„	Warrenpoint	1·48
X.	Haltwhistle, Unthank H.	2·78	„	Seaford	2·81
„	Bamburgh	1·50	„	Belfast, Springfield	3·98
„	Keswick, The Bank	3·01	„	Bushmills, Dundarave..	3·15
XI.	Llanfrechfa Grange	1·42	„	Stewartstown	3·02
„	Llandovery	2·25	„	Killybegs	3·64
„	Castle Malgwyn	1·69	„	Horn Head	2·80
„	Brecknock, The Barracks	...			

## APRIL, 1900.

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. On grass.		Max.		Min.			
				Dpth	Date			Deg.	Date	Deg.	Date.		
		inches.	inches.	in.									
I.	London (Camden Square) ...	·98	—	·76	·36	3	15	76·4	21	25·1	2	5	13
II.	Tenterden .....	·82	—	·90	·30	3	11	75·0	22	26·0	1	4	13
III.	Hartley Wintney .....	1·11	—	...	·25	3	15	77·0	21	26·0	1	7	9
	Hitchin .....	1·43	—	·36	·33	3	11	75·0	21	25·0	1c	5	...
IV.	Winslow (Addington) .....	·55	—	1·37	·28	3	11	75·0	21a	24·0	2d	8	13
	Bury St. Edmunds (Westley) .....	1·45	—	·21	·48	5	13	68·0	21	27·0	1	...	...
V.	Norwich (Brundall) .....	1·30	—	...	·30	16	15	75·4	21	28·0	1	4	13
	Winterbourne Steepleton ...	1·77	—	...	·74	3	13	69·9	22	24·7	1	6	15
VI.	Torquay (Cary Green) ...	1·19	—	...	·33	3	11	63·4	22	34·2	1, 2	0	8
	Polapit Tamar [Launceston]..	1·55	—	·67	·38	30	14	69·0	21	27·8	27	6	10
VII.	Stroud (Upfield) .....	1·05	—	1·10	·27	3	17	69·0	21	34·0	5e	0	...
	Churchstretton (Woolstaston) .....	1·69	—	·65	·31	3	15	73·0	21	29·5	26	3	10
VIII.	Worcester (Diglis Lock) .....	·99	—	·72	·30	30	13	...	...	...	...	...	...
	Boston .....	1·37	—	·34	·52	5	9	75·0	20	27·0	2	6	...
IX.	Hesley Hall [Tickhill].....	·79	—	·92	·27	16	9	76·0	21	25·0	2	7	...
	Breadsall Priory .....	1·75	—	...	·60	28	13	...	...	...	...	...	...
X.	Manchester (Plymouth Grove) .....	2·50	+	·79	·53	11	16	75·0	21	28·0	1	5	6
XI.	Wetherby (Ribston Hall) ...	1·49	—	·36	·44	12	12	...	...	...	...	...	...
	Skipton (Arncliffe) .....	5·38	+	1·95	1·68	12	18	...	...	...	...	...	...
XII.	Hull (Pearson Park) .....	1·08	—	·84	·19	3	12	75·0	21	23·0	1	6	10
	Newcastle (Town Moor) .....	1·36	—	·47	·25	3	11	...	...	...	...	...	...
XIII.	Borrowdale (Seathwaite).....	8·58	+	1·44	2·15	11	18	...	...	...	...	...	...
	Cardiff (Ely).....	1·95	—	·46	·64	6	14	...	...	...	...	...	...
XIV.	Haverfordwest .....	2·07	—	·56	·48	3	17	69·0	21	28·3	6	2	12
	Aberystwith (Gogerddan) ...	2·41	—	·15	·41	3, 10	14	75·0	20	20·0	1	12	...
XV.	Llandudno .....	1·61	—	·20	·44	11	16	69·0	20	34·5	26	0	...
	Cargen [Dumfries] .....	...	—	...	...	...	...	...	...	...	...	...	...
XVI.	Edinburgh (Blacket Place) ...	1·35	—	...	·46	12	13	71·9	20	30·2	2	3	6
XVII.	Colmonell .....	3·11	—	...	·46	3	18	73·0	21	27·0	2	...	...
	Tighnabruaich .....	4·04	—	...	·94	12	15	63·0	21	30·0	5, 7	3	...
XVIII.	Mull (Quinish) .....	3·86	+	·88	·47	14	24	...	...	...	...	...	...
	Loch Leven Sluices .....	2·50	+	·28	·80	13	9	...	...	...	...	...	...
XIX.	Dundee (Eastern Necropolis) .....	1·45	—	·60	·30	3	17	71·4	20	29·4	2	5	...
	Braemar .....	1·46	—	·96	·25	15	17	65·8	20	24·7	7	12	24
XX.	Aberdeen (Cranford) .....	1·82	—	...	·38	3	21	73·0	20	28·0	1c	...	...
	Cawdor (Budgate) .....	2·38	+	·86	·31	2	18	...	...	...	...	...	...
XXI.	Strathconan [Beauly] .....	5·01	+	2·20	·85	29	10	...	...	...	...	...	...
	Glencarron Lodge .....	9·48	—	...	1·30	28	26	64·0	20	29·0	8	4	...
XXII.	Dunrobin .....	2·95	+	1·22	·35	13	19	68·0	20	32·0	1, 2	2	...
	S. Ronaldshay (Roeberry) ...	2·20	+	·59	·39	14	22	62·0	20	32·0	3	1	...
XXIII.	Darrynane Abbey .....	3·30	—	...	·47	2	18	...	...	...	...	...	...
	Waterford (Brook Lodge) ...	1·98	—	·49	·32	29	15	64·0	22	31·0	6	1	...
XXIV.	Broadford (Hurdlestown) .....	2·04	—	...	·38	5	19	...	...	...	...	...	...
	Carlow (Browne's Hill) .....	2·56	+	·28	·69	6	16	...	...	...	...	...	...
XXV.	Dublin (Fitz William Square) .....	1·30	—	·82	·20	3	16	70·7	21	35·9	8	0	2
	Ballinasloe .....	2·60	+	·26	·40	3	15	65·0	19b	36·0	1	0	...
XXVI.	Clifden (Kylemore) .....	5·23	—	...	·78	28	18	...	...	...	...	...	...
	Waringstown .....	2·53	+	·11	·35	8	14	75·0	22	27·0	8	5	9
XXVII.	Londonderry (Creggan Res.) .....	2·57	+	·33	·35	3	22	...	...	...	...	...	...
	Omagh (Edenfel) .....	2·76	+	·53	·49	11	19	70·0	20	29·0	25	3	5

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

a—and 22. b—and 20. c—and 25. d—and 26. e—and 27.

# METEOROLOGICAL NOTES ON APRIL, 1900.

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.

LONDON, CAMDEN SQUARE.—A warm period occurred from the 18th to the 24th, the mean of the 9 a.m., 9 p.m. max. and min. temp. for each of the seven days being :—

18th.	19th.	20th.	21st.	22nd.	23rd.	24th.
53°·4	55°·4	55°·2	59°·9	61°·8	52°·4	51°·5

while the mean for 40 years is 48°·1. The highest 9 a.m. reading (64°·6 on 22nd) has been exceeded in 4 ApriIs in 40 years; the highest 9 p.m. reading (62°·1 on 22nd) has been exceeded in three ApriIs; the highest max. (76°·4 on 21st) has been exceeded in 8 ApriIs, and the highest min. (47°·3 on 19th) has been repeatedly exceeded.

TENTERDEN.—Generally cold, except in the third week. Very warm from the 20th to the 22nd, but the max. temp. on 25th was 27° lower than that on 22nd. The latter part of the month was dry. High winds blew from S.W. on 11th and 12th, W. on 13th and N.W. on 16th. T and slight H at 4 p.m. on 16th. Duration of sunshine 178 hours.

HARTLEY WINTNEY.—Until the 18th the weather was bitterly cold with dull days and showers from N.W.; a terrible W. wind blew on 14th, 15th and 16th. A sudden burst of heat occurred on 20th and lasted till the 22nd, with a max. temp., in shade, of 77°. Total R ·18 in. below the average. Distant T on 5th. Ozone on 16 days with a mean of 4·2. Vegetation very backward. Nightingale heard on 15th, cuckoo on 16th, and swallow seen on 18th.

WINSLOW, ADDINGTON.—The least R in April in 30 years, with the exception of 1893, when only ·11 in. fell on 3 days. The max. temp. was rather high from 19th to 22nd, but frost on the morning of the 26th did much damage to fruit blossom and seedling plants. Very high winds blew from 11th to 13th. Swallows arrived on 16th.

BURY ST. EDMUNDS, WESTLEY.—A nice spring month with the exception of the 1st, 13th and 25th. Very little R fell after the 5th. Very high wind occurred on 13th and much damage was done on light lands by blowing sand. The 21st and 22nd were very hot, but sharp frost occurred on 26th. T on 4th and 5th.

NORWICH, BRUNDALL.—A month of many extremes; on 1st the shade temp. fell to 28°·0, and on 21st it rose to 75°·4, this being the warmest April day since 1892. On the 5th occurred the most severe TS for some years, lasting from 11.50 a.m. to nearly 4 p.m., with great darkness; Brundall only caught the fringe of it, but in some parts of Norwich more than an inch of R fell. T and L on 4th and 16th, and L also on 3rd. Large flakes of S on 2nd.

WINTERBOURNE STEEPLTON.—The weather on the whole was cold and ungenial. The R in the early part was accompanied by much wind and squally weather and in the latter part, although brighter, the nights were mostly frosty. It was therefore not a "growing" time. Mean temp. 45°·6.

TORQUAY, CARY GREEN.—R 1·19 in. below the average. Mean temp. 48°·5 or 0°·3 above the average. Duration of sunshine 195 hours 30 mins., being 18 hours 50 mins. above the average; one sunless day. Mean amount of ozone 5·3; greatest 8·0 on 17th with a W.S.W. wind, and least, 2·0 on 11th also with W.S.W. wind.

**POLAPIT TAMAR [LAUNCESTON].**—A rather cold and dry month. From the 12th to the 28th, inclusive, was particularly dry, only '07 in. of R falling. Morning fogs on 8th, 17th, 18th, and from 22nd to 25th. H on 5th. R for the first 4 months of the year 3'95 in. above the average.

**WOOLSTASTON.**—The early part of the month was cold and backward but towards the middle it became very warm. Strong gale on 11th and 12th. T on 23rd. Violent H storms on 5th. Mean temp. 47°'8.

**BREADSALL PRIORY.**—A cold month and everything very backward.

## WALES.

**HAVERFORDWEST.**—A cold and somewhat stormy month, with a small amount of bright sunshine and low night temp.; though some of the day readings were high. Vegetation generally very backward, but fruit trees promise good crops, and agricultural operations are well advanced. Swallows were seen on 11th. Blackthorn in bloom and cuckoo heard on 18th.

**ABERYSTWITH, GOGERDDAN.**—A very changeable month; for a few days it was more like July than April, but the nights were cold.

## SCOTLAND.

**EDINBURGH, BLACKET PLACE.**—R 35 per cent. below the average. Mean temp. 1°'5 above, and duration of sunshine 17 hours above, the average.

**COLMONELL.**—R '63 in. above, and mean temp. 2°'0 above, the average for 24 years. Gales on 12th, 14th and 15th.

**TIGHNABRUAICH, CRAIGANDARAICH.**—A splendid spring month, with R, heat and sunshine in proper proportions.

**S. RONALDSHAY, ROEBERRY.**—A cold, wet month. Mean temp. 42°'1, or 1°'5 below the average of 10 years.

## IRELAND.

**DARRYNANE ABBEY.**—The first half of the month was wet and cold; the remainder was fine and warm, with some really hot days. Vegetation very backward, but improving towards the close. H on 4th, 5th and 15th.

**WATERFORD, BROOK LODGE.**—Mean temp. 48°'4. Heavy H on 4th and 6th. A pair of swallows seen on 22nd, and cuckoo heard on 26th.

**BREADFORD, HURDLESTOWN.**—R '13 in. below, and rainy days 2 above, the average for 15 years.

**DUBLIN, FITZWILLIAM SQUARE.**—A favourable, springlike month. At times changeable, cloudy and showery, but on the whole warmer than usual, and with a moderate rainfall. Mean temp. 50°'1, or 2°'4 above the average. Fog on 3 days. High winds on 9 days, reaching the force of a gale on 4 days. H on 3 days. The shade temp. reached 60° on 7 days, and on 2 failed to reach 50°. Solar halo on 1st, and L on 1st.

**OMAGH, EDENFEL.**—Wet and somewhat raw until the 17th, but not repressive of vegetation; thence till 24th a summer-like spell reaching a max. of 70° on 20th, a temp. only twice before recorded in April in (at least) 35 years, viz.; in 1875 and 1893. The remainder of the month was dry and cool. Swallows on 19th; land-rail on 30th.



# SYMONS'S

## MONTHLY

# METEOROLOGICAL MAGAZINE.

CCCCXIII.]

JUNE, 1900.

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### MEMORIAL TO THE LATE G. J. SYMONS, F.R.S.

ON May 31st a few friends of the late Mr. G. J. Symons assembled at the rooms of the Royal Meteorological Society, by invitation of the President, to consider the best means of commemorating the services to the nation of the late Founder of the Rainfall Organization.

It was resolved that the most appropriate memorial would be a gold medal, bearing on the obverse a portrait of Mr. Symons, to be awarded from time to time by the Council of the Royal Meteorological Society for distinguished work in connection with meteorology.

The following were nominated to form an executive committee to carry out the proposal:—

DR. THEODORE WILLIAMS.  
MR. CAMPBELL BAYARD.  
MR. RICHARD BENTLEY.  
MR. C. HAWKSLEY.  
MR. J. HOPKINSON.

PROF. MELDOLA.  
DR. R. H. SCOTT.  
MR. SOWERBY WALLIS.  
MR. W. WHITAKER.

About a hundred and fifty guineas is already promised, and it is hoped that the fund will reach a sum of at least £750.

The committee will issue notices at an early date inviting contributions to the fund, and we venture to express the hope that our readers, and our colleagues of the rainfall organization, will respond heartily to do honour to the memory of our late chief.

### METEOROLOGICAL EXTREMES.—III. WIND FORCE.

WE have received two communications respecting our article in last month's Magazine on the maximum force of the wind.

Mr. G. H. Courtenay, writing from Kenton, near Exeter, appears to be a little incredulous respecting the details we gave of the Kansas tornado of 1879; and he suggests that if these are correct the proper answer to the query with which we closed the article, "What is the strongest force the wind ever attains?" should be, "The force of gunpowder or dynamite!"

The details we gave were quoted from the account given in the Transactions of the St. Louis Academy of Science, *littera scripta manet*. On this point, however, we may now add that the library of the Royal Meteorological Society contains a series of photographs of various phenomena which resulted at different times from similar storms in America; and these comprise, amongst other remarkable effects, *straw* driven end on *into* the bark of trees; a plank similarly driven through the floor of a barn; and a horse killed by a branch of a tree driven into its side.

A photograph is, we know, not always unimpeachable as evidence; but in these instances there is no reason whatever that we are aware of for supposing that the photographer desired to test the credulity of the scientific world.

The other correspondent is Mr. G. von U. Searle, who says he has "a very clear recollection that in the great gale of Nov. 17-18, 1893, a velocity of 120 miles was recorded either at Fleetwood or Holyhead," according to a report which appeared in the *Times*, and he asks us to verify the accuracy of his recollection.

The highest velocity recorded in any 60 consecutive minutes during that gale was 89 miles at Holyhead, and 86 miles at Fleetwood. But these velocities are based on the erroneous factor (3), and to compare them with the velocities we quoted in our article, they must first be reduced by about four-fifteenths, which will give us 65 miles for Holyhead and 63 miles for Fleetwood.

There is no doubt at all that much higher rates of velocity were attained in short squalls and gusts; but, unfortunately, the cup anemometer is not a satisfactory instrument for giving us exact information on this point, and at the date of the gale in question the pressure-tube anemometer was not in use. If the rather coarse, thick character of the trace is borne in mind, and also the fact that 280 revolutions of the cups are needed to produce a piece of line one-tenth of an inch long, this feature of the cup anemometer's record will be readily appreciated.

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## INDIAN FAMINE-CAUSING DROUGHTS AND THEIR PREVISION.

THE famine which has now for the last two years been devastating India is a matter of such serious importance in relation to the economy of Indian government and to the rapidly increasing population that no excuse is needed for discussing in these pages the general causes of Indian famines and their relation to the prevision of Indian weather.

The general causes of Indian famine have been summarised by Mr. Eliot, the head of the Indian Meteorological Service, as follows:—

- (1.) "Prolonged delay in the commencement of the rains more especially of the summer monsoon."

- (2.) "A prolonged break in the middle of the south-west monsoon rains."
- (3.) "Scanty rainfall during the greater part, or the whole of the season."
- (4.) "Unusually early termination of the south-west monsoon rains."

This last being especially fatal in the case of rice crops on unirrigated land.

In different parts of India these several factors work very differently.

Thus in Northern India, which comes under the incidence of both the south-west monsoon or summer rains and of the comparatively minute but valuable fall in the winter months, famine is usually due either to the failure of two crops in succession, the "Kharif" or summer crop and the "rabi" or winter crop, or to the complete failure of one crop after a succession of poor or bad seasons.

In the Deccan they are usually due to the more or less complete failure of the south-west monsoon rainfall throughout.

In general it may be said that failure of either the summer or winter rains or both together tend to produce famine in proportion to the intensity of the drought, the time of its duration and the area over which it extends. An untimely excess of rainfall seldom produces more than a local scarcity.

One very curious circumstance in regard to the prevalence of famine in India is that the area most subject to famine is not the most arid district but a zone intermediate between this and the moister areas which is technically designated as "dry."

Statistically, India may be divided into three areas (1) the arid area with a rainfall less than 15 inches per annum. Since all crops grown on this area are watered by irrigation it is practically independent of variation in the seasonal rainfall, and it is a non-famine area.

(2.) The dry area, in which the annual rainfall ranges from 15 to 35 inches. This is the real famine area and on the map appears as two great areas, one in Central and Southern India embracing the Deccan, Mysore, South Madras, and the other a belt stretching in the form of a boomerang from the Gujrat peninsula north-eastwards to Lucknow and Allahabad and thence north-westwards to Peshawar.

In time of severe famines such as the present, when the conditions in both areas are coincidently prolonged, the famine area embraces both at once and extends more or less symmetrically over the areas adjoining their borders.

(3.) The moist zone, in which the rainfall ranges from 35 inches to 200 inches and upwards. This area, which includes the rest of India, is practically a non-famine area.

Various attempts have been made to correlate the occurrence of Indian famines with the variations in the energy derived from the sun corresponding to the periodic changes in the spotted area, but

though there are evidences of parallelism, the relation is not a simple or regular one. The condition of the sun is probably a contributory *vera causa* but not a *maxima causa*.

Re-acting conditions initially determined by changes in the position of antarctic ice, slight deflections in the equatorial ocean currents and in the vertical and horizontal position of upper atmospheric air streams of abnormal condition such as those recently shewn to exist by means of the Kite observations at Blue Hill Observatory are likely to be far more potent prime causes of seasonal abnormalities than the small and fairly regular changes which appear to follow the appearance and disappearance of sunspots.

In fact the study of famine prevision can only proceed successfully with that of the general terrestrial factors which lie at the base of the normal and abnormal occurrence of the "monsoons."

The comparative regularity with which these periods of similar winds and weather alternate half-yearly, is one of the most salient and remarkable features of the Indian weather system, and the study of their proximate and remote causes, their changes from year to year, and their general local distribution of rainfall, have for several years formed the "*maxima quaestio*" of the Indian forecaster.

For the purpose of prediction, the American or European, and the Indian Meteorologist, regard weather from entirely different points of view.

To the former it appears to be mainly due to the passage of a succession of low and high pressure areas (technically termed cyclones and anticyclones) with their attendant respective characteristics of ephemeral stormy and fair weather.

To the Indian meteorologist, on the other hand, it appears to be chiefly a succession of broad seasonal changes, commencing suddenly in the case of the summer monsoon, and though characterised by minor changes due to the similar passage of ephemeral moving cyclonic and anticyclonic systems, it remains of a fairly constant and dominant type, when once it has fairly set in.

The marked changes from day to day which characterise the proverbially "fickle weather" in England, are less marked in that of India, while the persistent seasonal tone of the latter is comparatively unnoticed even if present in the former.

This apparently radical difference between the weather in India and that of extratropical countries, has led to an equally radical departure in the system of forecasting adopted there.

While in England and Europe, we are still content with 24 hourly predictions, founded chiefly on mere empirical sequences of changes already in existence, and in America the utmost limit at present adopted is 48 hours, India has boldly struck out into officially endorsed predictions, issued in May and November, of the average weather of the ensuing half-year.

The success of the forecasts, which have now been in operation for the last twelve years, has been such, that in spite of its well known

financial difficulties the Indian government has recently extended its field of observation so as to embrace portions of Persia, Kashmir, Arabia, East Africa, Mauritius and communication with West Australia, and with good reason, for as the investigation of the conditions upon which the initiation and persistence of the monsoons depend proceeded, it was found that the local factors such as early hot weather in the plains, or late snowfall on the Himalaya were insufficient to account for the large anomalies presented in different years and that extraneous causes were at work in surrounding areas which dominated and often masked any apparent temporal coincidences such as were too readily accepted in the early period of Indian meteorology as sufficient to account for everything.

(To be continued.)

## METEOROLOGICAL OBSERVATIONS DURING THE ECLIPSE.

*To the Editor of the Meteorological Magazine.*

SIR,—Thinking they might be interesting, I send you some meteorological observations I made here on May 28th, 1900, before and during the solar eclipse, which lasted from 2.45 to 5 p.m., G.M.T. (the max. obscuration being 7-10ths at 3.53 p.m.). A light W.N.W. breeze blew, veering to N.W. at 4.30 p.m., and the sky was nearly cloudless.

Hour, G.M.T.	Bar. at 32° and sea level.	Temp. in Stevenson's Screen.		Humidity.	Black Bulb. Max. in vacuo, in sun.
		Dry.	Wet.		
	in.			%	°
2. 0 p.m. ....	30.320	59.9	54.5	69	...
3. 0 „ ....	30.322	60.8	53.7	62	112.8
3.30 „ ....	30.334	59.2	53.3	66	90.3
3.45 „ ....	30.337	57.9	52.8	70	76.7
4. 0 „ ....	30.340	56.8	52.1	72	71.2
4.15 „ ....	30.338	56.2	52.0	74	73.7
4.30 „ ....	30.332	57.1	53.3	77	84.2
4.45 „ ....	30.336	57.6	53.7	76	85.2
5. 0 „ ....	30.333	58.6	54.5	76	89.2
5.15 „ ....	30.333	57.8	52.9	71	...
6. 0 „ ....	30.335	58.1	53.6	73	...

Max. Temp., 2 to 3 p.m.		Fall of Temp. (from Max. to Min.)		Rise of Temp. after Eclipse Min.		Rise of Humidity during Eclipse.	Fall of Humidity after Eclipse.
In shade.	In sun.	In shade.	In sun.	In shade.	In sun.		
61.8	118.8	5.6	47.6	2.4	18.0	15	6

There was much darkening of the landscape during the eclipse, different from that caused by clouds intervening between the sun and earth.—Yours truly,

EDWIN E. GLYDE.

*Statsford, Whitchurch, Tavistock, June 4th, 1900.*

## ROYAL METEOROLOGICAL SOCIETY.

THE first of the afternoon Meetings for the present Session, was held on Wednesday, May 16th, at the Society's rooms, 70, Victoria Street, Westminster, Dr. C. Theodore Williams, President in the Chair.

The following gentlemen were elected Fellows :—Mr. J. Dunn, Mr. T. Almond Hind, Mr. R. H. Maund, Mr. F. D. Outram, C.E., Rev. H. C. V. Snowden, Mr. P. C. Trebeck, Mr. W. J. Trevaskis.

The Secretary read an interesting paper on "The Wiltshire Whirlwind of October 1st, 1899," which had been prepared by the late Mr. G. J. Symons, F.R.S., just before he was seized with his fatal illness. The readers of the *Met. Mag.* will remember how often Mr. Symons collected data respecting whirlwinds which occurred in this country, and they will therefore understand that he visited the district and personally investigated the track of this whirlwind. Mr. Symons wrote :—

"It has been the author's privilege to visit the sites of many of these disturbances during more than thirty years, and also during that period to receive particulars of the paths of many others, with maps, photographs, and other illustrations. He is not now submitting a paper upon whirlwinds in general, but upon that of October 1st, 1899, and he refers to previous ones merely to say that, as regards force, he has seen more remarkable manifestations at Baldock, Hertfordshire, in 1875, and Walmer in 1878. With regard to direction there is a curious parallelism between the track herein to be described and that of the Cowes whirlwind of September 28th, 1876. The fact of the one occurring within three days of the anniversary of the other, may be a mere coincidence. But as regards direction there are some facts still more curious, but which cannot be considered now. It is hoped that some one will take them up on another occasion. The author now gives merely the dates and the angles with the meridian of all the whirlwinds in the south-east of England which he can find or has himself determined :—

1729.	May 20.	Pevensey Bay to Newingden Level	...	N. 24° E.
1872.	July 25.	Wantage ... ..	...	N. 22° E.
1872.	Nov. 30.	Banbury (a curved track but about)	...	N. 10° E.
1875.	June 12.	Baldock ... ..	...	N. 62° E.
1876.	Sept. 28.	Cowes ... ..	...	N. 30° E.
1877.	Aug. 10.	Guildford ... ..	...	N. 33° E.
1878.	Oct. 24.	Walmer ... ..	...	N. 42° E.

All these tracks are within 26° of N. 36° E., and their mean is N. 32° E. The track of the whirlwind now to be noticed falls well within the above limits, for though slightly bent at first its mean direction may be taken as N. 20° E. Why do whirlwinds in the south-east of England generally go from South-south-west to North-east ?"

From the Daily Weather Chart it appears that on the morning of

October 1st, the centre of a depression was off the extremity of Cornwall; and this depression moved across the country in a north-easterly direction. The whirlwind occurred considerably in front of the centre and north-east of it. The weather during the day was wild and squally, with thunderstorms in many places. The length of the damage caused by the whirlwind was nearly 20 miles, but the average breadth was only about 100 yards.

"The first trace of the storm is afforded by Mr. Charles Yates, who states that the trees in a copse near Middle Winterslow were violently agitated and twisted about in a manner which he had not before seen, but that no breakage occurred. This spot is in  $1^{\circ} 39' 40''$  W. and  $51^{\circ} 5' 25''$  N.; it is  $1\frac{1}{2}$  miles south by west of the first recorded damage, and about 200 yards west of a prolongation backwards of the path eventually taken: it is rare to obtain details so near the commencement."

Owing to the whirlwind having passed over a large portion of bare down, the damage was only slight compared with what it might have been had it passed over a thickly populated district. As it was, buildings were unroofed, trees were blown down, and other objects were carried a considerable distance before being deposited on the ground. Great havoc was wrought at Old Lodge, the farmyard being completely wrecked and trees torn and twisted in a very remarkable manner.

"Perhaps the most striking evidence of the lifting power developed by the passage of a whirlwind over even a small volume of air, is afforded by the fact that the air below the barn floor, though less than 2 ft. thick and open to expand laterally (only it had not time), sufficed to lift the whole floor and carry it laterally about 20 ft., depositing it at an angle of nearly  $45^{\circ}$  with its original position.

"A shed near the northern extremity of the yard, built of wood, on a brick foundation, and which was about 11 ft. square and 10 ft. high, was lifted up and dropped down 5 ft. west of its original position. Another wooden shed 12 ft. 6 ins. square and about 9 ft. high was lifted off its brick base, its centre moved about 7 ft. to north-west, and its sides deposited at an azimuth  $37^{\circ}$  W. with their original position."

Seven miles further on at the farm of Great Shoddesdon the damage was nearly equal to that at Old Lodge.

At a distance of eighteen and a half miles from its origin, the whirlwind "came upon a rick of oats, a considerable portion of which it carried right over the village of Ham and deposited in a field belonging to 'Prosperous Farm,' one and two-thirds of a mile (say 3,000 yards) from where it had been picked up."

In the discussion which followed the reading of this paper:

Mr. Sowerby Wallis said that the paper was the last piece of work done by Mr. Symons before he was stricken down with paralysis, he being engaged on it the day before his illness. It had often struck Mr. Wallis as a curious fact that nearly all the known instances of

destructive British whirlwinds occurred in the south-east of England, and travelled in a somewhat similar direction. Another feature common in whirlwinds was the manner in which the severest damage was concentrated at isolated spots along the track, as though at times the whirlwind come in contact with the ground and then rose into the air.

Mr. F. J. Brodie remarked that this paper showed that the collection of rainfall statistics was only a small part of Mr. Symons's service to Meteorology. No information respecting this particular whirlwind had reached the Meteorological Office. The Weather Chart threw no light on the occurrence, as it seldom does, the stations being too far apart.

Mr. R. H. Curtis referred to a whirlwind which he observed many years ago in Piccadilly, and also to another which occurred at the Stamford Bridge Grounds, Chelsea. He thought these whirlwinds were probably due to the differences of temperature at various levels in the atmosphere.

Capt. A. Carpenter gave an account of two small whirlwinds which he had recently observed from his house at Croydon. He thought that the reason why some of the farm buildings at Old Lodge were twisted and others not, was the fact that those not directly in the path of the whirlwind did not experience the full force of the wind.

Mr. H. N. Dickson suggested that an examination of the conditions and type of barometric distribution in which this kind of phenomena occurred would be very useful.

Dr. H. R. Mill thought that the reason why the south-east of England suffered most from these visitations was that the configuration of the ground was favourable for their formation, and the general trend of the valleys and the usual course of storms along these tracks no doubt determined the direction of the whirlwinds.

Mr. R. Bentley remarked that he had referred to the dates and localities of over fifty whirlwinds in the United Kingdom, and found that August was the month in which the largest number occurred; but they were also very numerous in the months of June, July and October, and comparatively few in September. They happened most frequently in the Midland counties, and very frequently also on the east side of England between Yorkshire and Kent, and more rarely in other parts.

Mr. W. Marriott referred to the thunderstorm observations organized by the Society in 1888 and 1889, from the discussion of which it appeared that the thunderstorm formations were really small cyclonic disturbances. He had tried to improve upon the Daily Weather Charts by preparing maps with the isobars drawn for each two-hundredths of an inch. These, to a large extent, indicated the localities where thunderstorms were in progress; but the direction of the wind was more important, for where there was any



deflection of the arrows, it was almost invariably connected with a thunderstorm.

Mr. W. H. Dines remarked that in America tornadoes occurred in the south-east quadrant of low pressure systems, and that most damage was done by south-east winds.

Mr. H. N. Dickson gave a summary of an elaborate paper by Dr. Nils Ekholm, of Stockholm. "On the Variations of the Climate of the Geological and Historic Past and their Causes." The author, who had presented this paper to the Society on the occasion of its Jubilee, attempts to apply the results of physical, astronomical and meteorological research in order to explain the secular changes of climate revealed by geology and history. The subject is treated under the following heads:—

1. The general causes of changes of temperature.—2. Geological chronology. The probable age of life on the earth.—3. The radiation of the sun nearly constant during geological ages. The temperature of the earth's surface explained by the equilibrium between insolation and radiation from the earth into space.—4. Variations in the quantity of carbonic acid of the atmosphere the principal cause of the great climatic variations during geological ages.—5. The secular cooling of the earth is the principal cause of the variations of the quantity of carbonic acid in the atmosphere. Modifying influences.—6. Variations of the obliquity of the ecliptic and their influence on the climate.—7. Climatic variations during historical times, particularly in north-western Europe.—8. Conclusions. Probable variations of climate in the future.

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## THE RELATIVE HUMIDITY OF OUR HOUSES IN WINTER.\*

THE present season seems scarcely appropriate to the discussion of the above subject, unless it be to stimulate some of our readers to take action in the matter before next winter. It is a subject which we have often considered of much import and have wished for time to study experimentally, but have not been able to find it. We have, therefore, heartily welcomed the receipt of a paper with the above title, by Prof. R. De C. Ward of Harvard University and hope, he will not think that we have exceeded the justifiable limit of quotation:—

"In discussing with my classes in climatology the various ways in which climatic conditions affect man, I have been accustomed to point out that the climate which we have been able to produce inside of our modern houses is an extremely artificial one . . . . In summer we are able to keep the air in our houses cooler than that

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\* The Relative Humidity of our houses in Winter, by Robert De C. Ward. Reprinted from the *Boston Medical and Surgical Journal*, of March 1, 1900. 8vo. Boston, 1900.

outside by closing windows and blinds, and by means of artificial ventilation. In winter our houses are heated, and we live in an atmosphere which is many degrees warmer, and very much drier, than that out of doors. This dryness of the air indoors in winter I have been in the habit of comparing with that of deserts, although I have never used any numerical data in making this comparison. In view of the importance of this matter from a physiological point of view . . . . . I have recently made a short series of simple observations along these lines."

Observations were made inside the professor's study on the average four times a day from November 3rd to 23rd, with a sling psychrometer and were compared with the records of Richard instruments outside, with the following result :—

No. of Observations.	INSIDE.		OUTSIDE.	
	Mean temp.	Mean relative humidity.	Mean temp.	Mean relative humidity.
78	69°	30 per cent.	36°	71 per cent.

The max. relative humidity, 45 per cent., was recorded on November 6th, at 8 a.m., when there was little heat from the furnace, and the min. was 21 per cent. on November 23rd at 10 p.m.

"In one case (November 4th) a change of wind from south-east to north-west, accompanied by clearing weather, was closely followed by a decrease in relative humidity of 34 per cent. outdoors and of 6 per cent. indoors. In another case (November 11th) a change of wind to the east, with rain, brought a rise in relative humidity of 15 per cent. outside and of 6 per cent. indoors."

"Now, the interesting question is: how did the relative humidity indoors compare with that of other places outdoors? It has been seen that the mean relative humidity in Cambridge during the twenty-one days of observation was 71 per cent.," [while indoors for the same period it was 30 per cent.] "The mean relative humidity in Boston for the year 1899 was 69 per cent., and for the month of November, 1899, 68·8 per cent." . . . "In the dry interior of the great Eurasian Continent we find the following relative humidities: South-western Siberia and Western Turkestan have a mean of 45-50 per cent. in July. Yarkand, in Eastern Turkestan, has a July mean of 47 per cent. In the arid region in the neighbourhood of the Sea of Aral, Nukuss (lat 42°·5 N., long. 59°·6 E.) has a June mean of 46 per cent., and a 2 p.m. June mean of 19 per cent. Petro-Alexandrowsk, a degree and a half east of Nukuss, in the desert (lat. 41°·5 N., long. 61°·1 E.), has a mean of 34 per cent. in June. Kasalinsk (lat. 45°·8 N., long. 62°·1 E.) has a mean of 45 per cent. in July. The air is still drier in the deserts nearer the equator. Ghadames, in Tripoli, has 27 per cent. in July, and 33 per cent. in August, and the Kufra Oasis has 27 per cent. in August, with a 3 p.m. August mean of 17 per cent., and 33 per cent. in September. In the Punjab and North-western India, Lahore has 31 per cent. and Agra has 36 per cent. in May."

"These examples show clearly enough that the atmosphere of the room in which the observations above referred to were made, was, and is, drier than that of many desert regions. That so dry an atmosphere is not healthy, especially in our winter climate, there is no need of an argument to show." . . . . .

Similar observations made by Dr. H. J. Barnes, of Boston, in his office and in various hospitals, are very accordant, giving a mean relative humidity indoors of 31 per cent., while the mean relative humidity outdoors was 71 per cent.

In England domestic heating by hot air is not general, but probably our open coal fires and, even more, the gas fires which are so rapidly increasing in number, reduce the relative humidity of the air in our rooms to almost as low a point; especially as the evaporating pan referred to as a usual accompaniment of the furnace in the United States is almost unknown in England.

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## A SUN PILLAR.

*To the Editor of the Meteorological Magazine.*

SIR.—On Monday, May 28th, the day of the eclipse, which was beautifully seen in Somersetshire, I was cycling homewards with my back to the sunset. At about 8.20, when between Ditchet and Castle Cary, at a turn in the road I caught sight of what at the first glance seemed to be a bit of a solar halo.

But the sun was already set, and this luminous stripe was not curved, but appeared to stand like a vertical pillar or column of rosy-orange light above the already sunken sun. Proceeding towards Castle Cary, I got a better view of it, and its brilliancy seemed to increase as the light elsewhere became dimmer. It was still shining brightly at 8.35, when I entered Cary, but had disappeared when a few minutes later I could get a clear view again to the N.W.

I never saw anything in the least like this before, so perhaps others who did not see it may be interested to hear of such a phenomenon.

H. A. BOYS.

*North Cadbury Rectory, S.E. Somerset, May 31st, 1900.*

[A sun pillar, seen near Sidmouth, April 4th, 1871, was figured in the *Met. Mag.*, Vol. VI., No. LXVI. The phenomenon is also referred to in the article on Halos by Dr. Cherrill in *Met. Mag.*, Vol. XXVI., No. CCCIV.—ED.]

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, DECEMBER, 1899.

STATIONS.  (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
°		°		°	°	°	0-100	°	°	inches			
London, Camden Square	55·3	6	21·8	14	41·6	32·4	33·7	80	68·3	15·8	1·05	17	7·7
Malta.....	67·7	21	46·7	5	63·2	52·5	50·2	79	123·8	39·8	3·99	20	5·4
Cape of Good Hope ...	98·1	15	48·9	8	77·4	59·5	56·5	66	...	...	1·30	3	3·3
Mauritius.....	87·0	28	68·0	1, 5	33·9	72·3	67·0	71	156·2	58·6	1·31	12	5·4
Calcutta.....	84·1	7	50·0	16	78·5	55·4	54·6	66	139·5	38·0	·00	0	1·3
Bombay.....	90·4	20	68·2	10	86·2	70·9	64·9	65	135·7	55·1	·00	0	0·9
Ceylon, Colombo .....	90·2	13a	69·2	5	87·6	73·0	69·5	77	156·0	67·0	4·48	8	4·5
Melbourne.....	104·2	31	45·5	12	79·6	55·0	48·5	57	156·9	36·0	1·23	6	4·4
Adelaide .....	109·6	31	48·9	12	84·7	59·2	48·9	44	175·7	40·3	·59	4	2·8
Sydney .....	102·1	1	57·3	17	79·2	64·5	58·5	62	155·1	46·4	·70	7	5·1
Wellington .....	73·0	31	44·0	18	65·5	52·6	48·9	69	130·0	35·6	4·48	12	4·3
Auckland .....	78·0	29	53·5	18	70·1	57·9	55·2	74	141·0	45·0	·34	5	4·1
Trinidad .....	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada.....	87·0	12	71·6	28	84·5	74·2	71·4	72	154·2	...	4·82	16	1·5
Toronto.....	52·7	1	— 5·6	30	35·2	23·0	25·8	78	60·7	—9·5	2·53	20	6·8
New Brunswick, Fredericton	52·8	12	—14·8	31	31·0	13·2	15·7	76	...	...	5·10	15	5·8
Manitoba, Winnipeg	41·0	22	—20·0	25	19·0	1·1	...	80	...	...	·10	2	4·5
British Columbia, Esquimalt.....	...	...	...	...	...	...	...	...	...	...	...	...	...

a—and 17.

## REMARKS.

MALTA.—Adopted mean temp. 57°·2, or 1°·0 above average. Mean hourly velocity of wind 10·8 miles, or 0·3 below average. Mean temp. of sea 64°·5. TSS on 6 days; L on 3 days; H on 4 days. Dew point ranged from 59°·7 on 31st to 41°·9 on 17th. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·4 above, of dew point 1°·0 and rainfall 3·55 in. below, their respective averages. Mean hourly velocity of wind 11·2 miles, or 0·3 above average; extremes, 30·1 on 13th and 1·7 on 20th; prevailing direction, S.E. by E. to E. by N. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 78°·8, or 0°·3 below, of dew point 1°·4 below, and rainfall 1·97 in. below, their respective averages. Mean hourly velocity of wind 11·6 miles; prevailing direction N. TS on 1st. H. O. BARNARD.

Adelaide.—Mean temp. of air 0°·7 above, and R 25 in. below, their respective averages for 42 years. Generally a dry month, especially inland. More than average of extreme heat, 7 days being over 100° and 3 over 109°. C. TODD, F.R.S.

Sydney.—Temp. 2°·0 above, humidity 7°·1 below, and rainfall 3·86 in. below, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—The early part of the month was showery, and there were heavy showers in the middle; the remainder was generally fine, though not warm for the time of year. T on 2 days. Slight fog on 2 days. Slight earthquake on 4th. Mean temp. 1°·8 below, and rainfall 67 in. above, the average. R. B. GORE.

Auckland.—An unusually dry December, the rainfall being barely one-eighth of the average of 32 years. Barometric pressure and mean temp. close to the average. T. F. CHEESEMAM.

SUPPLEMENTARY TABLE OF RAINFALL,  
MAY, 1900.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	1.03	XI.	Builth, Abergwesyn Vic.	5.57
II.	Dorking, Abinger Hall .	1.06	„	Rhayader, Nantgwilt ...	3.92
„	Birchington, Thor .....	.92	„	Lake Vyrnwy .....	2.39
„	Hailsham .....	.95	„	Corwen, Rhug .....	1.82
„	Ryde, Thornbrough .....	1.19	„	Criccieth, Talarvor .....	2.35
„	Emsworth, Redlands ...	1.08	„	I. of Anglesey, Lligwy..	2.19
„	Alton, Ashdell .....	2.09	„	I. of Man, Douglas .....	2.93
III.	Oxford, Magdalen Coll..	1.15	XII.	Stoneykirk, Ardwell Ho.	3.25
„	Banbury, Bloxham .....	1.64	„	New Galloway, Glenlee	4.98
„	Northampton, Sedgebrook	1.05	„	Moniaive, Maxwellton Ho.	4.70
„	Alconbury .....	1.21	„	Lilliesleaf, Riddell .....	1.80
„	Wisbech, Bank House...	1.45	XIII.	N. Esk Res. [Penicuik]	1.50
IV.	Southend .....	.84	XIV.	Glasgow, Queen's Park..	2.19
„	Colchester, Lexden .....	.85	XV.	Inverary, Newtown .....	5.66
„	Saffron Waldon, Newport	1.30	„	Ballachulish, Ardsheal...	6.68
„	Rendlesham Hall .....	1.19	„	Islay .....	3.59
„	Scole Rectory .....	...	XVI.	Dollar .....	2.76
„	Swaffham .....	1.66	„	Balquhider, Stronvar...	8.02
V.	Salisbury, Alderbury ...	1.80	„	Coupar Angus Station...	2.97
„	Bishop's Cannings .....	1.60	„	Blair Atholl .....	...
„	Blandford, Whatcombe .	1.67	XVII.	Keith H.R.S. ....	1.20
„	Ashburton, Holne Vic...	2.72	„	Forres H.R.S. ...	1.12
„	Okehampton, Oaklands.	3.04	XVIII.	Fearn, Lower Pitkerrie..	1.22
„	Hartland Abbey .....	1.75	„	S. Uist, Askernish .....	2.58
„	Lynton, Glenthorpe ...	2.26	„	Invergarry .....	3.20
„	Probus, Lamellyn .....	1.83	„	Aviemore, Alvie Manse.	...
„	Wellington, The Avenue	1.94	„	Loch Ness, Drumnadrochit	1.10
„	North Cadbury Rectory	2.83	XIX.	Invershin .....	1.35
VI.	Clifton, Pembroke Road	2.53	„	Durness .....	2.43
„	Ross, The Graig .....	2.77	„	Watten H.R.S. ....	1.82
„	Wem, Clive Vicarage ...	1.79	XX.	Dunmanway, Coolkelure	5.33
„	Wolverhampton, Tettenhall	1.95	„	Cork, Wellesley Terrace	2.42
„	Cheadle, The Heath Ho.	1.91	„	Killarney, Woodlawn ..	3.75
„	Coventry, Priory Row ..	1.73	„	Caher, Duneske .....	2.84
VII.	Market Overton .....	1.92	„	Ballingarry, Hazelfort...	...
„	Grantham, Stainby .....	1.45	„	Limerick, Kilcornan ..	...
„	Horncastle, Bucknall ...	.96	„	Miltown Malbay .....	2.92
„	Worksop, Hodsck Priory	1.72	XXI.	Gorey, Courtown House	2.84
VIII.	Neston, Hinderton .....	1.49	„	Moynalty, Westland ...	2.24
„	Southport, Hesketh Park	1.83	„	Athlone, Twyford .....	2.53
„	Chatburn, Middlewood.	1.80	„	Mullingar, Belvedere ...	2.12
„	Duddon Val., Seathwaite Vic.	4.30	XXII.	Woodlawn .....	3.09
IX.	Melmerby, Baldersby ...	1.33	„	Crossmolina, Enniscoe ..	5.36
„	Scalby, Silverdale .....	1.18	„	Collooney, Markree Obs.	3.75
„	Ingleby Greenhow Vic..	1.36	XXIII.	Enniskillen, Model Sch.	...
„	Middleton, Mickleton ...	1.25	„	Warrenpoint .....	2.48
X.	Haltwhistle, Unthank H.	2.26	„	Seaford .....	3.30
„	Bamburgh .....	.94	„	Belfast, Springfield .....	...
„	Keswick, The Bank .....	3.62	„	Bushmills, Dundarave..	2.33
XI.	Llanfrechfa Grange .....	2.33	„	Stewartstown .....	3.04
„	Llandovery .....	3.02	„	Killybegs .....	4.17
„	Castle Malgwyn .....	3.47	„	Horn Head .....	3.48
„	Brecknock, The Barracks	...			

MAY, 1900.

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.	Differ- ence from average 1880-9.	Greatest Fall in 24 hours.		Days on which ·01 or more fell.	Max.		Min.				
				Dpth	Date		Deg.	Date	Deg.	Date.			
		inches.	inches.	in.							In shade.	On grass.	
I.	London (Camden Square) ...	.93	— .97	.23	22	12	73·7	27	35·6	11	0	3	
II.	Tenterden .....	.98	— .58	.33	6	9	74·5	6	36·0	16	0	4	
III.	Hartley Wintney .....	1·46	...	.44	21	15	70·0	27	30·0	16	1	5	
III.	Hitchin .....	...	...	...	...	...	...	...	...	...	...	...	
IV.	Winslow (Addington) .....	1·45	— .65	.38	9	11	70·0	27	29·0	11	3	3	
IV.	Bury St. Edmunds (Westley) .....	1·34	— .41	.64	8	12	67·0	5, 6	34·0	14	0	...	
V.	Norwich (Brundall) .....	1·87	...	.71	8	15	71·0	6	33·0	11	0	8	
V.	Winterbourne Steepleton ...	1·98	...	.42	22	8	68·0	29	31·9	12	1	5	
„	Torquay (Cary Green) .....	1·70	...	.42	2	9	68·4	29	40·4	14	0	0	
„	Polapit Tamar [Launceston]..	1·92	+ .09	.56	2	11	67·1	29	31·0	26	2	4	
VI.	Stroud (Upfield) .....	2·20	+ .16	.43	6	13	68·0	28	38·0	15	0	...	
„	Churchstretton(Woolstaston)	2·74	— .13	.61	6	12	69·0	8	34·0	14	0	4	
„	Worcester (Diglis Lock) .....	2·44	+ .16	.53	9	18	...	...	...	...	...	...	
VII.	Boston .....	1·23	— .49	.67	8	9	72·0	5	32·0	11b	2	...	
„	Hesley Hall [Tickhill] .....	1·12	— .92	.68	8	10	70·0	17	30·0	11	2	...	
„	Breadsall Priory .....	1·74	...	.79	8	13	...	...	...	...	...	...	
VIII.	Manchester(PlymouthGrove)	1·69	— .66	.48	8	14	69·0	20	32·0	9	1	...	
IX.	Wetherby (Ribston Hall) ...	1·12	— .83	.50	8	7	...	...	...	...	...	...	
„	Skipton (Arncliffe) .....	2·70	— 1·02	.67	21	15	...	...	...	...	...	...	
„	Hull (Pearson Park) .....	1·37	— .51	.76	8	12	69·0	27	31·0	17	4	8	
X.	Newcastle (Town Moor) .....	1·30	— .45	.25	8	9	...	...	...	...	...	...	
„	Borrowdale (Seathwaite) .....	7·70	— .91	3·88	21	13	...	...	...	...	...	...	
XI.	Cardiff (Ely) .....	1·87	— .98	.40	21	14	...	...	...	...	...	...	
„	Haverfordwest .....	2·87	+ .51	.91	2	12	64·9	30	33·8	20	0	8	
„	Aberystwith (Gogerddan) ...	2·41	...	.58	21	9	66·0	16e	...	...	...	...	
„	Llandudno .....	1·58	— .35	.45	6	11	64·0	28	40·0	13	0	...	
XII.	Cargen [Dumfries] .....	...	...	...	...	...	...	...	...	...	...	...	
XIII.	Edinburgh (Blacket Place) ..	1·35	...	.42	6	13	68·7	15	37·2	13	0	0	
XIV.	Colmonell .....	4·01	...	.79	2	14	71·0	30	28·0	13	...	...	
XV.	Tighnabruaich .....	4·81	...	.92	21	13	67·0	30	33·0	12	0	...	
„	Mull (Quinish) .....	4·41	+ 1·46	.64	3	17	...	...	...	...	...	...	
XVI.	Loch Leven Sluices .....	2·40	— .16	.70	22	7	...	...	...	...	...	...	
„	Dundee (Eastern Necropolis)	1·70	+ .04	.35	6, 21	13	71·1	15	33·1	13	0	...	
XVII.	Braemar .....	3·64	+ 1·23	.92	3	20	64·6	16	32·0	12c	2	12	
„	Aberdeen (Cranford) .....	1·19	...	.24	3	19	64·0	28	34·0	10d	0	...	
„	Cawdor (Budgate) .....	1·94	+ .19	.56	24	14	...	...	...	...	...	...	
XVIII.	Strathconan [Beaul] .....	1·85	— 1·24	.55	7	6	...	...	...	...	...	...	
„	Glencarron Lodge .....	3·25	...	.55	4	18	64·4	27	32·0	13	1	...	
XIX.	Dunrobin .....	...	...	...	...	...	...	...	...	...	...	...	
„	S. Ronaldshay (Roeberry) ...	1·70	— .02	.29	7	21	58·0	24	32·0	18	1	...	
XX.	Darrynane Abbey .....	2·23	...	.40	2	15	...	...	...	...	...	...	
„	Waterford (Brook Lodge) ...	3·41	+ 1·18	.70	21	14	65·5	29a	35·0	1	0	...	
„	Broadford (Hurdlestown) ...	2·37	...	.37	21	17	...	...	...	...	...	...	
XXI.	Carlow (Browne's Hill) .....	2·47	+ .13	.51	21	15	...	...	...	...	...	...	
„	Dublin (Fitz William Square)	1·92	— .01	.40	23	13	66·7	28	39·4	19	0	0	
XXII.	Ballinasloe .....	4·05	+ 1·36	.64	12	17	67·0	30	37·0	15	0	...	
„	Clifden (Kylemore) .....	8·74	...	1·78	2	14	...	...	...	...	...	...	
XXIII.	Waringstown .....	2·71	+ .27	.56	4, 23	14	72·0	30	38·0	25	0	...	
„	Londonderry (Creggan Res.) ..	2·73	+ .21	.45	22	17	...	...	...	...	...	...	
„	Omagh (Edenfel) .....	2·88	+ .41	.41	2	18	68·0	30	34·0	18	0	1	

+ Shows that the fall was above the average ; — that it was below it.  
a—and 31.    b—and 20.    c—and 19.    d—and 11.    e—and 29.

## METEOROLOGICAL NOTES ON MAY, 1900.

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.

TENTERDEN.—Another dry month, and generally cold. High wind on 14th and 15th and very windy on 3rd, 13th, 16th, 22nd and 23rd also. TS on 6th. Duration of sunshine 180 hours 30 mins.

HARTLEY WINTNEY.—Cold showers from S.W. prevailed until the 11th, followed by many sunless days with harsh, dry and cold E. and N.E. winds, the temp. on grass on 16th falling to 23°·0. Rainfall ·25 in. below the average, Ozone on 18 days with a mean of 4·9. Swifts seen on 5th. Hawthorn in flower on 18th.

WINSLOW, ADDINGTON.—A cold month, the max. temp. reaching 70° on one day only. The nights were always cold though seldom frosty. On 24th there was a sharp peal of T at 6.30 p.m.

BURY ST. EDMUNDS, WESTLEY.—As regards temp. the weather was of the usual type. There were eighteen days with northerly winds. Distant T on 24th. Vegetation backward.

NORWICH, BRUNDALL.—The fifth cold May in succession. T and L at 6 a.m. on 9th.

WINTERBOURNE STEEPLTON.—A cold and ungenial month, but May usually is so. Very good prospects for the fruit crops.

TORQUAY, CARY GREEN.—R ·32 in. below the average, that of the first five months of the year being 3·29 in. above the average. Mean temp. for May 51°·9 or 1°·3 below the average. Duration of sunshine 248 hours 5 mins. being 24 hours 10 mins. above the average. Two sunless days. Mean ozone 5·8 the greatest being 8·5 on 3rd and 4th with S and W. winds, and the least 3·5 on 10th and 11th with N. and E. winds.

POLAPIT TAMAR [LAUNCESTON].—The first week was rather wet and stormy and the month generally unseasonably cold. T on 8th.

WOOLSTASTON.—A backward and ungenial month. Violent H on 23rd. Mean temp. 52°·0. Swifts arrived on 6th.

### WALES.

HAVERFORDWEST.—An unusually cold and stormy month with not much bright sunshine. On 2nd a gale commenced in the afternoon and continued with varying force from moderate to strong, until the 4th, when it abated during the night. Foliage of trees was much damaged and fruit trees in exposed positions suffered considerably, but fruit crops generally promise well. The oak was much in advance of the ash. Hay crops and vegetation generally very backward. T on 8th.

ABERYSTWITH, GOGERDDAN.—Cold and dull for May, with little sunshine. Crops very late but promising.

## SCOTLAND.

EDINBURGH, BLACKET PLACE.—Mean temp.  $0^{\circ}\cdot7$  above, duration of sunshine 17 hours below, and rainfall 35 per cent. below, their respective averages. Squally on 4th, 5th and 9th. H on 13th.

CLACHANTON, COLMONELL.—R  $1\cdot55$  in. above, and mean temp. ( $51^{\circ}\cdot7$ )  $0^{\circ}\cdot9$  above, the average of 24 years. Gales blew on each of the first five days.

CRAIGANDARAICH, TIGHNABRUAICH.—A good average month as regards rain-fall, temp. and sunshine.

ABERDEEN, CRANFORD.—Cold, with high winds and little sunshine. Strong breezes from N. and N.W. between the 8th and 19th.

S. RONALDSHAY, ROEBERRY.—A very fair month on the whole. Mean temp.  $48^{\circ}\cdot5$ , or  $1^{\circ}\cdot2$  above the average of 10 years.

## IRELAND.

DARRYNANE ABBEY.—The first half of the month was mild and showery, the second half fine and warm, and the last few days were very hot.

WATERFORD, BROOK LODGE.—A very backward spring. Oak trees much more forward than ash. Heavy gale from S.W. on 4th, and S.S.W. gale with H showers on 22nd. H on 3rd. T at night on 12th. Corncrake heard on 6th, and many swallows seen about the middle of the month.

BREADFORD, HURDLESTOWN.—R  $\cdot13$  in. less than, and rainy days one more than, the average for 15 years. T on 3rd and 9th.

DUBLIN, FITZWILLIAM SQUARE.—A favourable, spring-like month, with the usual preponderance of polar (N.E.) winds, dry sunny days, and clear cold nights. In the week ending on 26th there were heavy rains and H showers, with T and L on 23rd. Mean temp.  $52^{\circ}\cdot5$ , or  $0^{\circ}\cdot5$  above the average. Solar halos were seen on four days. High winds were noted on 11 days, but attained the force of a gale only on the 3rd. Slight fog on 12th and 30th. H on 22nd, 23rd, and 24.

BALLINASLOE.—S.W. gale on 3rd. L and T in afternoon on 8th. S.E. gale on 21st. Distant T on 31st.

OMAGH, EDENFEL.—The beginning of the month was rainy and unsettled, with temp. somewhat below the average but not repressive of general vegetation, but from the 12th, the usual dry cold period (which seems to be a fixed meteorological fact with the 3rd week in May) followed, accompanied by polar and easterly winds. Unlike England and Scotland, however, the min. temp. on grass only once (18th) reached freezing point, and no damage to fruit followed. From 20th to 27th it was again rainy and unsettled, giving way for the last few days to a brilliant spell of summer. All vegetation (especially flowering trees and shrubs) remarkably luxuriant.



# SYMONS'S

## MONTHLY

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### INDIAN FAMINE-CAUSING DROUGHTS AND THEIR PREVISION.

*Continued from page 69.*

With regard to yearly anomalies in the monsoons and their rainfall, it appears to be a common delusion amongst those who are unacquainted with India, to imagine them to be extremely regular both as to date of arrival and character, thus rendering their prediction a comparatively simple matter. This however, is far from being the case. Even taking India as a whole, the marked date of the burst of the S.W. monsoon varies occasionally as much as from three weeks to 30 days, while the total annual rainfall of the entire Indian area has varied from  $6\frac{1}{2}$  inches deficiency in 1868, to 9 inches excess in 1893. Concentrated in one spot this latter surplus would amount to 211 cubic miles of water. Let me give an illustration by which it may be brought home to the imagination. Suppose a gigantic hose-pipe half an acre in section to stretch from the earth to the moon and to be filled with water. This water would barely represent the excess of 9 inches rainfall spread over the Indian area, while if it were required to irrigate India by the hose-pipe so as to allow the water poured out to amount to the given excess at the end of the six months of the S.W. monsoon, it would have to be continuously projected from the hose with the enormous velocity of 55 miles per hour. Such variations of water supply can hardly be regarded as an insignificant variation from the annual average. It has moreover been established by the late Mr. Blanford, that while the average rainfall variation over the whole area is not more than from 15 to 20 per cent., the rainfall is most variable when it is smallest in amount and most regular and steady when it is greatest; so that, in certain regions, variations frequently occur of several hundred per cent., leading to disastrous floods or droughts, especially in the dry zone.

Prevision of such anomalies in time to warn the local governments and agriculturists of impending unfavourable seasons and possible scarcity and famine, through either drought or flood, is the principal aim of the Indian seasonal forecasts.

The method began under Mr. Blanford by the recognition of certain contrasts and sequences between the rainfall of the summer and winter seasons, and in particular the snowfall on the Himalaya and the character of the subsequent summer monsoon over the neighbouring plains. This was found to be inverse, so that a heavy snowfall, especially if it lasted well into the spring months, argued a deficient or retarded monsoon.

Though this factor is now found to be subordinate to the absolute strength of the monsoon current, it still forms one of the four main conditions from which the extension and character of the S.W. monsoon is inferred. The others are—

(2). The local peculiarities of the weather during the months immediately preceding the arrival of the monsoon, and which are best indicated by local variations of monthly barometric pressure from the normal.

(3). The absolute force of the south-east trade wind in the south Indian Ocean before it breaks through the belt of equatorial calms and appears in the Indian seas as a S.W. monsoon wind, and which at present can only be determined from the logs of ships traversing the Indian Ocean or by cable from the Seychelles and Mauritius.

(4). The occurrence of long-period waves of barometric pressure (variations from the normal for the whole area), and in particular whether the wave is rising or falling. If rising, the probability is that the monsoon will be deficient; if falling, that it will be strong and rainy.

The second of these conditions used to be considered the only one which determined the monsoons, but is now found to be chiefly useful in determining the local character and irregularities of the monsoonal rains; in other words, the pressure differences act much as the inequalities in a mould into which molten metal is poured, in determining its flow and aggregation.

While the general troughs and ridges of pressure alter considerably from year to year, they always tend to preserve their initial type all through the monsoon period. Besides these, certain local sinks or barometric hollows which are associated with locally heavy downpours, appear to persist or recur several years in succession in the same locality.

A knowledge of the two last conditions, (3) and (4), is now recognised as displacing that of every other condition in point of primary importance in determining the strength and character of the S.W. monsoon current.

The first two conditions are now chiefly used in determining the local behaviour and limits of the current when it has once developed over the Indian area; and since such behaviour is considerably modified by the strength of the current itself, their rôle is obviously subordinate to that of any means by which the strength of the current may be forecasted shortly before it invades the Indian land area.

As yet, (3) cannot be directly determined by any rational method of scientific deduction. Recent investigations, however, by the aid of the ample data which is now collected at the Indian ports from ships traversing the Indian Ocean, and embodied in a series of monsoon charts, show that during the prevalence of the S.W. monsoon, the equatorial calm belt—(where according to the old textbook theory the N.E. and S.E. trade winds were supposed to meet, rise, and after discharging their surplus burden of humidity in torrential rains, fall back as upper currents towards the poles)—ceases to exist, and the south-east trade wind, finding its upward escape closed, like a torrent of lava breaks down the wall of opposing weaker N.E. winds, and after a preliminary burst in the first week of June, settles down into quiet possession of the Indian land area. Impelled thither quite as much by a *vis a tergo* as a *vis a fronte*, and forming part of the general summer circulation of the North-Eastern quarto-sphere, it is impossible at present to trace how far variations in this current are due to southern oceanic or northern land conditions. Early information, however, of its strength and reliance on the principle of persistence, are found to give very fairly reliable results. At the same time, an extension of the means of determining the causes and character of the particular type of circulation present in different years, by closer connection with Mauritius and West Australian stations on the one hand, and with central Siberian on the other, is a desideratum of the highest importance.

The last principle is regarded by several leading scientists as supplying the hitherto much desired "open sesame" to long-period prediction, not merely within the Tropics but elsewhere. As a matter of fact, it has been found that the pressure over the entire Indian area is subject to a series of oscillations (or waves) above and below the average, varying in length from 6 to 24 months, and usually some multiple of the half-year. Twelve of these occurred over India during the past 20 years, and by comparison it has been found that when the wave of pressure is rising during the monsoon period, the rainfall is in defect and *vice versa*.

By a glance, therefore, at the slope of the pressure anomaly curve, which can be plotted out month by month, it is possible to read the symptoms of the coming monsoon with far greater accuracy than the day's weather in these islands can be prevised by tapping the hall-barometer.

As Mr. Eliot says, these waves are due to variations (checks or accelerations) in the seasonal mass transfer of air across the Equator between Southern Asia and the Indian Ocean, and a proof of this is to be found in the remarkable fact that as a general rule they are found equally marked but *reversed in phase* at Mauritius.

Moreover, these waves are not merely useful in deciding the character of the summer monsoon, but are equally closely connected with the presence or absence of those valuable, if scanty, rains which drop from the upper S.W. current more or less every year in

Northern India, in the winter months between November and March, when the N.E. monsoon—so-called—prevails near the surface.

The relation between the pressure anomaly curve and the winter rains is, curiously enough, precisely the reverse of that which obtains during the summer monsoon, a rising curve being associated with heavy, and a falling curve with light rains.

It would be unnecessary to enter into the reason for this, which is fairly obvious to the student of Indian meteorology. Empirical though it is at present in form, the fact is exceedingly valuable in relation to the prevision of the highly important winter rains and rabi crop of Northern India, upon the success or failure of which the question of famine in that area so often hinges.

Apart from these six monthly barometric waves, there is little doubt that certain influences are at work in the atmospheric circulation over the Indian area which co-operate with other periodic factors in tending to cause excess or defect of rains at intervals of from 9 to 12 years. What these influences exactly are it is difficult to say. To some extent they appear to be associated, as we have above noticed, with the eleven year period of sunspots; and certain irregularities in the parallelism of the two phenomena are, in my opinion, no argument against their covariancy and even casual connection, since the North and South Indian areas are at some seasons meteorologically distinct. So far as the facts go, they may be summarised as follows :—

(1). Extensive droughts occur in the dry area of Southern India, embracing in particular Northern Mysore, South Deccan, South-West Hyderabad, but occasionally reaching Guzerat and parts of the Bombay and Madras Presidencies, at intervals of 9 to 12 years and usually, but not regularly, about a year before the sunspot minimum. When the conditions are sufficiently acute, famine occurs in the ensuing year.

(2). A severe drought in the Peninsular of Southern India is followed by a severe drought and ensuing famine in Northern India in about 5 cases out of 7.

This sequence is attributed by Mr. Eliot to the empirical law of opposition in the seasonal rainfalls of Northern India and in the general monsoon conditions of Northern and Southern India.

Thus a drought and high barometric pressure in Southern India usually coincides with low pressure and heavy summer monsoon in Northern India. This latter tends to be followed by a heavy winter rainfall and this again by the compensatory law, first discovered by Prof. Hill and the writer in 1877, by subsequent deficient summer rainfall in Northern India.

(3). Besides these, summer droughts tend to occur in Northern India alone, in years of maximum sunspot, connected in some way with the abnormal high pressure over Western Asia which prevails at such epochs.

There is thus a double periodicity of drought and famine in North

India and a single periodicity in South India in the sunspot cycle, though the relation between the phenomena is too spasmodic and irregular to be utilised as a reliable factor for prevision.

Bruckner's empirical cycle of 35 years, whatever its cause, undoubtedly exists in the Indian area. Under the title of the "Grand cycle" it has long been known in Ceylon, and it is quite possible that the present famine which, from its area and the immense number (six million) of people who are still on relief works appears to be the greatest famine of which we have any record, may be the aggregate effect of the simultaneous occurrence of a Bruckner with a sunspot cycle drought.

The problem is similar to that of the combinations of harmonic undulations which cause unusual tides and its solution and application to prevision can only be effected by systematic study of the billows and ripples which appear in the long and short records of barometric pressure over wide areas and for many years.

DOUGLAS ARCHIBALD.

[The official forecast of the Meteorological Reporter to the Government of India has reached us, as we go to press, and we are glad to report that the probabilities are favourable to a normal rainfall in the coming monsoon.—ED. M.M.]

### METEOROLOGICAL EXTREMES.—III. WIND FORCE.

*To the Editor of the Meteorological Magazine.*

SIR,—I do not think at the present time that we have reliable data on which to found an estimate of the extreme force of the wind, since there are very few instruments in use that are capable of showing either the extreme pressure or the extreme velocity. In many ways with regard to self-recording meteorological instruments we are in the condition with which the Chinese are credited with respect to roast pork. It is said that a Chinaman's house, in which a pig chanced to be shut up, caught fire and was burnt down. After the accident the neighbours ate and enjoyed what was left of the pig, and roast pig came into favour as an article of diet, but it remained a very expensive luxury, since the method of roasting one pig involved the loss of a house, and even then it was only parts that were cooked to the right extent. We are not in a position to laugh at the Chinese, for our photographic curves of temperature and barometric pressure are about as expensive and unnecessary as their fabled method of roasting pork. Still we do at least get a correct record of the temperature and barometric pressure; a statement, unfortunately, which cannot be made with regard to the wind.

The Robinson anemometer is a most convenient instrument, and when it is properly exposed, kept properly oiled, and the right factor is used, gives a very reliable record; but how very rare it is to find these conditions fulfilled.

The trace of the recording instrument, as you point out, is coarse

and blurred, but that is simply because we prefer to have it so. An instrument giving a fine trace on common instead of on metallic paper could easily be obtained. It would cost less to make and to keep up, and would enable us to get velocities for short periods, but doubtless that same inscrutable reason which leads to the publication of records known to be incorrect by at least 25 per cent. is also efficacious in preventing the use of an improved method of registration. It is simply a case of the Chinese method of roasting pork.

However, with the best possible practical system of registration the Robinson anemometer is incapable of giving the extreme velocities that last for less than a minute or so, and although the tube anemometer can show better results, its values for the maximum velocity are certainly unreliable. In my opinion, no instrument that is free to oscillate can possibly give a reliable maximum. Observational results have shown (*Quarterly Journal Royal Met. Soc.*, July, 1894, page 180) that altering the weight only of a pressure plate will alter by some 50, or even 100, per cent. its record of maximum pressure, and that generally the heavier, but sometimes the lighter, plate will record the greater value. It is plain, under these circumstances, that we cannot depend upon any oscillating plate, for if we constructed one of such a weight that it recorded some gusts correctly, it would be incorrect for others.

There are now a few pressure plates constructed to give a record of the maximum pressure only, but as yet no gale of exceptional severity has passed over them. From the records of these instruments, and also from that of the Bridled Anemometer at Holyhead, I am of opinion that a pressure exceeding 30 lbs. per square foot, or a velocity exceeding 100 miles per hour, is extremely rare in the British Isles. The recorded mean velocity of 75 miles per hour (true) at Fleetwood would lead to the conclusion that 100 miles per hour must have been considerably exceeded in the gusts, but I am inclined to think the very high velocities that occur at this station are due to some peculiarity of the exposure.

There can be no doubt that far greater pressures occur in the American tornadoes. In them, however, much of the destructive effect is due to the sudden diminution of barometric pressure, and the well-known instance of the straw driven into the bark of a tree was probably due to the bark opening to allow an exit for air, or vapour from the sap, underneath, and then closing again on the straw.—Yours truly.

W. H. DINES.

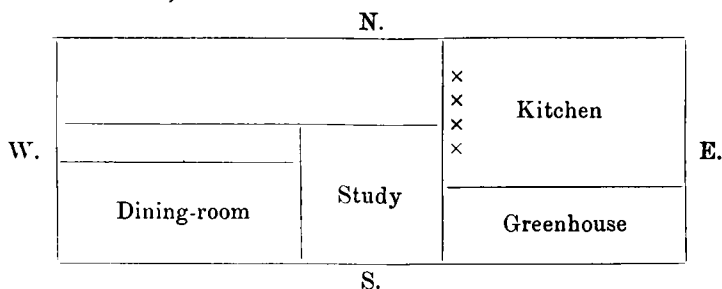
June 29th, 1900.

### THUNDERSTORMS OF JUNE 11TH & 13TH, 1900.

*To the Editor of the Meteorological Magazine.*

SIR,—My house was struck by lightning on the 11th June, at 10.30 p.m. The marvellous way in which it passed through and all round the house, and yet spared us all, I cannot understand.

The sides of the house face the cardinal points of the compass, and the main building consists of three floors, but the kitchen is built out on the E. side, and has no rooms over it.



At the E. side of the main house there is a stack of four chimneys. The three northern flues were struck, the northernmost pot being smashed and scattered in every direction, but mostly to N.W. The house roof was stripped, a hole being made in it N.W. of the stack large enough to put a cart body through. Many of the slates were blown to pieces and bore marks of fire; they were scattered all over the garden. Part of the charge at this level apparently made its way to the rain-water pipe, and descended to the tank in the yard, the flag of which was broken, and a piece cut out of the underside; it then passed on from the tank up to the pump and split the trough.

On the floor beneath, the lightning burst from the chimney stack northward and westward through the E. and S. walls of the N. bedroom, leaving holes—some the size of a finger—into the centre of the wall and sending pieces of plaster to the far end of the room. It also burst from the chimney eastwards through the roof of the kitchen, making again a hole big enough to put a cart body through. It also passed across to the S.E. corner of the kitchen roof, where it made a hole under the slates, and apparently passed to earth down the N.E. corner of the greenhouse; it also passed along an iron bar in the E. end of the greenhouse, burning a place the size of a penny at each end of it, and knocking off plaster outside at the same spots.

I was sitting not far from the fireplace in the study, which is at the S.E. corner of the house, its chimney being the third flue of the stack already referred to. The report was as loud as a cannon, and the effect was like a violent blow at the back of the head and neck and between the shoulders. The current passed across the room in a westerly direction—leaving a track of soot—to the bell wires in the passage, and was seen to pass the dining-room door as a flame; at the entrance it made a hole through the wall to the verandah, throwing plaster 10 yards into the garden; it also blew out the bell handle in the dining-room, and tore off bits of paper. It seems to have passed down the irons of the verandah roof and to earth by the pillars, killing plants trained up them. Two servants in the second floor bedroom over the study were knocked down, and one of them was stiff all down one side; fortunately, there is no chimney to their room.—Yours truly,

R. ELMHIRST.

*Farnham Lodge, Knaresborough, June 28th, 1900.*

On the same day (June 11th) thunderstorms were general over the midlands, and the north of England, and in the press it was reported that buildings were struck by lightning at Swindon, Birmingham, Leicester, Melton Mowbray, Sheffield and Seaham Harbour, several chimneys being thrown down. At Kirkby Stephen the church tower was struck; while at the Yorkshire Yeomanry Camp, at Harrogate, the officer in command, Colonel Heywood Jones, was killed. He was not many yards from the officers' ante-room, and was carrying an open umbrella.

Heavy hail was reported from many places. The observer at Hoar Cross states that the hailstones weighed 6 to the lb. In the Northampton district much damage was done to glass; and at Ashby-de-la-Zouch windows were broken; at Market Harborough the hail is said to have been as large as walnuts, in East Durham the size of marbles, and at Leicester as large as filberts.

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*To the Editor of the Meteorological Magazine.*

SIR,—A thunderstorm passed over this village on Wednesday, June 13th. The lightning was exceptionally vivid and blue, the thunder of a sharp, crackling character. At the height of the storm, at 9.12 p.m., a house within about 250 yards of the Rectory was struck, more or less damaging slightly every room, with displacement of roofing slates and the chimney stack, the upper part having to be rebuilt. The inmates (three persons) fortunately escaped injury.

Rainfall measured at 9 a.m. on June 14th, 0.53.—Yours truly,

W. L. W. EYRE.

*Swarraton Rectory, Alresford.*

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## ON A RECENT RECURRENCE IN WEATHER.—A LUNAR OR 30 DAY PERIOD.

*To the Editor of the Meteorological Magazine.*

SIR,—In a letter on the above subject contributed to the *Meteorological Magazine* of June last year (Vol. 34, p. 68), I said in referring to the length of a temperature period, "The interval is too short to determine whether the period had the exact length of the lunar period or had any relation of cause and effect, although the presumption favors it." Since then I have accumulated sufficient data to convince me that the mean length of the large oscillations of temperature with which I was there dealing is somewhat longer than the lunar month, and hence presumably not connected with it. The splendid work of Ekholm and Arrhenius have shown a connection between the moon's motion and changes in the electric potential of the air, and there may be other meteorological changes connected with the moon's motion, but probably very slight. Leaving out of



account any consideration of cause, I have now much data to show that these large atmospheric oscillations, or waves, of different lengths move eastward with a velocity proportional to the wave length.

H. HELM CLAYTON.

*Blue Hill Observatory, Readville, U.S.A., June 6th, 1900.*

### THE VISITATION OF THE ROYAL OBSERVATORY.

THE visitation of the Royal Observatory has for many years past been held on the first Saturday in June, but many astronomers (including the Astronomer Royal) having had this year to go abroad for the purpose of observing the total solar eclipse of May 28th, the visitation did not take place until June 26th. The opportunity of going over the Observatory, which the occasion affords, enables us to give some information on various changes of importance that have of late been made in the Meteorological Department.

On entering the Observatory, and proceeding through the grounds, the visitor will be charmed with the modern structure, the New Observatory, built by the present Astronomer Royal, at the extreme end of the ground beyond the Magnetical and Meteorological Department. This building, which has been in course of erection for some years past, is now complete; it consists of a central tower which was first built, to which four wings have at different periods since been added. Above the central tower is placed the Thompson Equatoreal, used to a great extent for general celestial photographic work, many excellent specimens of which were on view on visitation day. For the astrographic chart which has been for some years in progress, a special instrument in the older part of the Observatory is employed; this work is one so vast that the whole heavens was divided into portions or zones, of which certain of the national or public observatories each takes one. The new observatory building provides, what has been long required, a much needed accommodation for the greatly increased staff, as compared with that existing within the memory of many. More room was also wanted for the ever increasing books of calculations and photographic records, as well as for the proper disposition of the growing library, which, from being in the earlier part of Airy's time all contained in one not very large room, became dispersed in various rooms, until now brought together in the New Observatory.

Our present concern is, however, with the Magnetical and Meteorological Department, more especially the latter. In the course of building the New Observatory, its influence had to be considered in two ways: as regards magnetism, because the amount of iron used in its construction affected to an appreciable extent the determination of the absolute values of declination, dip, and horizontal force; and as regards meteorology, because the position occupied by the standard thermometers for air temperature became too much over-

shadowed. For both reasons it was necessary to seek for a new position; and this gave some trouble, since on account of the magnets it should be one free from any suspicion of disturbance from iron, whilst for the thermometers there should be also free circulation of air. The position ultimately selected is in a secluded portion of the park, on the eastern side of the Observatory, at a distance of about 350 yards. It is a nearly square piece of ground, the sides being each about 60 yards in length; it is well clear of trees, forming an excellent meteorological station, and is enclosed by a wood fence. In this enclosure is placed the new pavilion for the magnetic instruments for absolute measure, and the revolving stand carrying the standard dry and wet bulb thermometers, and those for maximum and minimum of air temperature was removed thereto in January, 1899. A Stevenson screen has been also set up this spring in the new ground; observation of the thermometers in the older Stevenson screen in the Observatory ground, commenced in 1887, being still continued. The radiation thermometers are in the new ground, and a rain gauge has also been placed therein. The photographic registration of the dry and wet bulb thermometers, commenced in 1848, is continued, at present, within the Observatory precincts. It may be of interest to remark that the register of the wet bulb thermometer stands, on the photographic sheet, immediately below that of the dry bulb, also that the degrees of the scales of both thermometers are photographed, showing as parallel lines throughout each register, the ten-degree lines being bolder than the others. The thermometers planted on the roof of the magnet house in 1886, and since regularly observed, of which the exposure has been throughout satisfactory, provide material for establishing the continuity of the temperature record by the thermometers in the new ground, but some little time must elapse before the precise difference between the two stations can be determined.

Some general history of the revolving stand on which, as mentioned, the standard thermometers for air temperature are placed, may be desirable. It was originally designed by Sir George Airy, though commonly known as the Glaisher stand. Its general construction, which is pretty well-known, is briefly as follows: An upright board, on the front of which the thermometers are placed, has attached to its back, at the upper edge, two inclined boards having an air space between them, the whole forming a frame capable of being revolved in azimuth on its vertical axis. The frame is turned at stated times during the day, whatever the state of the sky, to keep the inclined side always directed towards the sun. When first set up in the year 1841, the stand was placed on the north side of the magnet house, between the northern and eastern arms of the building, remaining in this position until 1846, when it was moved to the free space on the south side, to a distance of something more than 20 feet from the building, being again moved in 1863 some 10 feet further south, and eventually trans-

ported in 1899, owing to the interference of the New Observatory, to the new ground, as already mentioned. The stand is of the same general form as when set up in 1841, having since received one or two slight modifications only.

When the Stevenson screen began to come into general use for observation of shade temperature, the suggestion was made that a Stevenson screen should take the place of the open screen at Greenwich. But considering that the open screen had then been many years in use at Greenwich, this was scarcely to be expected. Both patterns of screen may have their faults, but continuity of record at Greenwich would not have been better preserved by replacing one imperfect screen by another. But to afford the means of comparison with other places, a Stevenson screen, the Royal Meteorological Society's pattern, was set up at Greenwich in the year 1887, as already mentioned. The maximum readings on the open stand were found to be higher, and the minimum readings lower, than those in the adjacent Stevenson screen. This is not surprising, and is not to be taken as implying error of the former. The exposure in the closed Stevenson screen is in some degree artificial, tending to contract the diurnal range by dwarfing the maximum and raising the minimum. It was at one time suggested that the higher open screen maxima at Greenwich might be due to radiation from other objects. But from a number of experiments made on unusually hot and sunshiny days in 1886 and 1887, this was found to be a misconception (details of the experiments are given at the end of the Introduction to the Greenwich Magnetical and Meteorological Observations for 1887).

A screen of some kind probably gives a better value of air temperature for investigation of climatic variation. But whilst meteorologists so much trouble themselves about the small differences between different screens, the question may arise as to the real value of shade temperatures from an agricultural or horticultural point of view, or even as affecting ourselves. The late C. Leeson Prince recorded, for a great number of years, not only shade temperatures, but also air temperatures, as given by ordinary thermometers (4 feet from the ground) exposed to the full rays of the sun, in regard to which some interesting remarks are to be found in his *Topography and Climate of Crowborough Hill, Sussex*, pp. 23 to 26.

The record of Temperature being one of the most important has been referred to at some length. Other matters are not especially affected by the presence of the New Observatory. The sunshine recorder was moved from the roof of the magnet house to above the old Flamsteed building four years ago. It may be remarked, that the better to compare together the magnetical and meteorological photographic and automatic records, as is at times desirable, the time scales are all (with one exception, the sunshine record) of equal length, 0.55 in. to one hour. This scale is, however, much too contracted for the record of wind pressure at Osler's anemometer in

gales of wind, because in successive momentary gusts the pencil moves too much over one part of the paper. A special gearing is, therefore, attached to the driving clock by which the paper can be made, at pleasure, to travel twenty-four times faster than the usual rate, which gives a really independent record of the ever-changing pressures that occur in high winds.

### ROYAL METEOROLOGICAL SOCIETY.

THE second afternoon Meeting of the present Session was held at the Society's rooms, 70, Victoria Street, Westminster, on Wednesday, June 20th; the President, Dr. C. Theodore Williams, being in the Chair.

The following gentlemen were elected Fellows:—Mr. Murray L. Allen, Dr. Nicholas Cullinan, Mr. A. J. L. Evans, Dr. J. St. Clair Gunn, Capt. W. P. Lapage, Mr. John Little.

The President announced that the late Mr. G. J. Symons, F.R.S., had bequeathed to the Society the photograph Album presented to him by the Fellows of the Society in 1879, a portion of his library, and the sum of £200.

Mr. W. Marriott read a paper on "Rainfall in the West and East of England in relation to Altitude above Sea Level." This was a discussion of the mean monthly and annual rainfall at 309 English and Welsh stations for the 10 years 1881–90, which the author had grouped together for each 50 feet up to 500 feet, and above that altitude for each 100 feet. All stations which drained to the west were considered as "western," and all which drained to the east as "eastern." The results were exhibited in the form of a number of interesting diagrams. These showed clearly that there is a general increase in the amount of annual rainfall as the altitude increases, and also that the rainfall is considerably greater in the west than in the east. The monthly diagrams brought out some striking features, among which may be mentioned (1) that the monthly rainfall in the west is subject to a much greater range than in the east; (2) that in the west the maximum at all altitudes occurs in November, but in the east it is generally in October; (3) that in the west the three spring months, April, May and June, are very dry; and (4) that both in the west and in the east there is a great rise in the rainfall from June to July. The author considered that exposure, position and surroundings, as well as altitude above sea level, greatly affect the rainfall.

The President, Mr. Baldwin Latham, Mr. Sowerby Wallis, Mr. E. Mawley, Rev. Dr. J. D. Parker, Dr. H. R. Mill, Mr. R. H. Curtis, Mr. F. J. Brodie, and Mr. J. Hopkinson took part in the discussion on the paper.

A paper by Mr. J. Baxendell, giving a "Description of Halliwell's Self-Recording Rain Gauge," was read by the Secretary. This gauge, which has been designed and constructed by Mr. F. L. Halliwell, the chief assistant at the Fernley Observatory, Southport, yields very satisfactory records. It combines the tipping bucket and the siphon, and the bucket when full is rapidly discharged. The gauge is also moderate in price.

SUPPLEMENTARY TABLE OF RAINFALL,  
JUNE, 1900.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	2.67	XI.	Builth, Abergwesyn Vic.	5.82
II.	Dorking, Abinger Hall ..	3.43	„	Rhayader, Nantgwillt ...	3.78
„	Birchington, Thor .....	2.36	„	Lake Vyrnwy .....	...
„	Hailsham .....	1.99	„	Corwen, Rhug .....	2.25
„	Ryde, Thornbrough .....	2.93	„	Criccieth, Talarvor .....	2.61
„	Emsworth, Redlands ...	3.24	„	I. of Anglesey, Lligwy..	1.91
„	Alton, Ashdell .....	3.02	„	I. of Man, Douglas .....	2.50
III.	Oxford, Magdalen Coll..	2.37	XII.	Stoneykirk, Ardwell Ho.	1.79
„	Banbury, Bloxham .....	1.84	„	New Galloway, Glenlee	5.03
„	Northampton, Sedgebrook	3.41	„	Mouiaive, Maxwelton Ho.	3.98
„	Alconbury .....	1.76	„	Lilliesleaf, Riddell .....	4.65
„	Wisbech, Bank House...	2.27	XIII.	N. Esk Res. [Penicuik]	2.85
IV.	Southend .....	2.68	XIV.	Glasgow, Queen's Park..	4.04
„	Colchester, Lexden .....	1.91	XV.	Inverary, Newtown .....	4.57
„	Saffron Waldon, Newport	2.55	„	Ballachulish, Ardsheal...	4.20
„	Rendlesham Hall .....	3.81	„	Islay .....	3.06
„	Scole Rectory .....	...	XVI.	Dollar .....	3.19
„	Swaffham .....	2.50	„	Balquhiddy, Stronvar...	5.49
V.	Salisbury, Alderbury ...	2.39	„	Coupar Angus Station...	2.56
„	Bishop's Cannings .....	2.27	„	Blair Atholl .....	3.03
„	Blandford, Whatcombe ..	2.25	XVII.	Keith H.R.S. ....	2.47
„	Ashburton, Holne Vic...	4.73	„	Forres H.R.S. ....	1.28
„	Okehampton, Oaklands.	3.72	XVIII.	Fearn, Lower Pitkerrie..	2.36
„	Hartland Abbey .....	4.29	„	S. Uist, Askernish .....	1.26
„	Lynton, Glenthorne ...	2.29	„	Invergarry .....	1.77
„	Probus, Lamellyn .....	3.72	„	Aviemore, Alvie Manse.	2.52
„	Wellington, The Avenue	2.67	„	Loch Ness, Drumnadrochit	2.42
„	North Cadbury Rectory	3.13	XIX.	Invershin .....	2.34
VI.	Clifton, Pembroke Road	2.48	„	Durness .....	1.64
„	Ross, The Graig .....	1.20	„	Watten H.R.S. ....	2.41
„	Wem, Clive Vicarage ..	2.09	XX.	Dunmanway, Coolkelure	8.88
„	Wolverhampton, Tettenhall	2.39	„	Cork, Wellesley Terrace	4.04
„	Cheadle, The Heath Ho.	4.53	„	Killarney, Woodlawn ..	5.92
„	Coventry, Priory Row ..	3.47	„	Caher, Duneske .....	3.53
VII.	Market Overton .....	1.82	„	Ballingarry, Hazelfort...	3.89
„	Grantham, Stainby .....	1.79	„	Limerick, Kilcornan ...	2.56
„	Horncastle, Bucknall ...	1.84	„	Miltown Malbay .....	6.73
„	Workshop, Hodsck Priory	1.57	XXI.	Gorey, Courtown House	3.09
VIII.	Neston, Hinderton .....	1.97	„	Moynalty, Westland ...	2.92
„	Southport, Hesketh Park	1.69	„	Athlone, Twyford .....	4.84
„	Chatburn, Middlewood.	2.68	„	Mullingar, Belvedere ...	4.94
„	Duddon Val., Seathwaite Vic.	6.32	XXII.	Woodlawn .....	4.48
IX.	Melmerby, Baldersby ...	3.29	„	Crossmolina, Enniscoe ...	6.55
„	Scalby, Silverdale .....	2.21	„	Collooney, Markree Obs.	...
„	Ingleby Greenhow Vic..	3.22	XXIII.	Enniskillen, Model Sch.	3.57
„	Middleton, Mickleton ...	4.02	„	Warrenpoint .....	6.08
X.	Haltwhistle, Unthank H.	4.37	„	Seaford .....	3.20
„	Bamburgh .....	3.64	„	Belfast, Springfield .....	3.89
„	Keswick, The Bank .....	4.43	„	Bushmills, Dundarave..	3.37
XI.	Llanfrehfa Grange .....	2.19	„	Stewartstown .....	5.25
„	Llandovery .....	4.89	„	Killybegs .....	5.72
„	Castle Malgwyn .....	3.69	„	Horn Head .....	4.12
„	Brecknock, The Barracks	...			

## JUNE, 1900.

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. Dpth Date		Max.		Min.		In shade.	On grass.		
						Deg.	Date	Deg.	Date				
		inches.	inches.	in.									
I.	London (Camden Square) ...	2·26	+	·25	·39	25	14	90·1	11	45·8	5	0	0
II.	Tenterden .....	2·14	+	·29	·70	21	13	85·0	11	45·5	27	0	0
	Hartley Wintuey .....	1·94	...	...	·28	21	17	85·0	11	42·0	24	0	0
III.	Hitchin .....	2·30	+	·44	·58	1	15	86·0	11	44·0	4	0	...
	Winslow (Addington) .....	3·90	+	2·04	·79	7	16	84·0	11	43·0	27	0	0
IV.	Bury St. Edmunds (Westley) .....	3·03	+	1·24	·51	1	17	78·0	11	45·0	6	0	...
	Norwich (Brundall) .....	2·70	...	...	·67	1	20	82·2	12	45·8	27	0	0
V.	Winterbourne Steepleton ...	3·20	...	...	·56	14	16	73·4	10	41·5	27	0	0
	Torquay (Cary Green) ...	3·07	...	...	·53	14	15	70·2	4	48·2	29	0	0
	Polapit Tamar [Launceston]..	3·17	+	·96	·85	12	18	72·2	4	39·0	1	0	0
VI.	Stroud (Upfield) .....	1·98	—	·41	·33	24	18	78·0	12 <sup>c</sup>	48·0	1	0	...
	Church Stretton .....	2·87	...	...	·60	24	17	74·0	10 <sup>d</sup>	39·0	1, 28	0	0
	Worcester (Diglis Lock) .....	...	...	...	...	...	...	...	...	...	...	...	...
VII.	Boston .....	2·84	+	·95	·47	5	16	88·0	11 <sup>e</sup>	45·0	1 <sup>h</sup>	0	...
	Hesley Hall [Tickhill].....	1·36	—	·56	·25	12	15	87·0	12	44·0	3, 5	0	0
	Breadsall Priory .....	3·89	...	...	2·04	11	19	...	...	...	...	...	...
VIII.	Manchester (Plymouth Grove) ..	3·29	+	·61	·49	7	19	85·0	11	46·0	4	0	0
IX.	Wetherby (Ribston Hall) ...	2·72	+	·83	·92	11	13	...	...	...	...	...	...
	Skipton (Arncliffe) .....	4·74	+	1·38	1·27	11	17	...	...	...	...	...	...
	Hull (Pearson Park) .....	1·93	+	·18	·38	19	19	84·0	12	43·0	1 <sup>i</sup>	0	0
X.	Newcastle (Town Moor) .....	4·92	+	3·28	1·52	24	18	...	...	...	...	...	...
	Borrowdale (Seathwaite).....	8·17	+	1·59	1·55	30	18	...	...	...	...	...	...
XI.	Cardiff (Ely).....	2·16	—	·27	·38	24	18	...	...	...	...	...	...
	Haverfordwest .....	4·13	+	1·57	·69	4	19	75·0	4	45·0	1	0	0
	Aberystwith (Gogerddan) ...	3·75	...	...	·89	21	14	78·0	10	...	...	...	...
	Llandudno .....	1·53	—	·24	·29	21	15	77·5	10	44·0	1	0	...
XII.	Cargen [Dumfries] .....	...	...	...	...	...	...	...	...	...	...	...	...
XIII.	Edinburgh (Blacket Place)...	2·83	...	...	1·18	24	18	75·6	10	41·4	4	0	0
XIV.	Colmonell .....	...	...	...	...	...	...	...	...	...	...	...	...
XV.	Tighnabruach .....	4·35	...	...	1·10	19	15	73·0	3, 4	44·0	24 <sup>j</sup>	0	...
	Mull (Quinish) .....	3·56	+	·27	·74	10	18	...	...	...	...	...	...
XVI.	Loch Leven Sluices .....	2·50	+	·75	1·10	24	9	...	...	...	...	...	...
	Dundee (Eastern Necropolis) ..	1·50	...	·00	·25	11	21	75·2	11	39·0	3	0	...
XVII.	Braemar .....	2·25	+	·26	·56	22	16	70·3	3	37·1	4	0	3
	Aberdeen (Cranford) ...	1·94	...	...	·50	11 <sup>a</sup>	17	...	...	...	...	...	...
	Cawdor (Budgate) .....	2·41	+	1·01	·66	24	19	...	...	...	...	...	...
XVIII.	Strathconan [Beaully] .....	3·27	+	·78	1·00	21	12	...	...	...	...	...	...
	Glencarron Lodge.....	3·31	...	...	·53	6	21	75·6	12	40·4	2	0	...
XIX.	Dunrobin .....	2·40	+	·38	·78	22	13	68·0	14	40·0	2	0	...
	S. Ronaldshay (Roeberry) ...	1·59	—	·17	·48	21	18	66·0	18	39·0	2	0	...
XX.	Darrynane Abbey .....	3·77	...	...	·82	8	23	...	...	...	...	...	...
	Waterford (Brook Lodge) ...	4·35	+	2·28	·80	20	22	73·0	3	41·0	1	0	...
	Broadford (Hurdlestown) ...	5·26	...	...	·52	6	25	...	...	...	...	...	...
XXI.	Carlow (Browne's Hill) .....	5·35	+	3·51	·51	20	24	...	...	...	...	...	...
	Dublin (FitzWilliam Square) ..	3·17	+	1·51	·52	20	22	71·6	15	47·2	23	0	0
XXII.	Ballinasloe .....	4·78	+	2·48	·49	12 <sup>b</sup>	26	71·0	3	44·0	23	0	...
	Clifden (Kylemore) .....	9·01	...	...	1·61	24	19	...	...	...	...	...	...
XXIII.	Waringstown .....	2·96	+	·89	·35	7, 23	13	79·0	5 <sup>f</sup>	36·0	24 <sup>j</sup>	0	...
	Londonderry (Creggan Res.) ..	3·64	+	1·22	·67	22	25	...	...	...	...	...	...
	Omagh (Edenfel) .....	5·22	+	2·75	·72	30	23	76·0	3	44·0	1	0	...

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

*a*—and 23.    *b*—and 16.    *c*—and 14.    *d*—and 11, 12.    *e*—and 12.    *f*—and 14, 16.  
*g*—and 23, 27.    *h*—and 2, 5, 21, 24.    *i*—and 2, 3, 9.    *j*—and 27.

# METEOROLOGICAL NOTES ON JUNE, 1900.

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.

CAMDEN SQUARE.—On 11th the temp. in shade rose to 90°·1. In the 42 preceding Junes 90° has been reached only three times; in 1858, 92°·6 on 16th, in 1870, 91°·2 on 22nd, and in 1893, 90°·4 on 19th. On 20th, ·18 in. of R fell in 9 minutes.

TENTERDEN.—A welcome R fell on 21st, the previous showers having done little to benefit the grass, which was deficient owing to the dry May. Slight TSS on 12th, 22nd and 25th; a house being struck by L on 12th. The shade temp. rose above 80° on 10th, 11th and 12th. Duration of sunshine 206 hours 45 mins. Strong S.W. winds on 20th, 22nd, 25th and 30th; N.W. on 23rd and 26th.

HARTLEY WINTNEY.—The month commenced with cold N.E. winds, and dull and cloudy days, followed by S.W. winds, with R almost every day. R ·14 in. above the average. A wave of heat occurred from 9th to 13th, with a mean max. temp. of 81°·5. T on 10th, 11th, 12th and 24th. Ozone registered on 13 days, with a mean of 3.

WINSLOW, ADDINGTON.—The greatest June rainfall since 1879. There were few hot days, 80° being reached only twice. A heavy TS occurred in the evening on 11th, the T and L being incessant; ·59 in. of R fell in 15 mins. On the 12th there was another T and H storm, the hailstones being large and varying in shape; some irregular pieces an inch long; others flat and thin, as large as a shilling, and some globular, three-eighths of an inch in diameter.

BURY ST. EDMUNDS, WESTLEY.—A cool month, with sunshine below the average, and vegetation backward. TSS on 5th, 7th and 12th; distant T on 20th; T and H on 22nd.

NORWICH, BRUNDALL.—Mean temp. 59°·3. R ·85 in. in excess of the average. TSS on 5th, 6th, 8th, 12th and 22nd; L on 2nd; T and L on 20th. R of the first six months of the year 1·88 in. above the average.

WINTERBOURNE STEEPLTON.—The month was cold, the mean temp. and mean max. decreasing:—

	Mean temp.	Mean max.
First week .....	57°·4	67°·0
Second „ .....	57°·4	65°·4
Third „ .....	56°·0	63°·0
Fourth „ .....	54°·9	62°·3

Constant R after the 13th damaged the hay crops and hindered getting it in.

TORQUAY, CARY GREEN.—R ·88 in. above, and mean temp 1°·1 below, the average. Duration of sunshine 47 hours 45 mins. below the average; one sunless day.

POLAPIT TAMAR [LAUNCESTON].—A wet month, the R being 1·26 in. above the average. The total for the first six months of the year is 5·06 in. above the average. T and L on 4th and 13th, with H on 13th.

CHURCH STRETTON.—A showery, changeable month. Only three really hot days, the 10th, 11th and 12th, yet no cold nights owing to prevalence of cloud. T on 11th, 12th and 14th.

BREADSALL PRIORY.—The heaviest TS on record occurred on 11th, when 2·04 in. of R fell.

SEATHWAITE.—T and L on 11th and 14th.

#### WALES.

HAVERFORDWEST.—A cold, unsettled month, with a great deal of R, and very little bright sunshine. From 2nd to 5th it was hot, and a TS occurred on 4th, with heavy R. The temp. rose to, or above, 70° on only two days, and some low night temperatures were recorded. Very little hay was cut at the close of the month.

ABERYSTWITH, GOGERDDAN.—A nice growing month. Wind S. or S.W. throughout.

#### SCOTLAND.

EDINBURGH, BLACKET PLACE.—R 35 per cent., and rainy days 4, above the average. Mean temp. 0°·7 above, and duration of sunshine 34 hours below, normal. L on 10th; TSS, with H, on 11th and 12th; and TSS on 13th, 21st and 23rd. The TS on 12th was accompanied by great darkness, and was the most severe in this district since August 12th, 1884.

TIGNABRUACH, CRAIGANDARAICH.—The rainfall is an average one, chiefly made up by T showers. Average max. temp. 65°·2; average min. 49°·2.

ABERDEEN, CRANFORD.—Cold, with frequent foggy nights, and little sunshine. TS, with H, on 23rd, 40 in. falling in 15 mins.

S. RONALDSHAY, ROEBERRY.—The first part of the month was dry and cold; the latter part mild and showery. Mean temp. 51°·3, being 0°·7 below the average.

#### IRELAND.

DARRYNANE ABBEY.—A wet, cold and bad month. TS on 3rd, but not heavy.

BROADFORD, HURDLESTOWN.—A very wet June. T on 16th.

DUBLIN, FITZWILLIAM SQUARE.—Opening with fair, though cool weather, June belied its early promise, and proved extremely unsettled, showery and thundery. The mean temp. was 1°·1 above the average, but the amount of cloud was large (6·9). Bright sunshine prevailed for only 158 hours; and torrential showers fell on many consecutive days, being frequently accompanied by T and L. High winds were noted on four days, and a gale occurred on 24th. Solar halos were seen on 3rd and 4th. The temp. exceeded 70° on only two days. T on 7th; L on 5th, 11th and 25th. TSS on 6th, 12th, 13th, 14th and 19th. H on 14th.

BALLINASLOE.—TS on 13th; T on 5th and 7th. On the 16th 48 in. of R fell in 31 minutes.

OMAGH, EDENFEL.—The brilliant summer in which the month commenced terminated on 4th, thenceforward the weather became progressively more and more rainy, totalling more than double the June average of 30 years. The temp. was, however, well maintained, so that growing crops were extremely luxuriant.



# SYMONS'S

## MONTHLY

# METEOROLOGICAL MAGAZINE.

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JULY, 1900.

THE past month has yielded so many exceptional phenomena that a dozen numbers of this Magazine would be requisite to deal with it fully, but we cannot let it pass without some special reference to its great heat, its thunder and hail storms of exceptional severity, and the cloud-burst on Rombald's Moor, similar in character to those on the Cheviots and at Angerton, described in *British Rainfall*, 1893 and 1898 respectively.

It is difficult to realize from description the havoc wrought, and the photographs received from Mr. Wilson give a clearer idea of it than many pages of letterpress would do. Some of these we hope to reproduce in *British Rainfall*, 1900, when we shall have all available records of the great rainfall.

### THE CLOUD-BURST ON ROMBALD'S MOOR.

*To the Editor of the Meteorological Magazine.*

SIR,—On Thursday afternoon, July 12th, a terrific thunderstorm raged over a part of the West Riding of Yorkshire, beginning in the west about noon, and extending or propagating itself gradually eastwards. The direction of motion of the thunder clouds was from S. to N., although, as is usual in such cases, the surface winds were very variable under the storm area, and in the district to the eastward the sky was very clear and blue, and a strong easterly wind blew in towards the storm-centre. The cloud summits, as I saw them from Bradford at 0.30 p.m., covering the western sky were exceptionally massive and grand. As far as I am able to ascertain, the most intense part of the storm occurred between 2 and 3 p.m., over the part of Rombald's Moor situated between Bingley and Ilkley, along a band running nearly S. and N.

I regret that I was at Bradford all day, and did not return to Ilkley until 8.15 p.m. I had considerable difficulty in walking the half-mile from the station to my house in Eaton Road, as the roads were like mountain torrents (even at that hour, 5 hours after the

storm was at its height), and strewn with sand and stones 8 to 18 in. deep all over, brought down from the moor and the higher parts of the village. The rain had continued from about 2 p.m. to 8 p.m., but after 3.30 it was only moderately heavy. During the first hour the fall was *most exceptional* and very disastrous in its effects. My wife measured the contents of gauge at 6 p.m., and found it contained 3.93 in., and from 6 to 8 p.m. a further .33 in. fell, giving a total of 4.26 in. On enquiry, I find that Mr. Worfolk, Brook Street, about half-mile E.N.E. of Eaton Road, registered 4.01 in.; and Mr. Robinson, gardener at Cherry Bank, a house situated 300 ft. higher up the hillside towards the moor, and say  $\frac{1}{4}$ -mile S. of Eaton Road, registered 5.40 in. ! He tells me that his gauge is unfortunately somewhat shaded, and he thinks six inches would more nearly represent the correct amount. On the moor above, I believe there was much more; in fact, what is popularly called a "cloud-burst," judging from the enormous volume of water which came down the Parish Gill Beck. The first road-bridge met with on its course, at a distance of only one mile from the summit ridge of the moor, was destroyed, and many hundreds of tons of stones and rocks, the largest measuring 4 ft.  $\times$  3 ft.  $\times$  3 ft., and many 3 ft.  $\times$  3 ft.  $\times$  2 ft. and smaller, were scattered over the roads and across the land bordering the stream. The total drainage area of the beck above the bridge is very small, and includes only about  $\frac{3}{4}$  sq. mile. A gamekeeper who lives on the moor, not far away and rather higher up, says the clouds seemed to touch the ground, and the water poured down the land in all directions. Further below, on the course of the same stream, bridges, walls, roads and adjoining gardens were swept away; and in Heber's Gill, the next beck further west, nearly every bridge has been destroyed and immense damage done. In the village of Ilkley itself, one man lost his life by the collapsing of the building in which he was working before he was able to escape, and several others had narrow escapes from drowning. I enclose a cutting from the *Ilkley Gazette*, which gives some idea of the devastation in Ilkley. The description is not at all overdrawn; in fact, it is inadequate, and to realize the magnitude of the destruction, it is necessary to see it oneself. The roads and streets are torn up to an extraordinary extent, and many are impassable to vehicles. I have taken some photographs illustrating the damage. I also enclose cuttings from the *Bradford Observer*, which give an account of the destruction in Sunnydale and at Morton, on the Bingley side of the moor. At Sunnydale Reservoir 4.12 in. of rain was recorded. It must be remembered, however, that the drainage area of the Sunnydale stream is considerable, and many times greater than that of any of the four Ilkley becks. In connection with this, the rainfall registered at Gilstead (4.50 in.), about two miles to the S.E. of Morton, is interesting; and it is quite possible that in the upper part of Sunnydale the rainfall was as violent, or more so, than it was just over the watershed on the Wharfedale side. At Esholt,  $2\frac{1}{2}$  miles

N.E. of Shipley, 2·15 in. fell ; while near Bradford the records were: Heaton, 3·30 in. ; Manningham, 3·11 in. ; The Exchange, 1·66 in.— at the latter station ·86 in. fell between 3.10 p.m. and 3.30 p.m.

It may be interesting to add, that the maximum temperature registered in Stevenson screen was 77°·1 on the day of the storm, and 84°·2 the previous day. This latter is exceptional for Ilkley, and the highest I have yet registered here.—I am, yours truly,

ALBERT WILSON.

*4, Eaton Road, Ilkley, July 14th, 1900.*

#### NOTES EXTRACTED FROM THE PRESS.

The greatest destruction was wrought along the line of the principal streams having their source on Ilkley Moor, viz., Heber's Gill, Parish Gill, Mill Gill and Backstone Beck. On the latter the bridge near Wharfedale School was carried away, trees were torn up and walls demolished. The water coming down Mill Gill converted Brook Street into a torrent, and a number of out-buildings behind the Wharfedale Hotel were carried away. In some houses at the bottom of Church Street the water was from 5 ft. to 6 ft. deep. The most damage was done by the rush of water down Parish Gill ; where the stream crosses Westwood Drive a hole was washed out nine or ten yards across. At Chapel Lane the force of the water caused a wall and shed to collapse at a coachbuilder's yard, and undermined the foundations of the main workshop, which also collapsed about 4 p.m., killing one of the inmates, and so great was the wreck that it was nearly 6 o'clock before the body could be recovered. In the adjoining houses in Chapel Lane the flood was 6 ft. deep, and much property was carried away. In Back Middleton Road nearly the whole of the back wall of a house was carried away, and a portion of that of the adjoining house. On Heber's Gill the substantial stone bridge at the bottom was destroyed, as were some of the lighter structures above. Prior to the storm, the Wharfe was so low that the immense volume of water failed to overflow its banks, though it caused a rise of 6 ft. or 7 ft. The Surveyor to the Ilkley District Council estimates that £11,000 will be required to repair the damage to the public roads, &c.

On the Morton Beck the first serious damage was at Upper Mill, where the flood carried away the roadway and the causeway, and surrounded four cottages, sweeping out furniture before anything could be done to save it. The end house pointing to the head of the stream had some of its walls swept down. At Botany Mill the water made a breach in the part of the premises which is carried over the beck, demolished and carried away the settling tanks and a small dam at the Paper Mill. At Messrs. Wright's Mill the reservoir embankment was wrecked, the supports of that part of the building which spanned the stream were washed away, and one corner of the machine room was carried away. The Dimples Dam

had two big breaches made in it. Four footbridges were washed away, and the Midland Railway was damaged and for a time in danger.

### TEMPERATURE.

The following table of Maximum temperatures in July, 1900, taken from various sources, will show that the extreme readings were limited to the southern part of England, for at Oxford the highest is 90° and at Loughborough 89°.

#### *Maximum Temperatures, July 10th to 27th, 1900.*

Date.	Tenterden.	Dungeness.	Brixton.	Greenwich.	Kensington, Edith Road.	Camden Square, (Glaisher Stand).	Camden Square, (Stevenson Screen).	Oxford.	Ross.	Castle Ashby.	Yarmouth.	Loughborough.	Liverpool.	Spurn Head.
10	81·0	67	83	82·7	83·8	85·2	85·9	82	83·8	...	66	82	77	72
11	82·0	75	86	84·7	85·7	87·2	86·8	84	87·6	...	67	87	80	70
12	...	70	80	76·9	80·7	80·4	79·2	82	...	...	68	85	65	65
13	81·0	68	83	83·6	82·4	85·2	84·1	79	...	...	70	80	71	71
14	...	67	75	75·9	74·9	77·3	76·2	72	...	...	72	73	67	74
15	81·0	72	80	84·1	81·2	83·9	83·3	78	...	...	68	79	74	67
16	91·0	82	92	94·0	92·4	95·2	93·4	78	78·2	...	71	80	73	69
17	...	75	83	82·9	84·2	85·6	84·2	79	80·6	82	71	79	69	71
18	81·0	75	85	85·3	86·1	87·2	87·0	83	84·6	87	72	84	75	69
19	87·0	76	92	91·7	92·1	93·4	93·2	90	88·2	92	70	89	74	74
20	88·5	72	91	90·2	90·9	92·9	90·9	83	82·2	89	70	81	80	68
21	...	71	78	78·1	77·0	80·2	78·3	75	...	77	75	76	74	74
22	81·0	70	80	80·9	80·3	82·3	80·7	77	...	78	71	76	67	71
23	80·0	74	82	82·9	84·2	86·3	86·1	83	83·6	86	71	80	72	75
24	84·5	76	87	88·2	87·8	90·1	88·2	85	86·1	92	82	86	74	84
25	88·5	77	91	93·0	91·4	94·0	92·9	89	86·9	79	78	86	69	78
26	81·5	77	80	80·7	80·2	83·2	81·5	79	79·6	...	71	75	66	72
27	...	70	80	76·5	78·5	80·4	78·3	80	80·1	...	67	80	71	67
Highest ...	91·8	82	92	94·0	92·4	95·2	93·4	90	88·2	92	82	89	80	84
90 or above	1	0	4	4	4	5	4	1	0	2	0	0	0	0
80 or above	13	1	16	14	15	17	14	10	10	...	1	12	2	1

The variation of the temperature in different parts of London is not so great as has occurred in other periods of heat :—

	BRIXTON. Stevenson Screen.		GREENWICH. Glaisher Stand.		KENSINGTON. Stevenson Screen.		CAMDEN SQUARE. Glaisher Stand.		CAMDEN SQUARE. Stevenson Screen.
16th.....	92·0	...	94·0	...	92·4	...	95·2	...	93·4
19th.....	92·0	...	91·7	...	92·1	...	93·4	...	93·2
20th.....	91·0	...	90·2	...	90·9	...	92·9	...	90·9
25th.....	91·0	...	93·0	...	91·4	...	94·0	...	92·9

while on July 15th, 1881, Greenwich recorded  $97^{\circ}1$ , Brixton  $95^{\circ}0$  and Camden Square  $94^{\circ}6$ ; and in August, 1893, the maxima were—Greenwich  $95^{\circ}1$ , Camden Square  $93^{\circ}6$ , Brixton  $93^{\circ}0$  and Kensington  $91^{\circ}8$ .

During the hot period the minima were remarkably high, frequently exceeding  $60^{\circ}$  over a large part of England. In the South the 23rd had the highest minimum, but at Yarmouth and Spurn Head it occurred two days later, while at Liverpool it was earlier.

*Minimum Temperatures, July 16th to 28th, 1900.*

Date.	Dungeness.	Brixton.	Greenwich.	Camden Square. (Glasier Screen.)	Camden Square. (Stevenson Screen.)	Oxford.	Ross.	Castle Ashby.	Yarmouth.	Loughborough.	Liverpool.	Spurn Head.
July												
16	$61^{\circ}$	$60^{\circ}$	$58^{\circ}3$	$59^{\circ}7$	$60^{\circ}6$	$54^{\circ}$	$^{\circ}$	$^{\circ}$	$61^{\circ}$	$57^{\circ}$	$61^{\circ}$	$57^{\circ}$
17	64	60	$62^{\circ}0$	$60^{\circ}2$	$60^{\circ}9$	52	...	54	60	53	57	59
18	58	58	$56^{\circ}4$	$57^{\circ}2$	$59^{\circ}7$	54	...	53	55	49	55	58
19	55	55	$52^{\circ}6$	$56^{\circ}1$	$58^{\circ}6$	53	...	54	62	52	58	58
20	64	64	$62^{\circ}1$	$63^{\circ}2$	$64^{\circ}1$	62	...	60	62	63	64	58
21	62	61	$61^{\circ}4$	$62^{\circ}2$	$63^{\circ}8$	61	...	57	62	60	62	57
22	62	62	$62^{\circ}7$	$62^{\circ}3$	$62^{\circ}6$	59	...	60	63	60	61	62
23	64	67	$65^{\circ}3$	$67^{\circ}7$	$68^{\circ}1$	65	$64^{\circ}2$	64	60	63	60	59
24	62	62	$62^{\circ}3$	$64^{\circ}2$	$65^{\circ}4$	61	$58^{\circ}9$	62	64	62	62	64
25	63	61	$59^{\circ}8$	$62^{\circ}1$	$63^{\circ}9$	61	$62^{\circ}1$	57	66	63	60	65
26	62	65	$60^{\circ}8$	$65^{\circ}3$	$65^{\circ}2$	61	$58^{\circ}9$	...	62	59	58	61
27	62	60	$57^{\circ}9$	$59^{\circ}7$	$60^{\circ}8$	58	...	...	59	53	57	59
28	63	60	$60^{\circ}3$	$60^{\circ}9$	$60^{\circ}7$	58	...	...	61	59	58	58
Highest	64	67	$65^{\circ}3$	$67^{\circ}7$	$68^{\circ}1$	65	$64^{\circ}2$	64	66	63	64	65
60° or above }	11	12	8	10	12	7	...	4	11	6	7	4

At Kensington the number of minima above  $60^{\circ}$  was 12, the same as at Brixton and Camden Square, and we believe that these numbers are altogether unprecedented.

### DROUGHT.

Drought was general over the South of England from Devonshire to Essex for about three weeks ending on 26th, but further North it was broken by TSS on or about the 12th, while in the N. of England and in Scotland there was no long dry period. The following records are sufficient to indicate the general area of the drought, which was not remarkable for its duration:—

	COUNTY.	STATION.	Date of beginning and ending.	Duration.
I.	Middlesex	Finchley (Etchingham Park)	July 5th to 22nd	22 days
II.	Surrey ...	Wallington .....	„ 7th „ 26th	20 „
„	„ ...	Farnham (Seale) .....	„ 6th „ 26th	21 „
„	Kent .....	Birchington (Thor) .....	„ 4th „ 26th	23 „
„	Hants ...	Alton (Ashdell) .....	„ 4th „ 19th	16 „
„	Berks ...	Maidenhead (Cookham Vic.)	„ 3rd „ 26th	24 „
III.	Herts ...	Broxbourne .....	„ 7th „ 26th	20 „
„	Bucks ...	Slough (Upton) .....	„ 7th „ 26th	20 „
IV.	Essex ...	Southend (Water Works) ...	„ 7th „ 26th	20 „
V.	Devon ...	Hartland Abbey .....	„ 14th „ 30th	17 „

## COMPARISON WITH 42 PRECEDING YEARS.

At Camden Square the max. temp. on July 16th, 1900,  $95^{\circ}2$ , is the highest recorded on any day since observations commenced in 1858; while that of the 25th,  $94^{\circ}0$ , has been exceeded only by  $94^{\circ}6$  on July 15th, 1881. On five days the temp. rose above  $90^{\circ}$ , while in only one previous July, that of 1868, had  $90^{\circ}$  been reached on as many as four days. On the 25th the temp. was above  $90^{\circ}$  from 11.30 a.m. to 5 p.m. On 17 days the max. was above  $80^{\circ}$ .

The records of  $92^{\circ}$  or upwards in the 42 years 1858–1899 are :—

1881.....July 15th.....	$94^{\circ}6$	1858.....June 3rd .....	$92^{\circ}6$
1893.....Aug. 18th.....	$93^{\circ}6$	1876.....July 15th.....	$92^{\circ}6$
1868.....July 21st.....	$93^{\circ}3$	1872.....„ 25th.....	$92^{\circ}3$
„ „ „ 22nd.....	$93^{\circ}2$	1876.....Aug. 13th.....	$92^{\circ}3$
1881.....„ 5th .....	$92^{\circ}7$	„ „ „ 14th.....	$92^{\circ}1$
1893.....Aug. 17th.....	$92^{\circ}7$	1884.....„ 11th.....	$92^{\circ}0$

The min. temp. on the 23rd,  $67^{\circ}7$ , is the highest for any day since the record began in 1858; and the min. on 26th,  $65^{\circ}3$ , has been exceeded only four times. There is no other instance of two nights with min. temp. above  $65^{\circ}$  in one year. On ten nights the minimum did not fall below  $60^{\circ}$ .

The minima of  $65^{\circ}$  and upwards in the 42 years 1858–1899 are :—

1872.....July 26th.....	$66^{\circ}3$	1868.....July 23rd.....	$65^{\circ}7$
1899.....„ 12th.....	$66^{\circ}0$	1898.....Aug. 15th.....	$65^{\circ}1$
1876.....Aug. 18th.....	$65^{\circ}8$		

The mean temp. for July, 1900,  $68^{\circ}6$ , is  $5^{\circ}3$  above the average, and has been exceeded only in 1859 ( $68^{\circ}9$ ) and 1868 ( $68^{\circ}8$ ). On five days the mean temp. was above  $75^{\circ}0$  :—

16th.....	$76^{\circ}8$	19th.....	$75^{\circ}2$	20th.....	$77^{\circ}0$
24th.....	$76^{\circ}9$	25th.....	$77^{\circ}6$		

Ten days after, on August 5th, the mean temp. was  $56^{\circ}4$ , or  $21^{\circ}2$  lower.

These mean temperatures are not unprecedented, for during the preceding 42 years there were 20 days on which the mean temp. was above  $75^{\circ}$ , and we find the following records :—July 15th, 1881,  $78^{\circ}9$ ; July 22nd, 1868,  $78^{\circ}7$ ; July 21st, 1868,  $78^{\circ}1$ ; August 18th, 1893,  $78^{\circ}1$ ; all higher than any day in 1900.

Absolute drought prevailed for 20 days, 7th to 26th, and the total rainfall is little more than half the average. The duration of the drought is by no means remarkable.

During the thunderstorm on the afternoon of the 27th, the pressure first rose  $\cdot 09$  in., the highest point being at 3.40 p.m., and then fell  $\cdot 18$  in., the lowest point being about 5.15 p.m. The curve was quite normal in type, but the amplitude was at least twice as great as any I have seen before in England. At Edith Road, Kensington, the barograph shewed a rise of about  $\cdot 1$  inch and a fall of  $\cdot 16$  inch.

### OBSERVERS' NOTES.

MIDDLESEX.—*Kensington, Edith Road.* Mean max. temp.,  $78^{\circ} \cdot 3$ ; mean min.,  $59^{\circ} \cdot 1$ ; both the highest in 17 years. On 15 days the max. was above  $80^{\circ}$ , on 4 above  $90^{\circ}$ : 16th,  $92^{\circ} \cdot 4$  (highest on record); 19th,  $92^{\circ} \cdot 1$ ; 20th,  $90^{\circ} \cdot 9$ ; 25th,  $91^{\circ} \cdot 4$ . On 12 days the min. was above  $60^{\circ}$ —the highest being  $68^{\circ} \cdot 0$  on 23rd, but this has been twice exceeded.—*Finchley, Etchingham Park.* Absolute drought for 22 days, broken by a heavy TS on 27th, when  $\cdot 84$  in. of R fell.

SURREY.—*Redhill, Oxford Road.* Mean temp.,  $65^{\circ} \cdot 2$ ;  $3^{\circ} \cdot 6$  above the average. Mean max.,  $75^{\circ} \cdot 2$ ; mean min.,  $55^{\circ} \cdot 0$ .—*Wallington.* The mean dry bulb, the absolute and mean shade max., and the mean temp. are all the highest recorded; and the duration of sunshine is 100 hours above the average, and the highest with one exception. Average max.  $6^{\circ} \cdot 6$ , and mean temp.  $4^{\circ} \cdot 9$ , above the average. TSS on 3rd and 27th.

KENT.—*Tenterden.* From 10th to 27th there was a period of intense heat, the max. being above  $80^{\circ}$  on 13 days, and on 16th being  $91^{\circ} \cdot 0$ , which is the only max. above  $90^{\circ}$  since July, 1876. On 20th the 9 a.m. temp. was  $84^{\circ}$ , and on 20th and 23rd the min. was  $65^{\circ}$ .—*Birchington, Thor.* One of the hottest months on record; the temp. in screen rising to  $92^{\circ}$  on 16th. Absolute drought for 23 days, ending 26th. T and L on 3rd, 27th and 29th. Duration of sunshine, 356 hours 35 min.

SUSSEX.—*Crowborough.* Very warm from 8th to 26th, with a max. temp. of  $87^{\circ} \cdot 5$  on 19th; and minima of  $64^{\circ} \cdot 0$  on 19th, and  $64^{\circ} \cdot 2$  on 22nd. TSS on 16th and 27th.

HANTS.—*Hartley Wintney.* Solar radiation max. on 16th,  $138^{\circ}$ ; on 19th,  $134^{\circ}$ ; on 26th,  $135^{\circ}$ . Shade max.: 16th,  $88^{\circ} \cdot 0$ ; 19th,  $92^{\circ} \cdot 5$ ; and 26th,  $91^{\circ} \cdot 0$ .

HERTS.—*Hitchin.* The hottest day ( $91^{\circ} \cdot 0$  on 25th), the hottest night, and the hottest month in the records extending over 50 years.

BUCKS.—*Slough, Upton.* Duration of bright sunshine, 290 hrs. 6 min., no sunless days. On more than half the days the max. temp. rose above  $80^{\circ}$ , the three highest being  $90^{\circ} \cdot 5$  on 16th;  $91^{\circ} \cdot 5$  on 19th; and  $91^{\circ} \cdot 0$  on 25th.—*Winslow, Addington.* Max. temp.,  $92^{\circ}$  on 25th; never exceeded, and equalled only on June 9th, 1858, August 13th,

1876, and August 18th, 1893.  $80^{\circ}$  was reached or exceeded on 13 days.

OXFORD.—*St. Giles*. On 15 days the temp. reached  $80^{\circ}$ , the max. being  $89^{\circ}0$  on 19th and 25th. Mean temp.  $4^{\circ}9$  above the average.

CAMBRIDGE.—*Elm, Grove House*. Solar max. in vacuo on 22nd,  $149^{\circ}$ .

DORSET.—*Winterbourne Steepleton*. The max. temp.  $84^{\circ}2$  on 19th, is the highest since June 18th, 1893, when  $84^{\circ}9$  was registered.

SOMERSET.—*Wellington*. On 19th the temp. rose to  $87^{\circ}0$ , and on six other days reached or exceeded  $80^{\circ}$ .—*North Cadbury*. On only four days after the 10th was the max. temp. below  $80^{\circ}$ ; while the minima on 20th and 21st were  $67^{\circ}$  and  $62^{\circ}$ .

GLOUCESTER.—*Cirencester, Further Barton*. Intense heat began on 15th, and continued without intermission until 27th, when a TS occurred, following great darkness at 3 p.m.—*Cheltenham*. Max. temp. on 19th,  $90^{\circ}5$ ; the highest for at least 23 years.

HEREFORD.—*Ross, The Graig*. The night of the 8th, with min.  $39^{\circ}6$ , was as exceptionally cold as that of the 23rd was warm, with a min. of  $64^{\circ}2$ . The average max.,  $76^{\circ}8$ , has been exceeded by  $77^{\circ}4$  in 1876,  $78^{\circ}0$  in 1870,  $76^{\circ}9$  in 1869, and  $80^{\circ}5$  in 1868.

SHROPSHIRE.—*Church Stretton*. Great heat from 10th to 27th, when 13 days drought was broken by a violent TS, with 1.32 in. of R. Temp. above  $80^{\circ}$  on 4 days; max.  $82^{\circ}5$  on 19th.

CHESHIRE.—*Wilmslow, Parksyde*. It is amazing what a difference of temp. the  $1^{\circ}48'$  of latitude between here and London makes; the max. temp. here was  $85^{\circ}0$  on 11th, but on 4 nights the min. was above  $60^{\circ}$ , the highest being  $64^{\circ}2$  on 20th.

LANCASHIRE.—*Bolton, The Park*. The mean temp.,  $60^{\circ}6$ , is  $2^{\circ}9$  above the average and a record for July; the max.,  $82^{\circ}3$  on 11th, and the min. on 20th,  $64^{\circ}7$ , are also the highest recorded.

MONMOUTH.—*Llanfrefcha Grange*. Max. temp. above  $80^{\circ}$  on 8 days.

DUMFRIES.—*Maxwelton House*. Hot from 10th to 28th, but no excessive heat. TSS on 11th and 21st.

EDINBURGH.—*Blacket Place*. Mean temp.  $61^{\circ}0$ , being the warmest July since 1887. The mean min.,  $54^{\circ}2$ , is the highest since August, 1857, when it was  $54^{\circ}5$ .

AYR.—*Colmonell*. Mean temp.  $4^{\circ}3$  above the average, and the highest in 25 years.

ARGYLL.—*Inverary, Newtown*. Very wet, there being seldom 24 hours of good weather.

PERTH.—*Coupar Angus*. The highest mean temp. in 20 years; no high maxima, but several very warm nights.

DUBLIN.—*Ballybrack, Streamville*. Mean max. temp.  $73^{\circ}3$ ; mean min.  $51^{\circ}7$ ; mean temp.  $62^{\circ}5$ . On 23rd the min. was  $62^{\circ}$ . On 28th .39 in. of R fell in 15 minutes.

#### JULY 3RD.

MIDDLESEX.—*New Southgate*. A severe H storm came up from the N. at 4.37 p.m., lasting about 10 minutes, accompanied by R, L



and T. The stones averaged about half-an-inch in diameter, and were pear-shaped; they covered the ground to a depth of about three-quarters of an inch. The damage to foliage was enormous, but no glass is known to have been broken.

JULY 12TH.

BRECON.—*Llandefaelogfach*. Severe TS, with H of unusual size. Some by actual measurement  $\frac{3}{4}$  inch in diameter, and weighing nearly an ounce. Great breakage of glass and destruction of crops. R 1.71 in.

JULY 16TH.

HERTS.—*Berkhamstead, Rosebank*. R began shortly after 1.30 p.m., and when it ceased, 16 minutes later, 1.14 in. was measured. For four minutes the R came down at the rate of seven inches an hour. The ground was so dry that less than one-eighth of the fall percolated through two and a half feet of bare soil; while in the percolation gauge, covered with short grass, only a few drops penetrated.—*Kensworth*. TS 1.15 p.m. to 2 p.m. R 1.00 in.; great darkness, and lights necessary; before the R commenced there was a severe gale and dust storm.

SUFFOLK.—*Bury St. Edmunds, Westley*. TS and more damage by H than in the last 50 years. The heaviest H appeared to be limited to a track 300 yards wide, but at least 5 miles long.

YORK.—*East Layton Hall*. Heavy TS.

JULY 20TH.

OXFORD.—*Magdalen College*. Heavy TS between 1 and 2 p.m.

NORTHAMPTON.—*Northampton, Kettering Road*. Heavy TS, with H of unusual size; two of the stones, carefully weighed, were found to be just  $\frac{3}{4}$ -oz. each. One was spherical, the other a flattened oval. This place, about a mile from the centre of the town, was evidently about the edge of the storm.—*Sedgebrook*. TSS all day, with very heavy H, which did considerable damage. R 1.13 in.

SUFFOLK.—*Ipswich*. Unusually large H; much glass broken.

GLOUCESTER.—*Stroud, Upfield*. TS from 11 a.m. to noon; a house was struck at *Cainscross*,  $\frac{1}{4}$  mile W., and a tree about 200 yards N.E.—*Cirencester, Further Barton*. TS; a tree struck near.

WARWICK.—*Bedworth Cemetery*. T and very large H stones or cubes of ice.

LINCOLN.—*Hemingby*. Two contiguous cottages were struck by L, and in one the bed was set on fire.

DERBY.—*Breadsall Priory*. Heavy TS, and 2.27 in. of R in 4 hours.

WATERFORD.—*Brook Lodge*. Heavy TS. A cottage struck by L, and some sheep and cows killed.

JULY 27TH.

SURREY.—*Redhill, Oxford Road*. L and T from 2.30 p.m. to 3.30 p.m. and from 6 p.m. to 9 p.m.; some H.

SUSSEX.—*Selmeston Vicarage*. I was much surprised by the long duration of the L. A flash at 3.14 p.m. seemed to descend in a continuous straight line, and lasted for several seconds. I never saw anything like it before. 1.07 in. of R fell.

HANTS.—*Alton, Colmer Rectory*. The L was very persistent in character; about 2 o'clock I saw three perpendicular flashes succeed each other, during which I had time to count three. One storm had passed from the west northwards; this was in a second storm, which passed to the S., it was near at one time, but there was little R.

BUCKS.—*Winslow, Addington*. Very heavy TS.

OXFORD.—*Magdalen College*. TS during whole of afternoon and evening.—*Oxford St. Giles*. T almost continually from 2 p.m. to 10 p.m., with L and R.—*Swerford*. TS overhead; .63 in. of R fell in three quarters of an hour.

WILTS.—*Alderbury*. T. A soldier was killed by L in camp; and a mill at *Stratford-sub-Castle* was burnt.

GLOUCESTER.—*Stroud, Upfield*. TS at night, and another house struck  $\frac{1}{4}$  mile W.

BRECON.—*Abergwesyn*. Heavy TS in distance, L very vivid for 2 hours. R .72 in.

CARLOW.—*Castledermot*. Violent TS, and 1.30 in. of R.

JULY 28TH.

CORK.—*Wellesley Terrace*. TS in the morning.—Cattle killed at *Midleton* and *Cloyne*.

KERRY.—*Killarney*. TS and 2.05 in. of R.

CARLOW.—*Castledermot*. Violent TS, and 1.26 in. of R.

JULY 29TH.

SURREY.—*Redhill, Oxford Road*. L and T with H about 1 p.m.

WARWICK.—*Coventry, Priory Row*. Violent storm of H and R.

## NOTES FROM THE NEWSPAPER PRESS.

JULY 3RD.

Middlesex.—*New Southgate*. For a quarter of an hour H fell heavily in stones, of which the average size was larger than that of ordinary marbles, many being as large as walnuts. The H covered the ground in sufficient quantities to induce boys to come round with brooms to offer to sweep it away.

South Lincolnshire.—H stones as large as acorns fell.

(To be continued.)

## WARM AND COLD SUMMERS.

To the Editor of the Meteorological Magazine.

SIR,—Mr. Parbury's table (p. 58) seems instructive, so far, though it might have been well to state in what sense he understands "average," "hot," and "cold." No potency of numbers was suggested by me.

The following way of looking at our London summers may be

found useful. Consider all the summer months separately in each group of years, 1800-04, 1810-14, &c. (*i.e.*, 15 months in each case), and similarly in each group, 1805-09, 1815-19, &c.; calling each month hot or cold as it is above or below the monthly average. We may then construct a table as follows:—

	a. Hot Months	b. Cold Months	Hot Months.		c. Hot Months	d. Cold Months	Hot Months.	Relation of c to a.
1800-04	11	4	+7	1805-09	11	4	+7	equal
1810-14	3	12	-9	1815-19	5	10	-5	+2
1820-24	3	12	-9	1825-29	8	7	+1	+5
1830-34	5	10	-5	1835-39	6	9	-3	+1
1840-44	5	10	-5	1845-49	7	7	equal	+2
1850-54	5	10	-5	1855-59	12	3	+9	+7
1860-64	3	12	-9	1865-69	8	7	+1	+5
1870-74	8	6	+2	1875-79	10	5	+5	+2
1880-84	5	10	-5	1885-89	8	7	+1	+3
1890-94	5	10	-5	1895-99	12	3	+9	+7
—43								+25
								+34

Thus it appears that in nearly all the earlier groups (0-4) hot months were less numerous than cold ones, and in most of the later groups (5-9) hot months were in excess. Further, the hot months in the later group were in excess of those in the earlier in every decade except one, when they were equal. (The figures previous to 1841 are to be taken "*cum grano*." In cases where the sum 15 is not made up, one month was average.)—Yours faithfully,

ALEX. B. MACDOWALL.

## A RAINBOW.

*To the Editor of the Meteorological Magazine.*

SIR,—The rainbow seen by me here to day at 5.40 p.m. presented some features which may be worth recording. It was of great brilliancy, and the band was of unusual width. For a little more than half its length the arc was backed by dark grey cloud; the remainder, only slightly less brilliant, was projected across an absolutely cloudless sky of deep blue. Above the primary bow was the secondary, with the colours, of course, reversed; but the strangest feature of all was the repetition of the primary bow itself; the spectrum reappearing below it in immediately succeeding, though narrower and less brilliant, bands without any reversal; the repetition giving two additional bows across the cloud, and three additional across the clear sky; there being no spaces intervening between the lower portion of each spectrum and the upper part of the next.—Yours truly,

JAMES G. WOOD, F.R.Met.Soc.

115, Sutherland Avenue, July 29th, 1900.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JANUARY, 1900.

STATIONS.  (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	Cloud.
	Temp.	Date.	Temp.	Date.									
London, Camden Square	53·9	24	25·8	14	45·7	34·8	37·0	87	75·2	19·7	2·92	21	7·0
Malta.....	67·7	2	41·2	14	60·2	50·7	48·0	78	114·4	39·8	5·51	15	4·7
Cape of Good Hope ...	94·9	18	54·8	31	77·6	60·4	57·3	69	...	...	·40	6	3·4
Mauritius.....	87·0	14	70·1	3	85·7	73·6	69·4	74	153·4	62·3	3·35	17	6·1
Calcutta.....	86·3	24	50·8	14	80·7	59·5	58·0	68	140·6	41·5	·00	0	3·1
Bombay.....	87·0	11	61·0	25	81·1	67·1	62·0	66	132·4	51·9	·00	0	1·2
Ceylon, Colombo .....	92·4	21	68·5	2, 3	89·8	72·6	71·5	80	155·6	65·5	3·72	9	2·5
Melbourne.....	106·9	28	47·0	9	81·7	58·7	52·9	58	160·2	40·5	3·30	10	5·3
Adelaide .....	112·2	1	51·8	9	87·3	63·3	50·0	43	167·0	43·3	·67	8	3·9
Sydney .....	92·4	27	59·8	15	80·0	65·2	61·9	68	148·3	49·0	1·67	12	4·5
Wellington .....	76·0	2	45·0	6	68·7	53·6	49·8	67	137·0	39·0	2·41	9	4·0
Auckland .....	77·0	22	50·0	5	72·5	58·4	54·9	69	138·0	46·0	·84	5	3·5
Jamaica, Halfway Tree	...	...	...	...	...	...	...	...	...	...	·52	4	...
Trinidad .....	89·0	sev. days	65·0	2	87·6	69·3	67·8	74	164·0	62·0	3·56	17	...
Grenada.....	...	...	...	...	...	...	...	...	...	...	...	...	...
Toronto.....	46·0	19	·00	3	33·5	18·6	23·5	82	60·5	—5·5	1·94	21	7·2
New Brunswick, Fredericton .....	47·8	20	—23·0	1	29·2	1·2	9·7	78	...	...	4·79	12	5·4
Manitoba, Winnipeg ..	41·8	19	—30·7	31	17·6	—4·4	...	...	...	...	1·05	6	5·2
Victoria, British Columbia .....	52·7	7	31·0	29	47·0	39·6	...	...	...	...	3·60	21	7·3

## REMARKS.

**MALTA.**—Adopted mean temp. 55°·3, or 2°·2 above average. Mean hourly velocity of wind 13·8 miles, or 2·6 above average. Mean temp. of sea 63°·0. TSS on 3 days; L on 4 days; H on 5 days. Dew point ranged from 59°·6 on 1st to 36°·3 on 30th. J. F. DOBSON.

**Mauritius.**—Mean temp. of air 0°·4 above, of dew point 0°·5 and rainfall 3·56 in. below, their respective averages. Mean hourly velocity of wind 8·8 miles, or 2·3 below average; extremes, 22·9 on 12th and 1·7 on 2nd; prevailing direction, E.S.E. to E.N.E. L on 4 days. T on 2 days, and L and T on 26th to 28th, and 30th and 31st. T. F. CLAXTON.

**CEYLON, COLOMBO.**—Mean temp. of air 79°·7, or 0°·6 above, of dew point 1°·7 above, and rainfall ·63 in. above, their respective averages. Mean hourly velocity of wind 7·4 miles; prevailing direction N.E., N. and N.W. TS occurred on the 8th. L on 12th and 13th. H. O. BARNARD.

**Adelaide.**—Mean temp. of air 1°·1 above, and R ·16 in. below, their respective averages for 43 years. Temperature above 100° on 8 days, or 3 above the average. C. TODD, F.R.S.

**Sydney.**—Temp. 1°·0 above, humidity 3°·7 below, and rainfall 1·93 in. below, their respective averages. H. C. RUSSELL, F.R.S.

**Wellington.**—Small total rainfall, but some nice light showers. Prevailing winds N.W., and generally moderate. On the whole a pleasant month. Temp. 1°·5 below, and rainfall 1·50 inches below, their respective averages. R. B. GORE.

**Auckland.**—Fine and dry throughout the month, the only rain of consequence (·63 in.) being recorded on the 8th. Mean temp. nearly 2° below, rainfall less than one-third of, the average. T. F. CHEESEMAN.

**TRINIDAD.**—R ·62 in. above the 30 years average. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,  
JULY, 1900.

Div	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	·81	XI.	Builth, Abergwesyn Vic.	3·38
II.	Dorking, Abinger Hall .	1·13	„	Rhayader, Nantgwiltt...	2·25
„	Birchington, Thor .....	1·63	„	Lake Vyrnwy .....	2·38
„	Hailsham .....	1·43	„	Corwen, Rhug .....	1·32
„	Ryde, Thornbrough .....	1·19	„	Criccieth, Talarvor .....	1·74
„	Emsworth, Redlands ...	1·23	„	I. of Anglesey, Lligwy..	1·33
„	Alton, Ashdell .....	1·74	„	I. of Man, Douglas .....	2·31
III.	Oxford, Magdalen Coll..	1·15	XII.	Stoneykirk, Ardwell Ho.	3·46
„	Banbury, Bloxham .....	1·90	„	New Galloway, Glenlee ...	...
„	Northampton, Sedgebrook	2·28	„	Moniaive, Maxwellton Ho.	2·47
„	Alconbury .....	·74	„	Lilliesleaf, Riddell .....	4·24
„	Wisbech, Bank House...	1·39	XIII.	N. Esk Res. [Penicuik]	3·85
IV.	Southend .....	1·46	XIV.	Glasgow, Queen's Park..	3·03
„	Colchester, Lexden .....	·73	XV.	Inverary, Newtown .....	5·36
„	Saffron Waldon, Newport	1·17	„	Ballachulish, Ardsheal...	5·49
„	Rendlesham Hall .....	·90	„	Islay .....	2·76
„	Scole Rectory .....	...	XVI.	Dollar .....	4·01
„	Swaffham .....	2·18	„	Balquhider, Stronvar...	3·26
V.	Salisbury, Alderbury ...	·59	„	Coupar Angus Station...	2·37
„	Bishop's Cannings .....	2·31	„	Blair Atholl .....	2·69
„	Blandford, Whatcombe .	·73	XVII.	Keith H.R.S. ....	5·63
„	Ashburton, Holne Vic...	·89	„	Forres H.R.S. ....	2·79
„	Okehampton, Oaklands.	1·24	XVIII.	Fearn, Lower Pitkerrie..	3·48
„	Hartland Abbey .....	1·16	„	S. Uist, Askernish .....	1·64
„	Lynton, Glenthorne ...	1·55	„	Invergarry .....	5·35
„	Probus, Lamellyn .....	·92	„	Aviemore, Alvie Manse.	3·01
„	Wellington, The Avenue	1·43	„	Loch Ness, Drumnadrochit	4·94
„	North Cadbury Rectory	·90	XIX.	Invershin .....	3·38
VI.	Clifton, Pembroke Road	·88	„	Durness .....	...
„	Ross, The Graig .....	2·68	„	Watten H.R.S. ....	4·05
„	Wem, Clive Vicarage ...	2·36	XX.	Dunmanway, Coolkelure	2·58
„	Wolverhampton, Tettenhall	2·15	„	Cork, Wellesley Terrace	1·56
„	Cheadle, The Heath Ho.	3·07	„	Killarney, Woodlawn ..	3·17
„	Coventry, Priory Row ..	1·61	„	Caher, Duneske .....	3·41
VII.	Market Overton .....	1·77	„	Ballingarry, Hazelfort...	...
„	Grantham, Stainby .....	1·40	„	Limerick, Kilcornan ...	1·58
„	Horncastle, Bucknall ...	·99	„	Miltown Malbay .....	3·30
„	Worksop, Hodsck Priory	1·75	XXI.	Gorey, Courtown House	2·83
VIII.	Neston, Hinderton .....	1·43	„	Moynalty, Westland ...	2·08
„	Southport, Hesketh Park	·79	„	Athlone, Twyford .....	2·48
„	Chatburn, Middlewood.	3·18	„	Mullingar, Belvedere ...	1·92
„	Duddon Val., Seathwaite Vic.	2·85	XXII.	Woodlawn .....	3·42
IX.	Melmerby, Baldersby ...	1·20	„	Crossmolina, Enniscoe ..	2·68
„	Scalby, Silverdale .....	1·23	„	Collooney, Markree Obs.	1·54
„	Ingleby Greenhow Vic..	1·63	XXIII.	Enniskillen, Model Sch.	...
„	Middleton, Mickleton ...	1·46	„	Warrenpoint .....	3·65
X.	Haltwhistle, Unthank H.	1·50	„	Seaforde .....	4·17
„	Bamburgh .....	1·21	„	Belfast, Springfield .....	4·50
„	Keswick, The Bank .....	2·01	„	Bushmills, Dundarave..	2·81
XI.	Llanfrechfa Grange .....	1·79	„	Stewartstown .....	3·81
„	Llandovery .....	3·24	„	Killybegs .....	2·96
„	Castle Malgwyn .....	1·44	„	Horn Head .....	2·34
„	Brecknock, The Barracks	...			

## JULY, 1900.

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.					
				Dpth	Date				Deg.	Date	Deg.	Date	
													inches.
I.	London (Camden Square) ...	1·50	— 1·18	·58	27	7	95·2	16	44·5	8	0	0	
II.	Tenterden .....	1·52	— ·83	·57	27	7	91·0	16	43·0	8	0	0	
III.	Hartley Wintney .....	·54	...	·26	27	8	92·5	19	47·0	19	0	0	
III.	Hitchin .....	1·96	— ·76	1·03	16	10	91·0	25	43·0	7	0	...	
IV.	Winslow (Addington) .....	1·50	— 1·79	·63	31	7	92·0	25	45·0	8	0	0	
IV.	Bury St. Edmunds (Westley) .....	2·04	— ·53	·64	20	10	83·0	20	43·0	8	0	...	
V.	Norwich (Brundall) .....	1·72	...	·63	6	12	87·2	25	46·8	8	0	0	
V.	Winterbourne Steepleton ...	·94	...	·28	13	9	84·2	19	39·1	8	0	0	
V.	Torquay (Cary Green) ...	·64	...	·17	31	7	79·7	25	49·2	3, 8	0	0	
VI.	Polapit Tamar [Launceston]..	1·20	— 2·21	·47	31	14	83·8	19	41·0	10	0	0	
VI.	Stroud (Upfield) .....	2·17	— 1·40	·86	31	11	84·0	24	48·0	7	0	...	
VI.	Church Stretton (Woolstaston) .....	2·38	— ·59	1·14	27	11	82·0	24	45·0	8	0	0	
VII.	Worcester (Diglis Lock) .....	1·96	— ·91	·74	27	8	...	...	...	...	...	...	
VII.	Boston .....	·70	— 2·09	·25	16	6	90·0	19 <sup>b</sup>	39·0	8	0	...	
VII.	Hesley Hall [Tickhill].....	1·95	— ·72	·36	12	11	89·0	11	40·0	8	0	0	
VIII.	Breadsall Priory .....	4·27	...	2·27	20	13	...	...	...	...	...	...	
VIII.	Manchester (Plymouth Grove) .....	2·47	— 1·32	·59	27	13	88·0	11	45·0	3, 7	0	0	
IX.	Wetherby (Ribston Hall) ...	2·89	— ·29	1·13	21	13	...	...	...	...	...	...	
IX.	Skipton (Arnccliffe) .....	2·44	— 3·20	·63	12	15	...	...	...	...	...	...	
X.	Hull (Pearson Park).....	1·62	— ·97	·52	3	12	85·0	25	39·0	8	0	0	
X.	Newcastle (Town Moor) .....	1·38	— 2·14	·52	2	10	...	...	...	...	...	...	
X.	Borrowdale (Seathwaite).....	4·09	— 6·90	·80	31	19	81·3	20	41·4	8	0	...	
XI.	Cardiff (Ely).....	1·78	— 2·28	·63	31	11	...	...	...	...	...	...	
XI.	Haverfordwest .....	·98	— 3·23	·48	31	8	80·1	19	41·9	8	0	0	
XI.	Aberystwith (Gogerddan) ...	1·76	...	·89	31	11	84·0	19 <sup>c</sup>	...	...	0	...	
XII.	Llandudno.....	1·00	— 2·00	·21	27	14	83·0	20	52·0	27	0	...	
XII.	Cargen [Dumfries] .....	3·28	— ·65	·51	20	20	77·0	26	42·0	8	0	0	
XIII.	Edinburgh (Blacket Place)...	2·92	...	·53	17	17	77·4	10	46·1	8	0	0	
XIV.	Colmonell .....	2·95	...	·65	27	15	83·0	18	46·0	2, 7	0	...	
XV.	Tighnabruaich .....	5·02	...	·87	31	22	70·0	18	43·0	6	0	...	
XV.	Mull (Quinish) .....	4·73	+ ·68	·80	22	23	...	...	...	...	...	...	
XVI.	Loch Leven Sluices .....	3·50	— ·12	·50	16	15	...	...	...	...	...	...	
XVI.	Dundee (Eastern Necropolis) ..	3·30	— ·16	·55	15 <sup>a</sup>	20	79·0	10	46·0	7	0	...	
XVII.	Braemar .....	3·45	+ ·24	·59	2	22	73·8	10	39·2	31	0	0	
XVII.	Aberdeen (Cranford) .....	4·26	...	·76	28	24	76·0	18	41·0	7	0	...	
XVIII.	Cawdor (Budgate) .....	3·45	+ ·15	·53	12	22	...	...	...	...	...	...	
XVIII.	Strathconan [Beauly] .....	2·77	— ·73	·58	3	15	...	...	...	...	...	...	
XIX.	Glencarron Lodge.....	...	...	...	...	...	...	...	...	...	...	...	
XIX.	Dunrobin .....	5·29	+ 2·44	1·22	14	17	73·0	11 <sup>d</sup>	43·0	4	0	...	
XX.	S. Ronaldshay (Roeberry) ...	3·20	+ ·84	·57	12	26	70·0	11	43·0	3	0	...	
XX.	Darrynane Abbey.....	1·59	...	·30	12	19	...	...	...	...	...	...	
XX.	Waterford (Brook Lodge) ...	3·54	+ ·01	1·25	26	13	73·0	22 <sup>e</sup>	43·0	8	0	...	
XXI.	Broadford (Hurdlestown) ...	...	...	...	...	...	...	...	...	...	...	...	
XXI.	Carlow (Browne's Hill) .....	4·17	+ ·65	2·10	27	15	...	...	...	...	...	...	
XXII.	Dublin (Fitz William Square) ..	4·52	+ 1·84	1·87	27	15	78·0	24	47·1	8	0	0	
XXII.	Ballinasloe .....	2·68	— ·87	·42	13	17	72·0	10 <sup>f</sup>	50·0	2 <sup>h</sup>	0	...	
XXIII.	Clifden (Kylemore) .....	...	...	...	...	...	...	...	...	...	...	...	
XXIII.	Waringstown .....	3·09	— ·43	1·20	25	16	85·0	<sup>g</sup>	38·0	7	0	...	
XXIII.	Londonderry (Creggan Res.) ..	4·17	+ ·05	1·09	28	21	...	...	...	...	...	...	
XXIII.	Omagh (Edenfel) .....	3·33	— ·39	1·22	27	20	73·0	21	43·0	6	0	...	

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

<sup>a</sup>—and 28.    <sup>b</sup>—and 24, 25.    <sup>c</sup>—and 20.    <sup>d</sup>—and 18.    <sup>e</sup>—and 23.    <sup>f</sup>—and 19, 22, 24.  
<sup>g</sup>—on 6 days.    <sup>h</sup>—and 6, 27, 28, 29.

# METEOROLOGICAL NOTES ON JULY, 1900.

(See also pp. 97 to 106.)

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.

TENTERDEN.—The month began wet, but from 10th to 27th was intensely hot. TSS on 3rd and 27th. Duration of sunshine 287 hours.

HARTLEY WINTNEY.—The driest and hottest July recorded here; half the total R falling in a TS on 27th. T on 3rd, 16th, 27th and 29th. Ozone on 10 days, with a mean of 2·7.

WINSLOW, ADDINGTON.—A dry, hot month. T on 4 days; very heavy on 27th, when there was much vivid L.

BURY ST. EDMUNDS, WESTLEY.—The month was very hot after the 10th, with very heavy TSS on 16th and 20th. TSS also on 3rd, 27th and 29th.

WINTERBOURNE STEEPLETON.—The early part was cool, but in the latter part the temp. was much above the average. The mean temp. is 61°·3, whilst for July, 1899, it was 61°·6, and for August 62°·9. These 3 months are the hottest since the record began in 1893. T and L on 27th.

TORQUAY, CARY GREEN.—R 1·81 in. below the average and mean temp. 2°·3 above the average. Duration of sunshine 86 hours above the average. No sunless day. Mean ozone 4·6, the highest being 8·0 on 7th and 30th with S.W. winds, and the lowest 0·5 on 23rd and 24th with N. and E. winds.

POLAPIT TAMAR [LAUNCESTON].—Very hot and dry. T and L on 11th and 12th.

MANCHESTER, PLYMOUTH GROVE.—The first week was unsettled and cool. From the 10th to 28th fine summer weather prevailed. T and L on 12th, 20th, 28th and 29th.

## WALES.

HAVEFORDWEST.—Generally fine and hot, with small R and high temp. From the 12th to 16th an almost continuous gale blew. Distant TS on 20th. Unusually high min. temperatures were recorded, 59°·8 on grass on 25th and 62°·8 in shade on 20th. Duration of sunshine 171·6 hours.

ABERYSTWITH, GOGERDDAN.—Very hot, with much bright sunshine.

## SCOTLAND.

EDINBURGH, BLACKET PLACE.—R and duration of sunshine slightly below the average. TS on 21st, and distant T on 3rd.

COLMONELL, CLACHANTON.—R ·51 in. below the average of 24 years.

TIGHNABRUACH, CRAIGANDARAICH.—The Bar. was high during the month, being below 30 inches on only 8 days, nevertheless we had continuous R.

ABERDEEN, CRANFORD.—This month was wet, with little sunshine.

S. RONALDSHAY, ROEBERRY.—Wet and mild. Mean temp. 57°, or 2°·3 above the average.

## IRELAND.

DARRYNANE ABBEY.—Except from 5th to 11th there was no real summer; the weather being close and misty, with drizzling R.

WATERFORD, BROOK LODGE.—Much T during the month. A cottage was struck by L near here, and some sheep and cows were killed.

DUBLIN, FITZWILLIAM SQUARE.—Very warm, but unsettled, and closing with a great rainstorm. Mean temp.  $63^{\circ}\cdot4$ , or  $2^{\circ}\cdot8$  above the average. High winds on 6 days. The temp. reached, or exceeded,  $70^{\circ}$  in the screen on 14 days, whilst in July, 1887, it reached, or exceeded,  $70^{\circ}$  on 17 days. TSS on 2nd, 3rd, 20th and 28th. T on 29th; L on 27th. H on 3rd and 20th. Fog on 11th and 21st.

OMAGH, EDENFEL.—The R was almost exactly the average, and fell almost entirely in torrential showers, except a remarkable fall of 1.32 in. in 8 hours, ending 11 a.m. on 28th. There was no continuance of clear skies, nor any great heat, and even during the fine periods the weather was mostly dull and humid, and unfavourable for haymaking. A phenomenal crop was, however, fairly saved.

## HAIL IN JUNE, 1900.

*To the Editor of the Meteorological Magazine.*

SIR,—May I call the attention of your readers to the shape of some of the hailstones which fell during a thunderstorm experienced in Westminster near midday on the 25th June, since it appeared to me to be somewhat peculiar.

In form they closely resembled that of a boy's peg-top, the length along the major axis of two which I measured being slightly over half-an-inch, whilst their diameter at the widest part was exactly 0.4 inch in both instances. But perhaps the most noticeable point was that whilst below the widest part of the stone the ice was quite opaque, the rounded cap of ice above was perfectly clear and transparent, the dividing line being sharply defined right through the diameter of the hailstone. The stones were apparently unusually brittle, and many of them flew into fragments as they struck the window-sill where I observed them. I should add that all the hail which fell was not of this character, the bulk of it being much smaller and of no well-defined shape.

R. H. CURTIS.

[We are indebted to the Rev. F. C. Clutterbuck, of Culham Vicarage, near Abingdon, for photographs of hailstones which fell near there on June 12th. The photographs indicate the familiar type of hailstone, oval in form with corrugated surface and composed of layers of opaque and clear ice. The photograph gives the actual size of the stones, and careful measurement shews diameters of 2.25 in., 2.24 in. and 2.23 in. for the three largest.—ED. M.M.]



# SYMONS'S

## MONTHLY

# METEOROLOGICAL MAGAZINE.

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AUGUST, 1900.

AUGUST, 1900, has been, speaking of the United Kingdom generally, decidedly wet, with a considerable number of rainy days in addition to the heavy thunderstorm rains which usually make up the larger part of the total in a wet August. When we consider not only that it is the great holiday month, but also that it was preceded by a long spell of dry weather with intense heat in July to intensify the contrast, the amount of condemnation in the newspaper press is fully explained if not justified.

From the 50 stations in the Regular Table, 31 for which the average is available have been received up to the time of writing, and of these no fewer than 21 show an excess of 50 per cent. In the following table these returns are arranged in the order of excess :—

*Rainfall in August, 1900, expressed as a percentage of the average.*

Div.	County.	Station.	Per cent. of average.
XI.	Carnarvon .....	Llandudno .....	263
XVII.	Nairn .....	Cawdor, Budgate .....	246
X.	Northumberland ...	Newcastle, Town Moor.....	242
IX.	York .....	Wetherby, Ribston Hall .....	235
XX.	Dublin .....	Dublin, FitzWilliam Square .....	232
VII.	Lincoln .....	Boston .....	215
"	" .....	Bawtrey, Hesley Hall .....	202
XXII.	Galway .....	Ballinasloe .....	200
XXI.	Carlow .....	Carlow, Browne Hill .....	192
III.	Herts. ....	Hitchin .....	184
IX.	York .....	Arncliffe Vicarage .....	182
"	" .....	Hull, Pearson Park .....	178
XI.	Pembroke .....	Haverfordwest .....	174
XVII.	Forfar .....	Dundee, Eastern Necropolis.....	171
XXIII.	Down .....	Waringtown .....	170
VI.	Gloucester .....	Stroud, Upfield .....	166
XV.	Argyll .....	Mull, Quinish ...	161
VI.	Shropshire .....	Church Stretton, Woolstaston.....	155
VIII.	Lancashire .....	Manchester, Plymouth Grove.....	153
III.	Buckingham .....	Winslow, Addington.....	153
XVII.	Kinross .....	Kinross, Loch Leven Sluice.....	150

The distribution of these stations is naturally rather irregular, but the table shows a very large excess over nearly all parts of the kingdoms except the South of England.

The first week was very wet, and at many stations rain fell daily until the 9th; but for a wet week the total amounts were not exceptional, for out of more than 200 stations only a dozen recorded more than 4.00 in. in the seven days, and these stations were all in comparatively wet districts. Again, the falls on individual days, though frequently exceeding an inch, were, as a rule, far from remarkable for thunderstorm rains, but the following records exceed the limit of 2.50 in. adopted in *British Rainfall* :—

5.03 in.	on 11th	at Strathaird,	Skye.
3.50 „ „	3rd „	Carn, Trefnant,	Denbighshire.
3.39 „ „	3rd „	Middleton-on-the-Wolds,	Driffield, Yorks.
3.13 „ „	3rd „	Ingleby Greenhow Vicarage,	Yorks.
3.05 „ „	21st „	Oakley Quarries, Ffestiniog,	N. Wales.
2.95 „ „	3rd „	Scalby, near Scarborough,	Yorks.
2.60 „ „	3rd „	East Layton, near Darlington,	Yorks.
2.52 „ „	3rd „	Hurworth Grange, Croft,	Darlington, Yorks.

The 11th produced heavy falls at many stations in the West of Scotland, while the rain of the 3rd was very heavy in North and East Yorkshire.

#### OBSERVERS' NOTES.

*New Park Road, Clapham Park, Surrey.*—On the 17th shortly before 5 o'clock in the afternoon, a thunderstorm occurred which was remarkable alike for its short duration, the small area affected, the energy of electric discharges, and the volume of rainfall precipitated.

The storm approached from an unusual quarter—i.e., E.S.E. (such phenomena generally advancing in this district from the S.W.)—in fact, it travelled *with* the wind, instead of, as more usually, *against* it.

At 4.50 p.m. rain commenced and continued without intermission until 5.50, and so heavy was the fall that on measuring at the end of the storm 1.50 in. was recorded.

With regard to the electrical disturbance itself, the lightning and thunder were simultaneous between 5.5 and 5.15, whilst from 5.15 to 5.25 the time interval was about 3 seconds.

Much damage was caused by the flooding of basements in the Brixton Hill and Streatham Hill districts.

At so short a distance as Kennington and Clapham Road there was scarcely any rain.

*Ridgmount, Frimley Green, Surrey.*—One tremendous flash of L at 10 a.m. on 23rd struck a mare in a field at Cove, killing her and her foal, which was more than 30 yards distant from her.

*Wallington, Surrey.*—Great gale and damage to trees on 3rd. Gale on 6th, and a tent at Beddington Flower Show blown down. Terrific TS between 4.10 p.m. and 5.10 p.m. on 17th; more than 3 ft. of water under the railway bridge.

*North Cadbury Rectory, Somerset.*—A strong gale on 3rd, breaking limbs from trees.

*Parkside, Wilmslow, Cheshire.*—On 3rd a TS began about 2.40 p.m. and lasted almost without break till 4.30 p.m., the R continuing till about 5.30 p.m., when .70 in. was measured.

*Park Corner, Blundellsands.*—In the seven days ending on 6th, 4.38 in. of R fell, the greatest amount in seven consecutive days since the record began in 1876, and exceeding any other similar period by more than half an inch.

*Goldsborough Hall, Yorkshire.*—The 3rd was very rough and stormy, with heavy R during the greater part of the day, and a N.E. gale with torrents of R and H in the afternoon.

*Beverley Asylum, Yorks.*—On the 3rd 1.07 in. of R fell here, but on Scarborough racecourse the fall must have been nearer four inches. There was steady R in the early part of the day; about 4 p.m. T very near, with very heavy R, and after 7 p.m. a S.E. gale. Tents were blown down and flooded at the Camp.

*Middleton-on-the-Wolds, Yorkshire.*—The R on 3rd was 3.39 in., the greatest fall ever recorded in 24 hours. Between 9 a.m. and 5 p.m. 2.44 in. fell.

*Hurworth Grange, Darlington, Durham.*—It began to rain about 3 a.m. on 3rd, and by 9 a.m. .42 in. had fallen. In the 24 hours ending 9 a.m. on 4th 2.52 in. fell, but the whole 2.94 in. fell within 24 hours.

*Garn, Trefnant, Denbighshire.*—In the first seven days 6.22 in. of R fell, 3.50 in. being recorded for the 3rd, of which 3.25 in. fell between 9 a.m. and 6 p.m.

*Miltown Malbay, Clare.*—A month of disastrous floods, the first eight days giving about 5 inches of rain, while there were four falls exceeding an inch in 24 hours.

*Twyford, Westmeath.*—R 7.38 in., exceeded only in four months in a record of 25 years.

*Strathaird, Skye.*—In 8½ hours on 11th 4.53 in. of R fell.

## REVIEW.

*Les Bases de la Météorologie Dynamique Historique—Etat de nos Connaissances.* Par M. le Dr. H. HILDEBRAND HILDEBRANDSSON, Upsala, et M. LÉON TEISSERENC DE BORT, Paris. Paris: Gauthier-Villars et Fils. Parts 1 and 2. 1898—1900. Royal 8vo, 184 pp. Plates and diagrams.

THE distinguished authors of this historical summary have compiled it in the belief that a new era in the study of the movements of the atmosphere has been entered upon, and that the time is appropriate to consider the development of the older phase. Recent mathematical investigations have shown that it is possible to apply rigidly accurate methods to the treatment of atmospheric physics, and it

appears probable that meteorology is emerging from the preparatory period of empirical observations which characterises the infancy of all sciences. It is claimed by the authors that this period in the case of meteorology has been remarkably short. Although Aristotle wrote on meteorology, they consider that the scientific study of atmospheric movements can hardly be said to have commenced until the second half of the eighteenth century. This opinion we think it would be difficult to justify; we are inclined to put back the beginning of scientific meteorology to the period of the invention of the barometer and thermometer—the former an instrument unique in the history of science, for its earliest form was perfect and it has never been improved. The question as to the commencement of scientific meteorology is, however, not of practical importance in this connection, as the work before us deals almost exclusively with the last hundred years. It is a history of the growth of meteorological observations and of the deductions which have been drawn from them, touching lightly on theories, but going pretty fully into the bases of the great principles of climatology and weather forecasting. The object is, in fact, to investigate the building of that foundation of observed meteorological facts on which all theories of atmospheric movements must be built.

We cannot but think with the profoundest regret of the manner in which the founder of this Magazine would have reviewed this work of his French and Swedish colleagues. He probably was the only man in this country—indeed, it would hardly be too much to say in the world—who had mastered the history of observational meteorology from the beginning, and knew how to appreciate the work of the historians, and to supplement it where it fell short. Our authors acknowledge their indebtedness to Mr. Symons' work in more places than one.

The whole work, as planned, consists of eight chapters, of which six are already published. They begin with the old researches of Halley, Hadley, Dove and Maury on the grand circulation of the winds of the globe; and go on to consider, in considerable detail and with great clearness, the growth of knowledge regarding tropical cyclones and the discovery of "the law of storms." The researches of Brandes in Germany, and of Espy and Loomis in America, on the storms of the temperate zone, lead up naturally to the full recognition of the relation of the direction of wind to the distribution of barometric pressure by Leverrier, FitzRoy and Buys Ballot, with the resulting establishment of international meteorological observations and of national meteorological services.

Chapter V. deals with fundamental researches in different countries by Buchan, Jelinek, Mohn, Hildebrandsson, Clement Ley and others, which led, by the year 1872, to the full recognition of the principles of the movements of the atmosphere.

The last chapter as yet published treats of water vapour in the atmosphere and the theory of the formation of rain. After tracing

the development of the theory of rain, the authors point out that the principal and ordinary cause of rain is the cooling of a current of ascending air ; and they adopt the classification of rain into three kinds, as proposed by Mr. G. E. Curtis in the *American Meteorological Journal* for 1893. These are—*Convective Rain*, due to the condensation of vapour in an ascending current of air during the warmest hours of the day ; *Orographic Rain*, produced by a horizontal layer of vapour-laden wind being forced to rise along the slope of an elevated land-mass lying in its path ; and *Cyclonic Rain*, accompanying the low-pressure area of a cyclone. The influence of dust particles in promoting precipitation is also fully considered.

A very interesting feature of the work is the facsimile reproduction of illustrations from the works of the various authors cited. Thus we have the very earliest specimens of synoptic charts, the ingenious system of weather signs devised by Mr. Francis Galton in 1861, and many quaint diagrams by which the natural philosophers of the seventeenth and eighteenth centuries felt out their way.

It is always good to look back towards the beginning of a science if only to see how gradual is the progress it has made, but the retrospect is sometimes difficult on account of the prodigious multitude of the workers whose results have to be considered. Messrs. Hildebrandsson and Teisserenc de Bort have very wisely and skilfully limited the number of names cited to those of the leading pioneers and final exponents of the various branches of meteorology. All through they emphasize the essential principle that the only basis for any theory lies in observation carefully and systematically carried out, and that as accurate observations increase in number the theories deduced from them become more complete and more certain to lead to results of practical utility.

H.R.M.

## A "SUN PILLAR."

*To the Editor of the Meteorological Magazine.*

SIR,—This somewhat rare phenomenon was observed by me last evening from Aylstone Hill, Hereford. The day had been warm, with clear sky, but with haze, not sufficient, however, to obscure the outline of the Black Mountains (20 miles S.W.), or that of the Malverns (19 miles E.).

Immediately after sunset (6.45) the earth shadow was very distinct and dark in the east, with crimson masses of light cumuli above it ; the sky overhead perfectly clear. Over the sunset were streaks of pale golden cirrus, across which rose vertically a beam of light, of darker yellow. This continued, slightly deepening in colour, till 7 o'clock ; between which time and 7.20 it passed through orange and reds to a deep crimson, and resting on the crest of Credenhill it resembled a tongue of fire rising out of the hill.

Towards the end of this period two spots in the beam gradually became brighter, while the rest of the beam (actually or by contrast) became paler, and streaks of light green showed in the sky on either side. These spots, by 7.20, had developed into sharply defined mock-suns, of the same apparent diameter as the sun itself; the lower one resting immediately on the hill, the upper one separated from the lower by the distance of two diameters, the two still connected by the beam (which also passed upwards for some distance above the upper one), and both of deep red, as of the sun setting through smoke. At 7.25 the upper mock sun merged into the band, and at 7.30 the lower one became blurred, while the whole gradually faded; and by 7.33 nothing remained but a strong after-glow along the hills.

One curious point was that the mock sun resting on the hill did not appear to set, or follow the descent of the sun below the horizon.

The night was brilliantly clear and moonlight, but towards dawn a thick fog filled the Wye and Lug valleys, while this hill, 100 feet above them, remained clear.

JAMES G. WOOD, F.R.Met.Soc

*September 6th, 1900.*

## MEAN TEMPERATURE. SOUTHERN COUNTIES.

17-18 YEARS, JANUARY 1883—AUGUST, 1900.

*To the Editor of the Meteorological Magazine.*

SIR,—Taking the months from the beginning of 1883, and representing them simply as over, under, and average, the results are somewhat curious, if not striking, especially with regard to the train of sequences of heat and cold; a cold spell seems to have lasted for eight years (1885-1892), while for the last seven years (1893-1899), the very opposite conditions have prevailed. Whether we have yet reached the limit of this warm period remains to be seen. The first eight months of the year, 1900, however, do not shew a marked change. But in order to illustrate the position fairly, the observed temperatures in Sussex, Surrey and Hants, will be given, with their bearing afterwards on the years and months of the above period.

	Mean temp.		Mean temp.
January .....	35·9	August .....	60·2
February .....	37·0	September .....	55·5
March .....	39·2	October .....	46·9
April .....	45·2	November .....	41·5
May .....	51·6	December .....	36·3
June .....	58·5		
July .....	60·9	Average .....	47·4

*Synopsis of Months.*

+ — and average (...) Temperatures, showing sequences.

Years.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept	Oct.	Nov.	Dec.	Years.
1883	+	+	—	+	...	+	—	+	+	+	...	+	1883
1884	+	+	+	—	...	—	—	+	+	...	—	+	1884
1885	—	+	—	...	—	—	...	—	—	...	—	—	1885
1886	—	—	—	—	...	—	...	...	+	+	...	—	1886
1887	—	—	—	—	—	...	+	—	—	—	—	—	1887
1888	—	—	—	—	—	—	—	—	—	—	+	+	1888
1889	—	—	—	—	+	+	—	—	—	—	...	—	1889
1890	+	—	...	—	...	—	—	—	...	—	—	—	1890
1891	—	—	...	—	—	...	—	—	...	+	—	...	1891
1892	—	...	—	—	...	—	—	—	—	—	+	—	1892
1893	—	+	+	+	+	...	+	+	—	...	—	—	1893
1894	—	...	+	+	—	...	...	—	—	+	+	+	1894
1895	—	—	+	+	+	+	+	+	+	—	+	+	1895
1896	+	+	+	+	+	+	+	+	+	...	—	+	1896
1897	—	+	+	+	+	+	+	+	...	+	+	+	1897
1898	+	+	...	+	...	...	...	+	+	+	+	+	1898
1899	+	+	...	+	...	+	+	+	+	...	+	—	1899
1900	+	—	—	+	...	+	+	+	+	...	+	—	1900
													Total months.
+	7	8	6	9	5	7	8	9	7	6	7	8	87
—	11	8	8	8	5	6	6	8	7	7	7	8	89
...	0	2	4	1	8	5	4	1	3	4	3	1	36
Total .....	18	18	18	18	18	18	18	18	17	17	17	17	212

The most consistent returns (sequences) appear to be from December—April, the latter month is indeed quite remarkable. July and August are somewhat similar, the remaining months have no exceptional features. Taking the years with months over average, &c., the cold and warm periods, 1885–92, and 1893–99, respectively, are illustrated as follows :—

Years.	+	—	Aver.	Years.	+	—	Aver.
1883 .....	8	2	2	1893 .....	6	4	2
1884 .....	7	3	2	1894 .....	5	4	3
1885 .....	1	9	2	1895 .....	9	3	0
1886 .....	2	6	4	1896 .....	10	1	1
1887 .....	1	10	1	1897 .....	10	1	1
1888 .....	2	10	0	1898 .....	8	0	4
1889 .....	2	9	1	1899 .....	8	1	3
1890 .....	1	8	3	1900 ... }	5	2	1
1891 .....	1	7	4	(To Aug) }	—	—	—
1892 .....	1	9	2	Total...	87	89	36

Yours faithfully,

ARTHUR F. PARBURY.

Chiddingfold, Godalming, Surrey.

## STUDIES OF CYCLONIC AND ANTICYCLONIC PHENOMENA WITH KITES.

THE above title forms the heading of a memoir recently issued from the Blue Hill Observatory, by Mr. Helm Clayton, who is so ably carrying out this novel and valuable means of investigating the meteorological conditions in the free atmosphere, under the liberal patronage of Mr. A. L. Rotch, of Boston.

The history of this new departure in meteorological observation has been alluded to more than once in these columns and regret has often been expressed that, while kites are now extensively used in America, France, Germany, Russia and Sweden, as unique means for raising meteorographs into the free atmosphere, and have been proposed as permanent additions to official observations in connection with weather prevision as well as theory, in England, so far, there appears to be a total absence of any further experiments or progress in scientific kite flying. And yet it was in this country that the idea of using these tethered *aërostats* as a means for sounding the inaccessible regions of the atmosphere over our heads was first conceived, and at a date when even balloons were not yet invented.

When, after a period of nearly forty years of oblivion, the kite was resuscitated by Mr. Douglas Archibald in 1883, and employed by him to raise anemometers to heights of 1,500 feet, various historical records were unearthed, which gradually revealed the fact that, as in the case of so many novel applications, the idea had been carried out sporadically and spasmodically as far back as 1749, and that these earliest experiments were made by Dr. Wilson and Mr. Melvill, of Glasgow.

Such ephemeral experiments, however, had left no permanent impression on the world of science, so that, practically speaking, we may date the first serious use of kites for research from that of Archibald's first flight in September, 1883. Indeed, this may be considered to have been the originating point of all the recent development of scientific kite flying and particularly of the work at present carried on at Blue Hill, since it was during the progress of these observations that Mr. Rotch visited England and learnt from Mr. Archibald some of the improvements in kite flying, such as the use of steel wire, tandem suspension, &c., which he has recently adopted in the experiments at Blue Hill.

The use of wire, which was originally suggested by Lord Kelvin, quite apart from more recent improvements in the kite itself, has been a turning point in its history, since by its aid alone it has been possible to raise kites and instruments up to the prodigious elevations of over two miles of late attained at Blue Hill and also in France.

In his first paper on the results of his observations at Tunbridge Wells, read before the British Association at Montreal in 1884, Mr. Archibald says, regarding the wire:—"This I have found a great



improvement on the string. It is double the strength, one-fourth the weight, one-tenth the section."

In his experiments great altitudes were not a main object, since he wished at first to test the velocity at different heights, beginning with 100 feet above the surface, which was that at which Mr. Stevenson's observations, with anemometers attached to a pole, terminated. It is, however, worthy of remark that twelve years after this paper was read and published, the Blue Hill observers, after having tried string for two years, in 1896 took to the steel wire employed by Mr. Archibald, and it has only been since their employment of this wire that altitudes above a mile and upwards have been attained.

The kites used at Blue Hill are chiefly modifications of the tailless Malay kite, which is diamond shaped, but with the cross bar nearer the top than in the orthodox diamond pattern. In addition to these, one or two of the ordinary double-celled Hargrave kites are used, especially in strong winds. These kites are arranged so that either the largest kite or a group of kites are flown at the end of the tether, this being the condition for maximum elevation, and then the remaining kites are successively attached by branch cords at intervals, as the wire is payed out, so as to fly tandem.

The attachments are ingenious aluminium clamps, devised by Mr. Ferguson, one of the assistants. The winched-reel has an oil dropper to keep the wire from rusting; an automatic recorder to register the amount of wire payed out; and a dynamograph to register the pull. The main additional improvement of late has been a small engine, which substitutes artificial for hand labour in paying out and hauling in the wire. The meteorograph employed is a modification of a Richard, invented and constructed by Mr. Ferguson, in which aluminium is freely used where it can be employed, and in which a barograph, thermograph, hygrograph, and anemograph enable all four elements to be recorded continuously, both in ascent and descent.

*(To be continued.)*

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JULY, 1900.

*(Continued from p. 106.)*

# NOTES FROM THE NEWSPAPER PRESS.

JULY 12TH.

*Devon.*—Barnstaple. The dépôt adjoining the station was struck by L.

*Somerset.*—At Huntspill Moor, near Highbridge, a woman sheltering under a tree was killed. H the size of walnuts fell in the neighbourhood of Watchet, and much damage was done; in Swain Street alone, several hundred squares of glass were broken.

*Gloucester*.—In Dean Forest, at Noxen, three horses were killed ; at Newlands, beasts and sheep, and at Poolway, a mare.

*Worcester*.—Redditch. A house struck in Park Road.

*Cheshire*.—Northwich. A farmer at Whitegate killed.

*York*.—A cloud-burst occurred on Rombald's Moor, near the water-parting between the Wharfe and the Aire, destroying roads and bridges. Leeds.—The Hospital at Brighouse, the new Methodist Church at Elland, and the brewery in Kirkstall Road, were all struck. At Halifax a house in Harrow Street was struck ; a man was struck at Oxenhope ; four cows were killed at Wilsden ; a cabin on the Midland Railway, at Apperley Bridge, was also struck.

*Glamorgan*.—A pony was killed at East Aberthaw.

*Brecon*.—H the size of marbles, and the Mount Street Board School struck by L.

#### JULY 16TH.

*Buckingham*.—Two horses were struck by L at Aylesbury.

*Huntingdon*.—Godmanchester Church was struck.

*Bedford*.—H stones 2 inches square fell at Leighton Buzzard, and there was much damage to glass at Woburn, the H was the size of cherries.

*Cambridge*.—At Willingham, a boy was killed and a man struck by L ; at Cottenham a windmill was struck, and at Boxworth a barn was fired and six calves killed.

*Suffolk*.—Many windows at Bury St. Edmunds were broken by H, which was said to be the size of plums.

*Norfolk*.—Prowick Hall, Wymondham, was struck by L ; a horse was struck dead at Knettishall, and damage was done at Wortham.

*Lincoln*.—At Stamford the "Hit or Miss" inn was struck ; at Holbeach two horses were killed.

#### JULY 20TH.

*Hants*.—At Godshill Park ten steers, a bull and a heifer, out in the open, were killed by L. At Bournemouth a house was struck and fired and at Titchfield two houses were struck.

*Northampton*.—Bozeat. A stack struck ; Horton Hall struck ; Floore, a house struck ; Harpole Hall struck and fired, and cattle and sheep killed ; Lamport Grange struck ; Raunds, three houses struck ; Isham Church struck ; Islip Church struck ; Welford, four bullocks killed. In Northampton H fell for about seven minutes : the first stones were about the size of hazel nuts, but the majority were more than an inch in diameter and a large proportion as large as hen's eggs, stones measuring two inches long being by no means uncommon. Over an area extending for nearly a mile round the Town Hall scarcely a piece of glass exposed to the sky escaped and even slates and tiles were damaged. 550 street lamps were broken. The storm extended from Northampton to Kettering and Market Harborough, but near Northampton, which was about the southern limit of the H, the track of the storm was not two miles wide. At Althorpe, Holdenby and Dallington there was great destruction of glass in the conservatories.

*Bedford*.—A house in Bedford was struck by L and at Kempston an inn was struck.

*Essex*.—At Staning Hall 17 lambs were killed, and at Edgefield a stack was fired.

*Suffolk*.—An inn at Boyton, near Bury St. Edmunds, was struck.

*Norfolk*.—At Wymondham glass was broken by H.

*Cornwall*.—At Anganack, near Hayle, a horse was killed.

*Stafford*.—At Rowley Regis a signal box was struck; at Bradley, near Bilston, a chapel was struck and fired; at Moseley, near Wolverhampton, the Board School was struck.

*Warwick*.—At Birmingham the Art Gallery at Margaret Street was struck; New Street Station was struck; workshops in Kathlin Road were struck, and at Langley a stable was struck and a horse killed.

*Leicester*.—At N. Kilworth a boy was struck; at Leicester large H fell; a man was killed at Belgrave Road cricket ground and at Sheepshed a man was seriously injured. At Hugglescote 2 beasts were killed.

*Nottingham*.—The Board School at Newark was struck.

*Derby*.—At Clay Cross a horse was killed.

*York*.—Sheffield. Three houses in Cricket Inn Road were struck, also a house in Derbyshire Lane, and at Tinsley Bank Farm a stack was fired. At Scarborough a tent was struck at the volunteer camp.

*Tipperary*.—At Nenagh two men were killed by L.

#### JULY 25TH.

*Middlesex*.—Kingston-on-Thames post office was struck by L, and Cricklewood Church struck and fired.

*Surrey*.—A house was struck at East Croydon.

*Kent*.—In the neighbourhood of Maidstone H the size of walnuts fell, and much glass was broken in the district.

*Sussex*.—Two houses in Norfolk Square, Bognor, were struck, and also a man outside the railway station. Eversfield House, St. Leonards, was struck.

*Hants*.—Two workmen were killed and others injured, near Ryde, and at Ventnor a house was struck.

*Berks*.—At West Ilsley 27 ewes were killed under an oak.

*Herts*.—Royston, L killed a boy riding on a load of hay, and also the horse drawing it.

*Northampton*.—At Weedon the telephone testing station was fired.

*Essex*.—The "Blakesley Arms," at Manor Park, was struck.

*Wilts*.—At Bulford Camp one man was killed and a dozen injured, while at Perham Down, a service corps horse was killed; at Devizes a lad and a horse were killed, and at Stratford, near Salisbury, a mill was struck and fired.

*Cheshire*.—The "Boot and Shoe" Inn at Nantwich was struck.

*Kilkenny*.—Kilkenny Castle was struck and fired.

#### JULY 29TH.

*Hereford*.—At Pembridge, farm buildings were struck and fired; at Lustor, a mare was killed, and at Yarpole a cow.

*Worcester*.—Upton-on-Severn Church was struck during service.

*Cheshire*.—Near Northwich a cottage was struck, and the thatch fired; at Alderley Edge the telephone office was struck; horses and cattle were killed at Mobberley, and two cows were killed at Warford Hall.

*Lancashire*.—At Salford, the Technical Institute was struck.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, FEBRUARY, 1900.

STATIONS.  (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
	°		°		°	°	°	0-100	°		inches		°
London, Camden Square	57·0	24	17·7	9	43·9	33·0	35·7	90	84·4	13·0	3·99	20	7·3
Malta .....	73·3	14	43·5	1	63·0	50·3	48·7	79	131·7	38·6	1·04	8	2·8
Cape of Good Hope ...	88·2	2	55·9	24	79·9	62·1	59·3	72	...	...	·88	3	2·5
Mauritius .....	86·2	22a	70·2	10	84·4	75·1	72·2	80	153·2	65·1	4·79	20	7·2
Calcutta .....	89·7	26	58·2	21	85·1	64·5	61·4	65	145·0	51·7	·75	3	3·6
Bombay .....	83·6	20	64·3	14	81·6	68·0	64·2	69	129·2	54·1	·00	0	1·1
Ceylon, Colombo .....	93·7	24	72·2	5	91·9	74·4	72·0	75	156·0	68·5	·63	4	1·1
Melbourne .....	104·0	4	47·0	28	79·0	56·6	51·4	60	156·8	38·3	·46	3	4·0
Adelaide .....	107·4	4	53·1	27	88·2	61·5	54·4	52	170·5	45·3	·06	1	3·0
Sydney .....	86·8	20	60·9	19	78·7	66·6	59·8	69	145·0	51·2	1·67	12	5·3
Wellington .....	79·0	1	44·5	12	67·8	52·6	48·0	64	132·0	37·0	1·92	8	3·8
Auckland .....	78·5	2	55·5	12b	73·0	59·5	57·2	73	133·0	48·0	1·60	9	3·7
Jamaica, Halfway Tree	87·0	28	64·0	23	84·4	67·4	64·2	74	...	...	·45	2	2·0
Trinidad .....	92·0	19	63·0	15	88·5	69·4	69·3	76	167·0	59·0	·76	7	...
Grenada .....	86·2	9	69·2	4	82·9	72·6	69·6	75	160·0	...	4·31	14	2·2
Toronto .....	48·0	9	-9·6	26	27·4	12·8	19·0	80	55·0	-14·0	5·21	14	5·9
New Brunswick, Fredericton	49·8	25	-29·0	3	29·1	8·0	10·7	72	...	...	4·74	11	5·6
Manitoba, Winnipeg...	30·5	22	-34·8	9	6·3	-16·9	...	...	...	...	·20	3	4·2
Victoria, British Columbia, .....	52·7	21	18·0	14	45·2	36·5	...	...	...	...	2·75	19	7·7

a—and 24, 25. b—and 23.

## REMARKS.

**MALTA.**—Adopted mean temp. 56°·3, or 2°·3 above average. Mean hourly velocity of wind 13·3 miles, or 1·5 above average. Mean temp. of sea 60°·0. H on 15th and 18th. Dew point ranged from 55°·3 on 2nd to 40°·7 on 22nd. J. F. DOBSON.

**Mauritius.**—Mean temp. of air 0°·8 above, of dew point 2°·0 above, and rainfall 1·99 in. below, their respective averages. Mean hourly velocity of wind 7·7 miles, or 3·5 below average; extremes, 22·1 on 4th and 0·0 on 17th; prevailing direction, S.E. to E. and variable. L and T on 1st, 6th to 8th, 11th, 20th and 24th. T on 3rd, 13th, 17th and 23rd; and L on 19th, 21st and 22nd. T. F. CLAXTON.

**CEYLON, COLOMBO.**—Mean temp. of air 82°·2, or 2°·1 above, of dew point 1°·8 above, and rainfall 1·27 in. below, their respective averages. Mean hourly velocity of wind 5·9 miles; prevailing direction, N.E. to N.W. TSS occurred on the 15th and 25th; L on 24th. A slight shock of earthquake was felt all over the Island about 3 a.m. on the 10th; the approximate direction was West to East, and duration 2 or 3 seconds. H. O. BARNARD.

**Adelaide.**—A very dry month. Mean temp. 74°·8, or 0°·8 above the average for 43 years. C. TODD, F.R.S.

**Sydney.**—Mean temp. 1°·7 above, humidity 4·7 below, and rainfall 3·50 in. below, their respective averages. H. C. RUSSELL, F.R.S.

**Wellington.**—Fine weather generally throughout the month, except showers during the middle; prevailing N.W. winds and generally moderate. Earthquake on 10th at 6.40 a.m., short and smart, and on 20th at 4.40 a.m., slight. R. B. GORE.

**Auckland.**—Fine and dry throughout the greater part of the month, with a more than usual predominance of S.W. winds. Barometrical pressure slightly above, and mean temp. slightly below, the average; rainfall unusually small, less than half the average. T. F. CHEESEMAN.

**TRINIDAD.**—Rainfall ·93 in. below the average for 30 years. J. H. HART.

# SUPPLEMENTARY TABLE OF RAINFALL, AUGUST, 1900.

Div	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	3.14	XI.	Builth, Abergwesyn Vic.	7.99
II.	Dorking, Abinger Hall.	4.23	„	Rhayader, Nantgwillt...	6.27
„	Birchington, Thor .....	2.10	„	Lake Vyrnwy .....	7.66
„	Hailsham .....	2.37	„	Corwen, Rhug .....	6.29
„	Ryde, Thornbrough .....	2.37	„	Criccieth, Talarvor .....	5.48
„	Emsworth, Redlands ...	2.87	„	I. of Anglesey, Lligwy..	6.95
„	Alton, Ashdell .....	3.73	„	I. of Man, Douglas .....	6.66
III.	Oxford, Magdalen Coll..	3.07	XII.	Stoneykirk, Ardwell Ho.	5.02
„	Banbury, Bloxham .....	4.43	„	New Galloway, Glenlee	7.02
„	Northampton, Sedgbrook	3.35	„	Mouiaive, Maxwellton Ho.	6.42
„	Alconbury .....	2.10	„	Lilliesleaf, Riddell .....	4.98
„	Wisbech, Bank House...	3.25	XIII.	N. Esk Res. [Penicuick]	...
IV.	Southend .....	1.89	XIV.	Glasgow, Queen's Park..	4.42
„	Colchester, Lexden .....	2.42	XV.	Inverary, Newtown .....	4.13
„	Saffron Waldon, Newport	3.33	„	Ballachulish, Ardsheal...	6.50
„	Rendlesham Hall .....	2.19	„	Islay .....	4.73
„	Scole Rectory .....	...	XVI.	Dollar .....	4.28
„	Swaffham .....	4.55	„	Balquhider, Stronvar...	5.21
V.	Salisbury, Alderbury ...	...	„	Coupar Angus Station...	4.28
„	Bishop's Cannings .....	2.60	„	Blair Atholl .....	2.11
„	Blandford, Whatcombe.	2.78	XVII.	Keith H.R.S. ....	3.97
„	Ashburton, Holne Vic...	3.03	„	Forres H.R.S. ....	3.49
„	Okehampton, Oaklands.	2.87	XVIII.	Fearn, Lower Pitkerrie..	3.96
„	Hartland Abbey .....	2.41	„	S. Uist, Askernish .....	2.90
„	Lynton, Glenthorne ...	3.55	„	Invergarry .....	4.28
„	Probus, Lamellyn .....	2.92	„	Aviemore, Alvie Manse.	3.98
„	Wellington, The Avenue	2.20	„	Loch Ness, Drumnadrochit	3.97
„	North Cadbury Rectory	2.21	XIX.	Invershin .....	4.29
VI.	Clifton, Pembroke Road	2.34	„	Durness .....	3.15
„	Ross, The Graig .....	3.25	„	Watten H.R.S. ....	2.44
„	Wem, Clive Vicarage ...	4.41	XX.	Dunmanway, Coolkelure	5.54
„	Wolverhampton, Tettenhall	...	„	Cork, Wellesley Terrace	3.73
„	Cheadle, The Heath Ho.	4.25	„	Killarney, Woodlawn ..	5.24
„	Coventry, Priory Row ..	3.12	„	Caher, Duneske .....	3.94
VII.	Market Overton .....	4.85	„	Ballingarry, Hazelfort...	...
„	Grantham, Stainby .....	3.19	„	Limerick, Kilcornan ...	...
„	Horncastle, Bucknall ...	3.58	„	Miltown Malbay .....	7.43
„	Worksop, Hodsock Priory	4.57	XXI.	Gorey, Courtown House	...
VIII.	Neston, Hinderton .....	5.71	„	Moynalty, Westland ...	5.86
„	Southport, Hesketh Park	6.56	„	Athlone, Twyford .....	7.38
„	Chatburn, Middlewood.	6.06	„	Mullingar, Belvedere ...	7.21
„	Duddon Val., Seathwaite Vic.	10.29	XXII.	Woodlawn .....	6.46
IX.	Melmerby, Baldersby ...	6.00	„	Crossmolina, Enniscoe ..	5.92
„	Scalby, Silverdale .....	6.25	„	Collooney, Markree Obs.	4.52
„	Ingleby Greenhow Vic..	7.07	XXIII.	Enniskillen, Model Sch.	...
„	Middleton, Mickleton ...	4.68	„	Warrenpoint .....	4.32
X.	Haltwhistle, Unthank H.	5.92	„	Seaforde .....	5.08
„	Bamburgh .....	5.94	„	Belfast, Springfield .....	5.59
„	Keswick, The Bank .....	...	„	Bushmills, Dundarave..	4.04
XI.	Llanfrechfa Grange .....	4.33	„	Stewartstown .....	4.78
„	Llandovery .....	6.38	„	Killybegs .....	4.73
„	Castle Malgwyn .....	2.73	„	Horn Head .....	4.90
„	Brecknock, The Barracks	...			

## AUGUST, 1900.

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) ...	2·81	+ ·93	·41	31	17	86·7	17	48·1	5	0	0
II.	Tenterden .....	1·74	— ·12	·44	6	13	83·3	18	45·0	11 <i>d</i>	0	0
"	Hartley Wintney .....	2·81	— ...	·54	1	17	84·0	14	47·0	5, 25	0	0
III.	Hitchin .....	3·35	+ 1·53	·67	1	16	80·0	18	47·0	4	0	...
"	Winslow (Addington) .....	3·02	+ 1·05	·50	9	17	82·0	18	44·0	5	0	0
IV.	Bury St. Edmunds (Westley) ..	2·49	+ ·29	·62	3	15	77·0	17 <i>a</i>	47·0	5, 11	0	...
"	Norwich (Brundall) .....	4·35	— ...	·85	21	18	79·0	13	45·2	31	0	0
V.	Winterbourne Steepleton ...	2·52	— ...	·73	6	14	82·9	14	43·0	31	0	0
"	Torquay (Cary Green) ...	1·50	— ...	·46	6	11	74·4	14	48·5	25	0	0
"	Polapit Tamar [Launceston]..	3·00	+ ·52	·47	21	16	82·0	14	40·2	13	0	0
VI.	Stroud (Upfield) .....	3·47	+ 1·38	1·21	9	14	77·0	14	50·0	5 <i>e</i>	0	...
"	Church Stretton (Woolstaston)	4·28	+ 1·52	·71	3	18	76·5	14	48·0	4 <i>e</i>	0	0
"	Worcester (Diglis Lock) .....	2·39	+ ·42	·39	6	13	...	...	...	...	...	...
VII.	Boston ...	4·56	+ 2·44	·78	5	16	80·0	18	45·0	11	0	...
"	Hesley Hall [Tickhill].....	4·36	+ 2·20	·75	5	18	78·0	14	42·0	29 <i>f</i>	0	0
"	Breadsall Priory .....	5·00	— ...	·88	5	18	...	...	...	...	...	...
VIII.	Manchester (Plymouth Grove)	4·73	+ 1·64	1·48	6	16	79·0	16	41·0	27	0	0
IX.	Wetherby (Ribston Hall) ...	5·52	+ 3·18	2·23	3	16	...	...	...	...	...	...
"	Skipton (Arncliffe) .....	7·89	+ 3·56	2·42	3	19	...	...	...	...	...	...
"	Hull (Pearson Park) .....	4·71	+ 2·07	·93	3	15	79·0	13	42·0	29	0	0
X.	Newcastle (Town Moor) .....	6·56	+ 3·85	2·23	3	18	...	...	...	...	...	...
"	Borrowdale (Seathwaite).....	12·13	+ 3·68	2·76	31	17	77·5	14	39·4	27	0	...
XI.	Cardiff (Ely) .....	4·32	+ ·71	·79	9	15	...	...	...	...	...	...
"	Haverfordwest .....	5·54	+ 2·36	·85	23	15	81·0	14	43·2	13	0	0
"	Aberystwith (Gogerddan) ...	7·67	— ...	1·79	22	14	85·0	15	...	...	0	...
"	Llandudno .....	6·23	+ 3·87	1·93	6	18	78·0	15	51·0	29	0	...
XII.	Cargen [Dumfries] .....	6·30	+ 3·31	1·39	6	20	79·0	15	45·0	11 <i>h</i>	0	0
XIII.	Edinburgh (Blacket Place)...	5·68	— ...	2·00	6	19	76·3	15	43·0	9	0	0
XIV.	Colmonell .....	4·11	— ...	·77	6	14	83·0	14	44·0	4	0	...
XV.	Tighnabruich .....	4·93	— ...	1·05	11	13	68·0	15	45·0	4, 8	0	...
"	Mull (Quinish) .....	6·68	+ 2·53	1·51	30	13	...	...	...	...	...	...
XVI.	Loch Leven Sluices .....	4·40	+ 1·46	1·30	6	10	...	...	...	...	...	...
"	Dundee (Eastern Necropolis)	4·40	+ 1·83	·90	21	14	77·0	14	41·9	9, 26	0	...
XVII.	Braemar .....	4·06	+ ·73	2·06	22	14	75·4	14	33·5	9	0	2
"	Aberdeen (Cranford) .....	3·33	— ...	1·15	22	14	78·0	12	39·0	8	0	...
"	Cawdor (Budgate) .....	5·54	+ 3·29	1·77	22	18	...	...	...	...	...	...
XVIII.	Strathconan [Beaully] .....	3·78	+ ·48	1·55	23	12	...	...	...	...	...	...
"	Gleucarron Lodge .....	7·32	— ...	1·74	11	18	77·0	15	38·0	28	0	...
XIX.	Dunrobin .....	...	— ...	...	...	...	...	...	...	...	...	...
"	S. Ronaldshay (Roeberry) ...	2·96	+ ·40	·69	1	13	68·0	14	45·0	28	0	...
XX.	Darrynane Abbey .....	3·25	— ...	·63	8	18	...	...	...	...	...	...
"	Waterford (Brook Lodge) ...	4·82	+ 1·40	1·17	8	16	74·0	14 <i>b</i>	44·0	11	0	...
"	Broadford (Hurdlestown) ...	6·69	— ...	1·45	2	18	...	...	...	...	...	...
XXI.	Carlow (Browne's Hill) .....	5·70	+ 2·73	1·34	2	17	...	...	...	...	...	...
"	Dublin (Fitz William Square)	5·87	+ 3·35	2·14	2	17	75·0	15	48·1	4	0	0
XXII.	Ballinasloe .....	6·34	+ 3·16	1·30	2	15	74·0	14	46·0	27	0	...
"	Clifden (Kylemore) .....	5·24	— ...	·90	21	12	...	...	...	...	...	...
XXIII.	Waringstown .....	5·28	+ 2·17	1·30	6	12	85·0	16 <i>c</i>	40·0	9	0	...
"	Londonderry (Creggan Res.)..	4·01	— ·11	·87	22	15	...	...	...	...	...	...
"	Omagh (Edenfel) .....	4·15	+ ·66	·95	21	18	81·0	15	42·0	26	0	...

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

a—and 18. b—and 15. c—and 17. d—and 31. e—and 10, 26. f—and 30.  
g—several days. h—and 26.

# METEOROLOGICAL NOTES ON AUGUST, 1900.

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.

TENTERDEN.—Quite autumnal early in August, with several wet days, and much wind on 3rd, 4th, 6th and 9th; but hot summer weather again in the middle of the month, with temp. above 80° on four days. A few slight showers in the last ten days. Pastures nearly as much burnt up as in 1898 and 1899. Duration of sunshine 208 hours.

HARTLEY WINTNEY.—Rainfall normal. Nine rainless days from 11th to 19th. T on 23rd; L on 5th and 24th. Strong S.W. gale on 6th. Fog on 20th and 31st. Ozone on 17 days, with a mean of 3·1. Swifts were last seen on 10th.

WINSLOW, ADDINGTON.—From the 1st to the 10th cool, unsettled weather, prevailed, the max. temp. on 9th being only 58°. From 11th to 22nd it was much warmer, the temp. reaching 80° on three occasions. From 20th to 25th was rainy, and the remainder of the month was dry, but with want of sunshine. T on 5th.

BURY ST. EDMUNDS, WESTLEY.—The first ten days were wet and cold, but from that date to the end fair harvest weather prevailed. Distant T on 5th, 9th, 17th and 23rd.

NORWICH, BRUNDALL.—The wettest August since 1881. R 1·92 in. above the average. TSS on 21st and 23rd. T and L on 5th. L on 1st, 18th and 19th. H on 21st.

POLAPIT TAMAR [LAUNCESTON].—The first ten days were very wet and stormy, but from the 11th to the 20th the weather was very hot and dry. S.E. gale on 9th. Thick fog on 18th.

STROUD, UPFIELD.—TS from 4 to 4.45 p.m. on 9th, with ·57 in. of R in that time from S.E. T and L from 5 to 6 p.m. on 5th. Fog on 17th and 18th.

BREADSALL PRIORY.—A very wet month, with severe TSS. Rainfall almost double the average, and eight times that of August, 1899.

MANCHESTER, PLYMOUTH GROVE.—The weather on the whole was unsettled and cold. A great storm occurred on 6th and 7th; the R on 6th (1·48 in.) being the heaviest fall in 24 hours since July 2nd, 1888, when 1·89 in. fell.

ARNcliffe VICARAGE.—The usual heavy rainfall occurred in the first week of August. In 1897, 2·75 in. fell on 5th, and in 1898, 1·91 in. on 5th.

NEWCASTLE, TOWN MOOR.—The greatest total fall in August since 1878, when 6·58 in. fell on 21 days. In August, 1877, 8·86 in. fell on 28 days.

## WALES.

HAVERFORDWEST.—An unsettled month, with a large rainfall. Much damage was done to crops by the strong winds and heavy rains, especially to corn, but the country generally is looking well. A sharp TS occurred on 25th, with very heavy R, ·62 in. falling in three-quarters of an hour. TS on 25th.

ABERYSTWICH, GOGERDDAN.—A very stormy month, with strong wind, heavy R, H and T. Very unusual weather for August.

## SCOTLAND.

EDINBURGH, BLACKET PLACE.—R 63 per cent. above the average, and temp.  $1^{\circ}2$  below the normal. Sunshine very deficient, the total being 79 hours, which is the lowest in August since 1866, when the non-instrumental record gave 73 hours. Only 13 hours of sunshine were recorded after the 16th. A waterspout was seen at 6 p.m. on 23rd, during a TS, its outlines being clearly defined for about 10 minutes, when the lower portion gradually faded away, the upper part being absorbed into the clouds. Here  $\cdot62$  in. of R fell in 18 mins. Very heavy R and distant T on 6th. Dense fog on 15th and 16th.

COLMONELL, CLACHANTON.—R  $\cdot09$  in. above, and mean temp.  $59^{\circ}4$ , or  $1^{\circ}2$  above, the average of 24 years. Strong winds on 6 days.

TIGHNABRUAICH, CRAIGANDARAICH.—The atmosphere was in an electrical state throughout the month, and although the discharge of R from the clouds was not too frequent, it was several times heavy.

MULL, QUINISH.—The large total R, and the small number of days on which it fell, are very remarkable features of this month; more than an inch having fallen on three days. Since the gauge was established in 1874 there has been only one month (November, 1884) with more than three falls exceeding 1.00 in. in 24 hours. In that month  $9\cdot52$  in. fell on 19 days, of which  $8\cdot58$  in. fell in the first 12. In November, 1890, there were three days with more than 1.00 in., but with these exceptions August, 1900, stands alone.

S. RONALDSHAY, ROEBERRY.—A very fine month. Mean temp.  $55^{\circ}8$ , or  $1^{\circ}3$  above, the average of 10 years.

## IRELAND.

DARRYNANE ABBEY.—A bad harvest month. Wet, with not much wind, the only really fine weather being a few days in the middle, and a few at the end, of the month.

WATERFORD, BROOK LODGE.—Much T and L. Max. range of temp. in 24 hours  $28^{\circ}5$ , on 14th. The potato stalks went very early this year on account of the wet and L.

DUBLIN, FITZWILLIAM SQUARE.—August, 1900, was very changeable. Winds from polar points of the compass largely predominated. There were frequent downpours of R, causing a record rainfall of  $5\cdot87$  in. for the month. Providentially, for the saving of the harvest, two dry periods occurred, from 11th to 17th, and from 25th to 30th, inclusive. Mean temp.  $59^{\circ}1$ , or  $0^{\circ}2$  below average. High winds on seven days, attaining the force of a gale on 3rd and 31st. T on 5th and 22nd. L on 19th. TSS on 2nd and 21st. The shade temp. reached  $70^{\circ}$  on only six days, compared with 18 in August, 1899. Solar halo on 11th. Fog on 15th and 16th.

OMAGH, EDENFEL.—The heavy rains and "Lammas" flood in the early part did much damage, which the magnificent weather of the third week did not wholly redress. Short spells of wet and fine weather alternated during the remainder of the month.



# SYMONS'S

## MONTHLY

# METEOROLOGICAL MAGAZINE.

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### THE BRITISH ASSOCIATION MEETING, BRADFORD, 1900.

FROM the meteorologist's point of view, though from his alone, the meeting at Bradford was by no means brilliant. Perhaps the fact that the International Meteorological Congress was meeting during the same week in Paris, may account for the small number of students of atmospheric phenomena who were present; but of the few who did attend, the Committee of Section A did not include one. While this may have been an oversight on the present occasion, there have been signs, for some years back, that the meeting for meteorological papers held by Section A on the Monday, is viewed with little interest, either by the sectional officers or by the members of the Association. The reports of several committees were presented, that relating to Ben Nevis contained the gratifying news that funds have been received to keep our only high level station going for a few years longer. The Committee for recording the intensity of solar radiation made a long report, dealing with experiments on the copper-cube actinometer, and other instruments, by which the value of the radiation may be measured in absolute units, but a final result has not yet been obtained.

Mr. A. Lawrence Rotch, of Blue Hill Observatory, Massachusetts, sent a paper on the use of kites for raising instruments by which to observe the meteorological conditions of the upper atmosphere.

Mr. A. S. Davis showed a novel type of barometer, which has the advantage of being only ten inches in length, but has practical disadvantages of such a kind as to render it little better than a scientific curiosity.

Mr. J. W. Thomas described the effect of wind on the ventilation of houses, with particular reference to the smoking of chimneys when there is a high wind blowing and insufficient means of admitting air into the room to feed the draught of the fire.

The most important paper read was undoubtedly that by Captain Campbell Hepworth, on the weather of the North Atlantic Ocean in the winter of 1898-99. The Meteorological Office has investigated the remarkably stormy weather experienced during that winter,

and, from the numerous logs of ships it has received, has prepared charts showing the weather conditions at local noon for the whole basin of the North Atlantic, for sixty consecutive days. While these are not synchronous charts by any means, they are of extreme interest, and it is hoped they will soon be published. The stormy weather on the Atlantic was accompanied by a remarkably cold winter in America, February, 1899, being characterised by a frost which was unapproached in duration and severity since the U.S. Weather Bureau was founded. A minimum of  $-61^{\circ}$  F. was recorded at Fort Logan, Montana, and masses of river ice were carried out by the Mississippi into the semi-tropical Gulf of Mexico. At the same time Europe was enjoying a winter of unparalleled mildness, the thermometer at Liège rising to a maximum of  $70^{\circ}5$  F. This was on February 10th, the very day of the intense cold at Fort Logan, and the extraordinary range of  $131^{\circ}5^{\circ}$  F. was found between two places practically in the same latitude.

Mr. John Hopkinson read a paper on the rainfall of the northern counties of England, the following table summarising his results. The stations were selected on account of their records being complete for the ten years under consideration, but apparently without regard to their distribution over the area of the county.

*Mean Rainfall in the Northern Counties of England, 1881-90,  
according to Mr. John Hopkinson.*

	Northumberland, 11 stations.	Durham, 7 stations.	Cumberland, 6 stations.	Westmoreland, 8 stations.	Lancashire, 11 stations.	Yorkshire, 26 stations.	Cheshire, 7 stations.	Derbyshire, 4 stations.	Nottinghamshire, 3 stations.	Lincolnshire, 11 stations.	Mean, 94 stations.
	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.
January ...	2.23	2.02	5.68	5.69	3.35	2.88	2.35	3.61	1.94	1.72	3.04
February ...	1.73	1.47	4.62	4.47	2.30	2.12	1.77	2.63	1.58	1.60	2.32
March ...	2.73	2.55	4.49	4.53	2.89	2.70	2.11	3.16	1.87	1.68	2.82
April ...	1.98	2.01	3.05	2.86	2.05	2.23	1.69	2.48	1.64	1.65	2.15
May ...	2.15	2.04	3.77	3.54	2.56	2.38	2.22	2.84	2.19	2.03	2.50
June ...	1.92	1.81	3.10	2.89	2.69	2.10	2.57	2.74	1.80	1.78	2.27
July ...	3.38	3.31	5.58	5.31	3.98	3.33	3.31	3.56	2.47	2.44	3.60
August ...	3.14	2.64	4.52	4.20	3.64	3.05	3.05	3.43	2.28	2.30	3.19
September ...	2.86	2.30	5.58	4.90	3.67	2.70	3.02	5.25	1.94	2.18	3.14
October ...	3.18	3.04	5.33	5.36	3.81	3.72	3.32	4.47	2.68	2.81	3.72
November ...	3.15	2.68	6.72	6.67	4.01	3.29	3.30	4.49	2.16	2.27	3.72
December ...	2.58	2.27	5.48	5.46	3.38	2.85	2.63	3.57	1.89	1.84	3.09
Year ...	31.03	28.14	57.92	55.88	38.33	33.35	31.34	*40.23	24.44	24.30	35.56

Mr. Hopkinson took occasion to refer in terms of high appreciation to the work of the late Mr. G. J. Symons, and to the efficiency of

\* This column adds to 42.23.—Ed. M.M.

the Rainfall Organisation which he founded. Dr. H. R. Mill pointed out that the results of the estimate of mean rainfall would be more satisfactory if the stations were selected to represent proportionally the regions of different intensity of rainfall in each county, but he cordially endorsed Mr. Hopkinson's eulogium of Mr. Symons, whose regular attendance at the British Association Meetings made the present gathering seem poor and sad.

Geology has invaded the territory of many sister sciences, but we are hardly prepared for the discovery of fossil cyclones. This, however, is very like what Mr. Harmer announces in his paper to Section C., entitled, "The influence of winds upon climate during past epochs; a meteorological explanation of some geological problems." There is no doubt that if the arrangement of land and sea at any epoch in the past can be ascertained, it may be possible to deduce the probable general distribution of atmospheric pressure and the resulting winds, the attempt, at any rate, is full of interest.

An important meteorological paper was read to Section E (Geography) by Mr. E. G. Ravenstein, who dealt with the geographical distribution of relative humidity, and exhibited a series of maps he had compiled to show how that datum varies in different parts of the world.

Combining humidity and temperature, the author suggested mapping out the earth according to sixteen *hygrothermal types*, as follows:—

1. Hot (temperature  $73^{\circ}$  and over) and very damp (humidity 81 per cent. or more): Batavia, Camaroons, Mombasa.
2. Hot and moderately damp (66–80 per cent.): Havana, Calcutta.
3. Hot and dry (51–65 per cent.): Bagdad, Lahore, Khartum.
4. Hot and very dry (50 per cent. or less): Disa, Wadi Halfa, Kuka.
5. Warm (temperature  $58^{\circ}$  to  $72^{\circ}$ ) and very damp: Walvisch Bay, Arica.
6. Warm and moderately damp: Lisbon, Rome, Damascus, Tokio, New Orleans.
7. Warm and dry: Cairo, Algiers, Kimberley.
8. Warm and very dry: Mexico, Teheran.
9. Cool (temperature  $33^{\circ}$  to  $57^{\circ}$ ) and very damp: Greenwich, Cochabambo.
10. Cool and moderately damp: Vienna, Melbourne, Toronto, Chicago.
11. Cool and dry: Tashkent, Simla, Cheyenne.
12. Cool and very dry: Yarkand, Denver.
13. Cold (temperature  $32^{\circ}$  or less) and very damp: Ben Nevis, Sagastyr, Godthaab.
14. Cold and moderately damp: Tomsk, Pike's Peak, Polaris House.
15. Cold and dry:
16. Cold and very dry: Pamir.

The actual mean temperature of the earth amounted, according to his computation, to 57° F., and this isotherm, which separated types 8 and 9, also divided De Candolle's "Mikrothermes" from the plants requiring a greater amount of warmth.

The report of a Committee on the Climate of Tropical Africa, was also read in Section E. This Committee was re-appointed in order to draw up a final report of its ten years' work.

## STUDIES OF CYCLONIC AND ANTICYCLONIC PHENOMENA WITH KITES.

*(Continued from p. 120.)*

This continuity of record, the steady ascent, and the possibility of keeping the instruments suspended for considerable periods together, so as to record not merely changes with elevation, but changes at the same height at successive intervals (often as much as 12 hours) of time, give to these observations at Blue Hill a value greatly beyond anything hitherto accomplished by balloons, free or captive. The small free balloons (*les ballons sondes*) first sent up by MM. Hermité and Besançon, and the recent simultaneous international flights of similar balloons in different parts of the Continent, have no doubt extended our knowledge of the general conditions of the free air up to heights that will probably never be attained by man, and possibly never reached by kites. At the same time, such flights can never be anything more than spasmodic and sporadic; and since captive balloons are virtually useless, except in the rare case of calm above and below, and mountain stations do not give us the true conditions in the free atmosphere, kites are evidently, as originally stated by Mr. Archibald, in 1883, the best means hitherto available for conducting researches into the meteorology of the upper air.

Before alluding to the results attained in the recent flights at Blue Hill, it is important to observe that considerable care appears to have been taken to ensure reliable records. The sensitiveness of the thermometer, for example, is very essential where ascent and descent are concerned, and by practical checks and comparison with what ought to occur from theory, the instrument is shown to reach a most desirable standard in this respect. Great care is also taken to insulate it from undue direct exposure. The hair-hygrometer, which is the only feasible form for kite suspension, is admitted to be not so trustworthy. It is uncertain at extreme points, and more sluggish than the thermometer. In fact, a thoroughly reliable and conveniently portable recording hygrometer is still a desideratum. By empirical corrections, the final results in the present case are stated to be accurate within about 10 per cent. of the true amounts, and as the hygrometry in these researches is distinctly subordinate in importance to the thermometry and barometry, this approximation

appears to be satisfactory. The flights dealt with in Mr. Clayton's Bulletin occur in groups, thus:—

1899. Feb. 23 to 28.	Sept. 4 to 6.
May 24 to 27.	Oct. 31 to Nov. 2.

representing both typical conditions of the season, as well as of incidental and transient cyclones and anticyclones.

The maximum heights attained in each of these groups range nearly up to or over 3,000 metres above sea-level, while the highest on February 28th, was as much as 3,792 metres (12,441 feet).\* The times of flight from ascent to descent varied from 8 to 12 hours, and in some cases included entire nights.

In the discussion the results are analysed and differentiated, so to speak, for height, time, rate of increase or decrease of height, progress of cyclonic and anti-cyclonic condition, and are plotted so as to shew the changes at constant height with variable time, and where both height and time are taken as variables.

Taking temperature first: it has been found from about 250 kite flights at Blue Hill that in no case does the decrease of temperature appreciably exceed the adiabatic rate for dry air (about  $1^{\circ}6$  F. for 300 feet), except near the ground, and that in general it approximates to the  $1^{\circ}$  F. in 300 feet, or nearly  $1^{\circ}$  C. in 100 metres, which is found, by balloon ascents and mountain observations, to be the average observed temperature difference with the height.

This average, however, by no means holds continuously from the ground upwards, but is liable to interruptions, in which the law of decrease is suddenly inverted, so that, as Mr. Clayton says—"Within a short distance vertically there is a sharp rise of temperature, and above this the temperature decreases with the elevation as before." Sometimes, as on February 18th, May 27th, &c., two or more of these sudden rises of temperature form breaks in the fall of temperature, with increase of height, so that the curves may be compared to inverted stair steps." These breaks are found in anticyclones as well as in cyclones. They occur with cloudless skies, as well as when the sky is covered with dense clouds. They are found at night as well as by day, and in fact are more marked at the former time. Balloon observers have noticed these inverted gradients, but since they generally occurred about or above the cloud levels, they erroneously attributed them to the insolation on the upper cloud surface. It is obvious, however, that such an explanation entirely fails to account for their prevalence at night.

These strata, of which there are sometimes two or three between the ground and the altitude of 3000 metres, are also bounded by regions of sharp contrasts in a vertical direction of temperature, humidity, and sometimes of wind-direction. These boundaries are, moreover, loci of maximum wind velocity and cloud formation.

There seems thus a marvellous analogy between such air strata which are potentially warmer than the air below them, and super-

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\* On July 19th, 1900, 15,800 ft. was reached with  $4\frac{3}{4}$  miles of wire.

ficial ocean currents, such as the Gulf Stream, Kuro Siwo, &c. Their temporal existence had often been surmised, but such an objective reality and constancy as that shewn by the Blue Hill observations had certainly not been proved heretofore. That variations in the thickness, altitude, temperature, humidity, and velocity of such currents must have an important bearing upon the incidence and prevalence of meteorological conditions is obvious, and if this were the sole outcome of the kite observations at Blue Hill, it would of itself form a valid *raison d'être* for continuing and extending such observations. This, however, is only one of the plums in the cake.

When the general average decrease of temperature with the altitude is compared in cases where cyclonic and anticyclonic conditions were prevalent, it is found that up to all elevations the decrease is greater in cyclones than in anticyclones, agreeing thus with the results found by Dr. Hann, M. Teisserenc de Bort, and others.

The comparison also shews an increasing rate with increase of height, a conclusion entirely in agreement with that derived by Drs. Assman and Berson, from the momentary records of the upper atmosphere with "ballons sondes."

Both the relative and absolute humidities are found to diminish much more rapidly with the height in an anticyclone than in a cyclone. In fact, when the lines of equal condition are traced all through cyclonic and anticyclonic periods, it is found that "above anticyclones and areas of low temperature, the vapour tension approaches zero at all times of the year."

The wind velocity in every case increases with the height, but the increase is much less in the anticyclone than in the cyclone. The table in which this is shewn is so brief, and withal instructive, that we reproduce it here, converted into English measure.

*Increase of wind velocity, with height (in miles per hour).*

	feet.	feet.	feet.
Height in feet .....	0—3280	0—6560	0—9840.
Anticyclones.....	4	8	—
Cyclones .....	17	22	30

The gap at the higher levels above anticyclones simply indicates the frequent absence of sufficient wind above anticyclones to lift the kites continuously to such an altitude.

Another conclusion of considerable importance to which these observations at Blue Hill lead, is that "the curves shewing the changes of temperature at different heights indicate that the temperature changes are alike at all heights, up to at least 3,000 meters (9,843 feet), in other words, the warm and cool periods, occur aloft at the same time that they occur near the ground." Thus what are popularly termed warm and cold waves are not confined to a limited vertical section of the atmosphere, but are connected with grand movements in which the entire vertical section

of the atmosphere is concerned. This conclusion is shewn to accord with observations on Pike's Peak and Fusi-yama, while Teisserenc de Bort's observations with "ballons sondes" carry on the same law to a height of 11 kilometers (36,000 feet). The full meaning of this fact awaits solution, but it certainly negatively disfavours the vertical instability theory of cyclone generation.

Another fact, of perhaps even more prime importance in relation to atmospheric physics, is "that the maximum air temperature at all heights nearly coincides with, but slightly precedes, the minimum of air pressure at sea-level. The minimum of air temperature at the different heights apparently occurs when the air-pressure at sea-level is above normal, but usually some distance in advance of the maximum of air-pressure at sea-level." In other words, the mass of the air in the normal cyclone of the weather map\* is warmer than that of the mass of the air in the anticyclone. This would appear to be rather in opposition to the views promulgated by Dr. Hann, some few years back; but the discrepancy will probably be found in the circumstance that Dr. Hann relied upon mountain observations, which, owing to obvious physical causes, do not give the true values for the free atmosphere at the same level, especially in the element of temperature.

The diagrams which shew the changes in height of the lines of equal condition are, perhaps, the most interesting and instructive of any. They shew, for example, that "the belts of inverted gradient [which represent the air-currents already alluded to] reached their greatest distance from the ground about the time of minimum temperature, and were nearest the ground about the time of maximum temperature." This, taken with the facts mentioned in the preceding paragraph, shews a point which seems to have escaped even the keen eye of Mr. Clayton, viz. : that, approximately, these currents recede from or approach to the earth's surface with the rise and fall of the sectional isobars, indicating the passage of anticyclonic and cyclonic conditions. The bearing of this on weather changes is manifest.

Another very important deduction, though from limited data, is "that the oscillations in the height of the isotherms caused by the diurnal period in temperature occurred only in the stratum below the first belt of inverted gradients." In other words, the normal direct effect of the diurnal heating and cooling on the temperature of the free atmosphere is probably confined entirely within the first 2,000 feet or so above the surface. This agrees with Prof. Hill's observations at Allahabad, and Dr. Hergesell's at Strasbourg.

The same method of comparing the lines of equal wind velocity, or as they may be termed, isovels, shews a remarkable upward extension of the lines of low wind-velocity over the anticyclone, and a downward dip of the lines of high wind-velocity on each side of the line of minimum pressure, with an area of lighter winds between.

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\* This is necessary to distinguish the warm-centred surface cyclone from the theoretical upper air cold-centred cyclone.

Mr. Clayton concludes this exceedingly interesting monograph by first noticing the general results of observations made on mountain peaks and balloons in other parts of the world ; and, to eliminate the effects of insolation and radiation on mountains, recommends that the temperatures at summit and base be taken near 8 p.m., at which epoch both tend to be at their minimum, while the temperature is about the normal for the 24 hours.

He then discusses in the light of the deductions from the data furnished by the Blue Hill kites, the various theories of cyclone and anticyclone generation. This is a bold plunge to take with such comparatively sparse observations ; but it must be admitted that Mr. Clayton makes out a very good *prima facie* case for his conclusions.

After noticing in turn—

- (1) the theory of vertical instability ;
- (2) the convection theory, which may, with some degree of propriety, be termed the theory of horizontal instability ;
- (3) the condensation theory ;
- (4) the driven eddy theory ;

as theories of cyclone generation, he decides in favour of (2) the convection theory, as “the theory with which the observations in the free air with kites best agrees.” At the same time he very properly remarks—“Probably no meteorologist believes that any one of these causes acts entirely alone in cyclone formation. But opinion differs as to which is the principal cause, and to what extent each of the other causes is a subsidiary cause. All the theories agree in ascribing the primary cause to differences of temperature.”

If Mr. Clayton will admit that some of the other causes still contribute in a subsidiary degree to the result, little fault can be found with his conclusion that the horizontal differences of temperature are, perhaps, the major cause ; and since the anticyclone is the necessary complement of the cyclone, the same conclusion applies to its generation, coupled with a certain degree of complexity, due to the fact that areas of high pressure at the surface may be due to the overlapping of pericyclones surrounding both the cold-centred cyclones of the upper air and the warm-centred cyclones of the middle and lower strata.

In any case, it is plain that the kite observations are yielding data of the utmost importance to the advance of both theoretical and practical meteorology ; and are enabling us at last to learn what is really happening in that third dimension of space, which is inaccessible and whose conditions are for the most part either averaged into a single quantity or unrepresented in the charts constructed from observations ordinarily available to dwellers on the surface of our globe.



# THE WEATHER OF AUGUST.—COLD PERIODS.

*To the Editor of the Meteorological Magazine.*

SIR,—July this year, was, we know, very hot; and August was cool. A hot July apparently tends to be followed by a hot August; that is, it is so followed about twice as often as by a cool one. But there is a curious fact *per contra*; which may be correlated with the general contrast in temperature of summers in the earlier and the later half of decades, to which I have recently referred. It is, that of eighteen years ending 0, 1 and 2 (*i.e.*, in the last six decades), only one (1852) had a summer in which both July and August were *hot*. On the other hand, of eighteen years ending 5, 6 and 7, only two (1845 and 1866) had summers in which both July and August were *cool*. Thus, it was probable, I think, that last August would be cool.

The Jubilee summer (1887), which Londoners remember as very hot, does not come out prominently in Mr. Parbury's table (p. 119) for the Godalming district, with only July hot; at Greenwich all three months were hot. This table brings out very well one aspect of the fact of a recent cold period followed by a warm one.

If we consider years in tens (1841 to 1850, 1842 to 1851, and so on), averaging, *e.g.*, the mean temperature of December to March, in each 10-year group, we perceive a very prominent wave crest, or centre, of cold, about 1890, and another, less conspicuous, about 1856; while a centre of warmth, or mildness, lies about midway between those dates. Now, from 1856 to 1890 is 34 years, which agrees very well with Brückner's cycle (average 35 years). But then 1856 falls in one of Brückner's *warm* periods (1851–70); as also, presumably, 1890, since a cold period ends in 1885. And our warm centre, about 1873, falls in the *cold* period 1870–85. Are we, then, to suppose that London is in one of his "exceptional regions" (*Ausnahme gebiete*), as regards temperature?

Curiously, however, if we average our rainfall in 10 year groups, we find conspicuous centres of *dryness* about 1859, and, probably, 1894; and a wet centre about 1876; and these fall in Brückner's normal dry and wet periods respectively. They are associated, too, with the appropriate barometric conditions. Thus rainfall and pressure are apparently normal, while temperature is anomalous.

We find this kind of sequence: cold centre about 1856, followed by dry centre 1859 (3 years later); warm centre 1873, followed by wet centre 1876 (3 years later); cold centre 1890, followed by dry centre (say) 1894 (4 years later).

The rainfall in these 10-year groups, about the dry and wet centres, may be indicated:—

Ten years about	1859,	rainfall	224.1	inches.
"	"	1876	"	268.2 "
"	"	1894	"	221.7 "

It may be mentioned that Brückner's cold and wet periods are

nearly synchronous, likewise his warm and dry periods; but the wet sometimes last a little beyond the cold.

Perhaps some of your readers who may have studied the subject would give us their views on the above anomaly. I may possibly be under some misapprehension as to Brückner's ideas, and should be glad, in that case, to be corrected.—Yours faithfully,

A. B. M.

## DOUBLE LUNAR RAINBOW.

*To the Editor of the Meteorological Magazine.*

SIR,—Yesterday evening I was fortunate enough to see a most beautiful example of a double lunar rainbow; the primary bow was very bright, quite complete, and showed the prismatic colours most clearly; the secondary bow was faint, but also almost complete, though the colour was barely discernible; the appearance lasted from 9.10 to 9.30 p.m.

Both the rainbows were apparently projected on a background of absolutely clear sky, so that at 9.20 I could clearly see the third magnitude stars  $\theta$  and  $\psi$ , Ursæ Majoris, shining *through* the primary bow; this apparent absence of cloud is not unfrequent with a solar rainbow, but I have never seen it before in the case of a lunar rainbow.

The softness and brilliancy of the whole phenomenon was most remarkable.—Yours truly,

CHARLES L. BROOK.

*Harewood Lodge, Meltham, October 5th, 1900*

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## ANOTHER USE FOR THE KITE.

A few years since we had occasion to enumerate the various uses to which ingenious men have applied the kite. Among these was its application to the saving of life by carrying a line from a shipwrecked vessel over the breakers to the wreckers on the shore beyond. We now learn that two young men in Chicago have given an exhibition showing how those within a besieged town or other inaccessible place can use the kite line to carry a telephone, with its separate telephone wire, through the air, and let it drop from the kite upon a distant place while the kite still remains in the air. By using a very large box kite, and attaching to the kite line a little way below the kite a pulley through which runs the telephone wire, the telephone may be dropped from the pulley, while the insulated wire keeps up the connection with the man at the kite reel. Of course, at the present time, when kites have rarely been sent out with more than two miles of wire, which corresponds to a horizontal distance of much less than two miles, this method does not promise to put us into communication with persons at a great distance, but it may, of course, be very useful for short distances.—*Monthly Weather Review.*

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MARCH, 1900.

STATIONS.  (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	58·6	12	23·4	18	46·9	33·7	33·6	79	97·1	20·2	·79	7	6·7
Malta .....	71·7	28	41·8	12	62·4	49·8	45·9	73	133·7	36·1	1·04	7	4·0
Cape of Good Hope ...	87·3	3	45·4	21	75·7	58·4	56·4	77	...	...	·65	5	3·7
Mauritius .....	85·6	16	67·2	3	83·6	73·7	71·0	81	156·7	61·3	9·15	23	5·3
Calcutta .....	101·7	20	60·5	1	94·5	71·5	67·7	62	153·9	54·5	·12	4	1·8
Bombay .....	91·7	13	69·8	5	85·7	73·3	70·1	74	133·5	61·6	·00	0	1·5
Ceylon, Colombo .....	95·5	27	73·0	12	94·0	75·7	73·0	73	153·0	68·0	3·71	7	1·2
Melbourne .....	89·8	13	45·6	29	72·6	53·4	51·1	67	148·8	39·5	3·95	11	5·6
Adelaide .....	103·2	13	47·9	25	76·9	57·6	51·6	57	153·7	41·2	2·76	11	5·2
Sydney .....	88·9	18	57·5	22	76·5	64·6	57·3	72	149·0	49·2	6·02	14	...
Wellington .....	75·0	2	46·0	10	68·7	54·3	50·4	68	128·0	39·0	3·56	8	4·2
Auckland .....	78·5	9	54·5	18a	72·9	59·5	55·4	68	139·0	51·0	1·52	10	4·5
Jamaica, Halfway Tree	89·0	20	63·0	14	84·6	68·2	65·4	72	...	...	·28	2	3·1
Trinidad .....	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada .....	86·4	16	70·2	1	83·3	73·0	68·9	70	160·0	...	1·94	14	2·7
Toronto .....	43·8	6	—3·0	5	32·0	15·4	19·0	76	57·9	—6·0	3·45	12	5·1
New Brunswick, Fredericton .....	50·3	20	—20·0	6	36·1	12·0	13·0	62	...	...	3·67	7	4·9
Manitoba, Winnipeg Victoria, British Columbia, .....	47·2 67·0	31 31	—24·5 34·8	4 5	23·6 53·6	1·0 43·1	... ...	... ...	... ...	... ...	·68 3·63	8 15	5·6 6·4

a—and 21.

REMARKS.

MALTA.—Adopted mean temp. 55°·0, or 0°·9 below average. Mean hourly velocity of wind 10·8 miles, or 0·1 below average. Mean temp. of sea 61°·4. TSS on 6th and 18th; H on 5th, 7th and 18th. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·3, of dew point 1°·0, and rainfall ·86 in., above their respective averages. Mean hourly velocity of wind 8·7 miles, or 2·3 below average; extremes, 22·9 on 20th and 1·6 on 12th; prevailing direction, S.E. by E. and E.S.E. L and T on 6th to 8th and 23rd to 25th; L on 9th, and T on 14th and 22nd. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 84°·3, or 2°·4 above, of dew point 0°·1 above, and rainfall 1·07 in. below, their respective averages. Mean hourly velocity of wind 6 miles; prevailing direction, S.W. TSS on 27th and 30th; L on 8 days. H. O. BARNARD.

Adelaide.—Mean temp. of air 3°·3 below the average, and the lowest, with one exception, in 43 years. R 1·74 in. above the average. A splendid opening for the season this month; good rains falling all over the settled areas and extending well into the centre of the Continent. C. TODD, F.R.S.

Sydney.—Temp. 1°·3 above, humidity 3·8 below, and rainfall ·80 in. above, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Fine in the early part of the month; heavy R from the South between the 23rd and 26th. Prevailing winds N.W., frequently strong. Temp. 4°·5 above, and rainfall ·03 in. above, their respective averages. R. B. GORE.

Auckland.—With the exception of some slight showers, fine and dry throughout the month. Mean temp. slightly above, and rainfall nearly one inch below, the average. The fifth consecutive month with rainfall much less than the normal. T. F. CHEESEMAN.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, APRIL, 1900.

STATIONS.	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
<i>(Those in italics are South of the Equator.)</i>	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	76·4	21	25·1	2	58·6	39·5	...	...	113·2	18·3	·98	15	5·2
Malta	75·9	29	45·4	3	65·6	52·4	51·2	78	139·5	42·5	2·18	9	2·6
Cape of Good Hope	88·9	3	48·4	29	73·9	58·1	59·1	82	...	...	1·45	8	5·1
Mauritius	83·5	6	66·3	13	81·3	72·0	69·6	81	146·2	59·3	3·16	15	6·3
Calcutta	103·6	2	69·0	10	96·3	76·4	72·7	66	158·1	68·1	2·75	5	3·9
Bombay	90·9	30	74·6	4	88·2	77·5	74·3	76	134·9	67·3	·00	0	1·9
Ceylon, Colombo	93·7	4a	73·0	24	90·4	76·2	75·9	83	152·4	71·0	9·73	21	5·4
Melbourne	74·0	8	39·6	16	62·5	50·1	49·4	83	134·2	36·0	4·97	19	7·7
Adelaide	73·8	22	43·9	15	67·3	53·4	50·6	71	136·3	37·0	3·70	18	7·3
Sydney	77·0	10	47·7	16	69·2	56·6	53·5	78	129·4	41·0	5·40	13	5·5
Wellington	70·0	14b	42·0	27c	63·4	53·1	50·3	75	117·0	33·0	5·53	18	5·1
Auckland	76·5	2	47·0	29	70·3	59·8	54·9	69	132·0	43·0	1·94	16	5·5
Jamaica, Halfway Tree	89·0	19	64·6	7	85·4	69·5	68·1	75	...	...	2·38	5	2·8
Trinidad	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada	87·0	2, 7	70·0	25	84·4	74·6	70·4	73	154·2	...	2·38	14	3·0
Toronto	70·7	23	21·3	9	54·5	36·6	35·3	67	91·5	18·0	1·83	11	5·2
New Brunswick, Fredericton	76·1	21	19·2	5	51·4	29·4	24·8	56	...	...	2·87	10	6·0
Manitoba, Winnipeg	79·2	23	16·0	16	64·2	31·6	...	...	...	...	·30	5	3·4
Victoria, British Columbia	75·3	29	35·2	8	58·0	43·6	...	...	...	...	·87	9	5·5

a—8, 17. b—and 18. c—and 29.

## REMARKS.

**MALTA.**—Adopted mean temp. 58°·1, or 1°·5 below average. Mean hourly velocity of wind 10·6 miles, or 1·2 below average. Mean temp. of sea 62°·2. TSS on 5 days; L on 1st and 20th; H on 3 days. J. F. DOBSON.

**Mauritius.**—Mean temp. of air equal to, of dew point 1°·2 above, and rainfall 2·20 in. below, their respective averages. Mean hourly velocity of wind 10·1 miles, or 0·5 mile below the average; extremes, 25·8 on 18th and 2·1 on 13th; prevailing direction, E.S.E. L and T on 6 days. T. F. CLAXTON.

**CEYLON, COLOMBO.**—Mean temp. of air 82°·6, or 0°·1 above, of dew point 1°·6 above, and rainfall 1·58 in. below, their respective averages. Mean hourly velocity of wind 7·1 miles; prevailing direction S.W. TSS occurred on 11 days; L alone was seen on 5 days. H. O. BARNARD.

**Adelaide.**—The coldest April in 43 years: mean temp. 3°·8 below the average. The previous lowest max. was 81°·2 in 1876. Also very cloudy—the most cloudy April in 32 years. Rain double the average. Good general agricultural rains all over Colony. C. TODD, F.R.S.

**Sydney.**—Temperature 1°·7 below, humidity 0°·1 above, and rainfall ·12 in. below, their respective averages. H. C. RUSSELL, F.R.S.

**Wellington.**—Heavy rains during the month. Prevailing winds N.W., frequently strong. A few fine, pleasant days. Hail on 27th; fog on 13th and 14th. Temp. 1°·2 above, and rainfall 2·01 in. above, their respective averages. R. B. GORE.

**Auckland.**—An unusually dry April, the rainfall being 1·25 in. under the average of 30 years. Mean temp. quite 3° above the average. T. F. CHEESEMAN.

SUPPLEMENTARY TABLE OF RAINFALL,  
SEPTEMBER, 1900.

Div.	STATION.	Total Rain. in.	Div.	STATION.	Total Rain. in.
I.	Uxbridge, Harefield Pk..	·67	XI.	Builth, Abergwesyn Vic.	3·22
II.	Dorking, Abinger Hall ..	...	„	Rhayader, Nantgwillt ...	1·99
„	Birchington, Thor .....	·47	„	Lake Vyrnwy .....	1·97
„	Hailsham .....	1·35	„	Corwen, Rhug .....	·95
„	Ryde, Thornbrough .....	1·28	„	Criccieth, Talarvor .....	1·19
„	Emsworth, Redlands ...	·66	„	I. of Anglesey, Lligwy..	1·82
„	Alton, Ashdell .....	1·09	„	I. of Man, Douglas .....	2·16
III.	Oxford, Magdalen Coll..	·36	XII.	Stoneykirk, Ardwell Ho.	2·61
„	Banbury, Bloxham .....	·43	„	New Galloway, Glenlee	3·75
„	Northampton, Sedgebrook	·55	„	Mouhaive, Maxwellton Ho.	3·38
„	Alconbury .....	·35	„	Lilliesleaf, Riddell .....	1·77
„	Wisbech, Bank House...	·51	XIII.	N. Esk Res. [Penicuick]	3·95
IV.	Southend .....	·82	XIV.	Glasgow, Queen's Park..	3·70
„	Colchester, Lexden .....	·69	XV.	Inverary, Newtown .....	8·48
„	Saffron Waldon, Newport	·66	„	Billachulish, Ardsheal ...	8·82
„	Rendlesham Hall .....	·77	„	Islay .....	4·68
„	Scole Rectory .....	...	XVI.	Dollar .....	4·91
„	Swaffham .....	·67	„	Balquhider, Stronvar...	6·80
V.	Salisbury, Alderbury ...	·83	„	Coupar Angus Station...	1·92
„	Bishop's Cannings .....	·86	„	Blair Atholl ... ..	2·90
„	Blandford, Whatcombe ..	1·39	XVII.	Keith H.R.S. ....	2·23
„	Ashburton, Holne Vic...	2·26	„	Forres H.R.S. ....	1·85
„	Okehampton, Oaklands ..	1·73	XVIII.	Fearn, Lower Pitkerrie..	1·81
„	Hartland Abbey .....	2·01	„	S. Uist, Askernish .....	3·53
„	Lynton, Glenthorne ...	1·81	„	Invergarry .....	5·50
„	Probus, Lamellyn .....	1·81	„	Aviemore, Alvie Mansc.	3·68
„	Wellington, The Avenue	·64	„	Loch Ness, Drumnadrochit	2·94
„	North Cadbury Rectory	·46	XIX.	Invershin .....	1·84
VI.	Clifton, Pembroke Road	·80	„	Durness .....	6·72
„	Ross, The Graig .....	·40	„	Watten H.R.S. ....	2·48
„	Wem, Clive Vicarage ...	·79	XX.	Dunmanway, Coolkelure	3·23
„	Wolverhampton, Tettenhall	1·23	„	Cork, Wellesley Terrace	·83
„	Cheadle, The Heath Ho.	1·22	„	Killarney, Woodlawn ..	2·25
„	Coventry, Priory Row ..	·53	„	Caher, Duneske .....	·72
VII.	Market Overton .....	·38	„	Ballingarry, Hazelfort...	1·31
„	Grantham, Stainby .....	·21	„	Limerick, Kilcornan ...	1·05
„	Horncastle, Bucknall ...	...	„	Miltown Malbay .....	2·93
„	Worksop, Hodsock Priory	1·28	XXI.	Gorey, Courtown House	·87
VIII.	Neston, Hinderton .....	·62	„	Moynalty, Westland ...	1·78
„	Southport, Hesketh Park	1·86	„	Athlone, Twyford .....	2·03
„	Chatburn, Middlewood..	2·26	„	Mullingar, Belvedere ...	1·73
„	Duddon Val., Seathwaite Vic.	7·29	XXII.	Woodlawn .....	2·38
IX.	Melmerby, Balderby ...	·86	„	Crossmolina, Enniscoe ..	2·81
„	Scalby, Silverdale .....	·66	„	Collooney, Markree Obs.	2·64
„	Ingleby Greenhow Vic..	·82	XXIII.	Euniskillen, Model Sch.	...
„	Middleton, Mickleton ...	·93	„	Warrenpoint .....	1·37
X.	Haltwhistle, Unthank H.	2·15	„	Seaforde .....	1·56
„	Bamburgh .....	·78	„	Belfast, Springfield .....	2·56
„	Keswick, The Bank .....	4·97	„	Bushmills, Dundarave..	3·52
XI.	Llanfrechfa Grange .....	1·72	„	Stewartstown .....	2·32
„	Llandovery .....	2·57	„	Killybegs .....	4·32
„	Castle Malgwyn .....	1·77	„	Horn Head .....	3·12
„	Brecknock, The Barracks	...			

## SEPTEMBER, 1900.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which ·01 or more fall.	TEMPERATURE.				No. of Nights below 32°.	
		Total Fall.	Differ- ence from average 1880-9.	Greatest Fall in 24 hours.		Max.		Min.		In shade.	On grass.		
				Dpth	Date			Deg.	Date			Deg.	Date.
I.	London (Camden Square) ...	·79	— 1·72	·41	27	7	80·4	16	42·6	4	0	0	
II.	Tenterden .....	·88	— 2·03	·54	27	6	80·0	16	42·0	4d	0	0	
III.	Hartley Wintney .....	·73	—	·34	27	6	77·0	16b	35·0	4	0	8	
IV.	Hitchin .....	·36	— 2·14	·12	30	7	77·0	16	39·0	11	0	...	
V.	Winslow (Addington) .....	·49	— 2·18	·18	26	5	75·0	16	35·0	6	0	0	
VI.	Bury St. Edmunds (Westley) .....	·66	— 2·04	·22	27	5	72·0	16	45·0	25	0	...	
VII.	Norwich (Brundall) .....	·89	...	·18	27	11	80·0	16	41·2	25	0	0	
VIII.	Winterbourne Steepleton ...	1·74	...	·59	30	8	71·0	8	35·0	4	0	4	
IX.	Torquay (Cary Green) ...	1·05	...	·32	26	8	72·9	8	45·7	7	0	0	
X.	Polapit Tamar [Launceston]..	1·87	— 1·84	·58	1	16	74·8	7	31·7	6	1	2	
XI.	Stroud (Upfield) .....	·40	— 2·51	·15	30	6	72·0	8	42·0	30	0	...	
XII.	Church Stretton (Woolstaston) .....	·72	— 1·78	·22	30	11	78·0	16	41·0	3	0	0	
XIII.	Worcester (Diglis Lock) .....	·98	— 1·46	·26	22	6	...	...	...	...	...	...	
XIV.	Boston .....	·40	— 2·37	·30	30	4	75·0	6, 12	40·0	20e	0	...	
XV.	Hesley Hall [Tickhill].....	1·27	— ·89	·99	16	6	70·0	22	38·0	21f	0	0	
XVI.	Breadsall Priory .....	·84	...	·44	30	5	...	...	...	...	...	...	
XVII.	Manchester (Plymouth Grove) .....	1·23	— 2·24	·30	26	12	79·0	16	40·0	19	0	0	
XVIII.	Wetherby (Ribston Hall) ...	·79	— 1·67	·31	7	6	...	...	...	...	...	...	
XIX.	Skipton (Arncliffe) .....	2·41	— 2·35	·65	26	16	...	...	...	...	...	...	
XX.	Hull (Pearson Park) .....	1·37	— 1·07	·77	16	7	73·0	13	37·0	14	0	0	
XXI.	Newcastle (Town Moor) .....	·90	— 1·88	·35	7	11	...	...	...	...	...	...	
XXII.	Borrowdale (Seathwaite).....	10·19	— 1·54	2·95	26	16	77·3	15	36·3	3	0	...	
XXIII.	Cardiff (Ely) .....	1·44	— 2·30	·45	26	10	...	...	...	...	...	...	
XXIV.	Haverfordwest .....	2·72	— 1·68	1·29	29	13	73·2	16	37·7	20	0	1	
XXV.	Aberystwith (Gogerddan) ...	3·78	— ·49	·65	21	15	78·0	13	...	...	...	...	
XXVI.	Llandudno .....	1·05	— 1·17	·21	27	13	72·5	16	43·5	3	0	...	
XXVII.	Cargen [Dumfries] .....	3·33	— ·23	1·12	26	16	71·0	15c	37·0	3	0	0	
XXVIII.	Edinburgh (Blacket Place)...	1·86	...	·58	26	17	70·2	14	38·0	3	0	0	
XXIX.	Colmonell .....	3·71	...	·91	26	16	80·0	13	35·0	2	0	...	
XXX.	Tighnabruaich .....	5·62	...	1·24	26	16	62·0	9, 17	39·0	2	0	...	
XXXI.	Mull (Quinish) .....	5·97	+ ·94	1·06	26	20	...	...	...	...	...	...	
XXXII.	Loch Leven Sluices .....	3·40	— ·61	1·10	27	9	...	...	...	...	...	...	
XXXIII.	Dundee (Eastern Necropolis) .....	2·30	— ·21	·85	26	14	74·4	14	34·4	3	0	...	
XXXIV.	Braemar .....	2·49	— ·37	·46	23a	15	72·0	15	30·4	3	1	8	
XXXV.	Aberdeen (Cranford) .....	2·20	...	·53	26	21	70·0	14	30·0	24	...	...	
XXXVI.	Cawdor (Budgate) .....	2·78	+ ·03	·53	26	18	...	...	...	...	...	...	
XXXVII.	Strathconan [Beaully] .....	4·15	+ ·47	·65	27	14	...	...	...	...	...	...	
XXXVIII.	Glencarron Lodge .....	8·70	...	1·70	26	22	73·2	15	35·1	3	0	...	
XXXIX.	Dunrobin .....	2·34	— ·25	·55	26	13	66·0	20	26·0	26	0	...	
XL.	S. Ronaldshay (Roeberry) ...	3·32	+ ·66	·66	25	21	66·0	14	39·0	25	0	...	
XLI.	Darrynane Abbey .....	1·51	...	·53	29	16	...	...	...	...	...	...	
XLII.	Waterford (Brook Lodge) ...	1·14	— 1·78	·46	29	6	70·0	7, 16	35·0	4	0	...	
XLIII.	Broadford (Hurdlestown) ...	...	...	...	...	...	...	...	...	...	...	...	
XLIV.	Carlow (Browne's Hill) .....	1·32	— 1·50	·43	17	8	...	...	...	...	...	...	
XLV.	Dublin (Fitz William Square) .....	·91	— 1·06	·26	17	10	68·9	23	41·2	12	0	0	
XLVI.	Ballinasloe .....	2·07	— ·72	·61	26	15	67·0	13g	41·0	3	0	...	
XLVII.	Clifden (Kylemore) .....	4·01	...	1·00	28	14	...	...	...	...	...	...	
XLVIII.	Waringstown .....	2·19	— ·97	·39	1	11	74·0	...	35·0	...	0	...	
XLIX.	Londonderry (Creggan Res.) .....	3·34	— ·44	·78	29	20	...	...	...	...	...	...	
L.	Omagh (Edenfel) .....	2·84	— ·54	·92	29	16	72·0	13	33·0	2	0	1	

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

a—and 29. b—and 17, 18. c—and 16. d—and 21, 26. e—and 25. f—and 22. g—and 14.

# METEOROLOGICAL NOTES ON SEPTEMBER, 1900.

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.

TENTERDEN.—Another month of drought and heat; ponds and ditches being empty or very low. Graziers call it the worst year for scarcity of grass since 1893. The mean temp. was higher than in 1899, but considerably lower than in 1895 and 1898. Duration of sunshine 204 hours. Absolute drought for 15 days ended on 16th, and partial drought for 30 days, with .24 in. of R ended on 26th.

HARTLEY WINTNEY.—A dry month, with much sunshine. R fell on 6 days only, being 1.74 in. below the average. The driest September since 1890. Ozone on eight days, with a mean of 2.6.

WINSLOW, ADDINGTON.—A very fine month, with not a drop of R until the 24th. Only once in 30 years has less R fallen in September, but in 1898 only .41 in. fell on 4 days.

BURY ST. EDMUNDS, WESTLEY.—A fine, dry month. Since 1856 there have been only 4 drier Septembers.

NORWICH, BRUNDALL.—A very fine, warm and dry month. Distant L on 16th.

WINTERBOURNE STEEPLETON.—The principal feature of the month was the drought of 20 days duration, during which bright sunshine prevailed daily, with only about three exceptions.

TORQUAY, CARY GREEN.—R 1.31 in. below, and mean temp. 0°·7 above, the average. Duration of sunshine 22 hours 15 mins. above the average. No sunless day. Mean ozone 5.4; greatest daily amount 7.0, with S. to W. winds; least, 0.5, with N.E. wind.

POLAPIT TAMAR [LAUNCESTON].—Very dry on the whole for the first three weeks. The comparatively calm weather that prevailed throughout was particularly noticeable. Heavy T and vivid L between 4.30 and 5 a.m. on 16th.

BREADSALL PRIORY.—An exceptionally dry month.

MANCHESTER, PLYMOUTH GROVE.—Upon the whole very fine weather prevailed.

## WALES.

HAVERFORDWEST.—A fine, bright month generally. Temp. high, with abundance of bright sunshine. Wet weather set in after the 20th, with a good deal of fog, and the last five days were stormy. Corn crops were harvested in good condition, and the quality of the grain is fairly good. Potatoes were not nearly so good as usual, and fruit crops, though abundant, did not ripen well. Duration of bright sunshine, 122.4 hours. Slight TS on 16th.

ABERYSTWITH, GOGERDDAN.—A very fine month, but showery during the last fortnight.

## SCOTLAND.

CARGEN [DUMFRIES].—A wet, unsettled month; very unfavourable for harvest operations in the later districts.

EDINBURGH, BLACKET PLACE.—Mean temp.  $1^{\circ}\cdot 5$  above, and R 36 per cent. below, the average. Dense fog on the mornings of 16th and 17th.

COLMONELL, CLACHANTON.—R  $\cdot 40$  in. below, and mean temp.  $57^{\circ}\cdot 8$ , or  $4^{\circ}\cdot 1$  above, the average of 24 years. Gales on four occasions.

TIGHNABRUACH.—In the first part of the month the weather was good; calm and foggy in the mornings. During the second half there were strong winds and too much R.

ABERDEEN, CRANFORD.—Very little sunshine during the month.

S. RONALDSHAY, ROEBERRY.—The weather was very good until the 21st, but the latter part was very unsettled. Mean temp.  $51^{\circ}\cdot 9$ , or  $0^{\circ}\cdot 3$  above the average of 10 years.

## IRELAND.

DARRYNANE ABBEY.—A dry month, especially in the first half, which was fine and warm. Only  $\cdot 10$  in. of R fell from the 1st to the 16th.

WATERFORD, BROOK LODGE.—Absolute drought for the first 16 days of the month. Thick fog on several mornings. Mean temp.  $56^{\circ}\cdot 2$ .

DUBLIN, FITZWILLIAM SQUARE.—A very fine and enjoyable month. Absolute drought prevailed until the 17th, but from the 20th onward less settled weather was experienced and R fell frequently. Mean temp.  $57^{\circ}\cdot 6$ , or  $1^{\circ}\cdot 8$  above the average. High winds were noted on 8 days, but attained the force of a gale on only one occasion, the 26th. Fog on 7 days. Solar halo on 18th.

OMAGH, EDENFEL.—There was hardly any interruption to the magnificent harvest weather that commenced on August 25th, and only terminated on September 22nd, but there has seldom been so great irregularity in the ripening of cereals, for while on some soils an abundant harvest was gathered well within the fine period mentioned, on a large area of this county the sodden shocks still filled the fields on October 6th, for the weather that broke on September 23rd still showed no signs of changing from the saturating rains that have since prevailed.



# SYMONS'S

## MONTHLY

# METEOROLOGICAL MAGAZINE.

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### HEAVY RAINFALL IN DURHAM AND NORTHUMBERLAND, ON OCTOBER 26TH, 1900.

A very exceptional fall of rain and snow occurred in Durham and Northumberland on October 26th, more than three inches being recorded at Durham, Sunderland, Newcastle, North Shields and Morpeth. The fall was a prolonged one, lasting about 15 hours, and was accompanied by a gale, but neither lightning nor thunder is reported from the district.

At Sunderland sleet began to fall just after 5 p.m. on Friday, October 26th, and sleet and snow fell continuously until about 10.15 p.m. when it changed to rain which lasted until after 9 a.m. on Saturday, the 27th.

At Newcastle rain and sleet began to fall in earnest about 6 p.m. on Friday, the 26th, and continued, practically without diminution, until 8 a.m. on Saturday, the 27th. Up to midnight on Friday 1.70 in. had fallen, and by 9 a.m. on Saturday 27th a further 2.02 in.

The Observer at the Deaf and Dumb Institution on the Town Moor, remarks that the fall (3.33 in.) is the greatest registered since the observations began in 1868, and exceeds the next greatest fall (2.60 in. on August 12th, 1890) by nearly three quarters of an inch.

How severe was the flooding around Newcastle, and the damage resulting, is shown by the following brief summary of the effect on the North Eastern Railway Company's System. Out of Newcastle the Carlisle line and the south line via Leamside were the only lines working. The north line was completely blocked, the mail train for Edinburgh being sent via Carlisle. The Blyth and Tyne line was open as far as Benton. The Team Valley line was blocked. The Consett line was blocked. The South Shields line was blocked. At noon on Saturday there were no bookings for South Shields except by Cleadon Lane. There were no bookings beyond Tynemouth, and passengers going to Blyth had to book to Tynemouth and walk to Whitley, where they got the connection. Passengers from Alnwick were brought round by Morpeth to Whitley, whence they had to walk to Tynemouth. At Cullercoats the block was still complete.

We have obtained many extra returns of rainfall, which are given in the following table, but still more will be available when the whole of the returns are received at the end of the year.

The area over which the fall exceeded three inches, extends from Durham to Morpeth, or about 30 miles from south to north, but was probably not more than half that amount from east to west. The fall exceeded two inches from Ingleby Greenhow, in North Yorkshire, to Bamburgh, in Northumberland, a distance of nearly 80 miles, while the greatest width was probably about 25 miles.

*Rainfall in the North-east of England from October 25th to 28th, 1900.*

STATIONS. <i>York, N.R.</i>	OBSERVERS.	OCTOBER.			
		25	26	27	28
Baldersby .....	W. Gregson, Esq. ....	·21	·65	·01	·40
Ingleby Greenhow Vic. ....	Rev. J. Hawell .....	·27	2·37	·24	·46
East Layton .....	Mrs. Proud .....	·30	·68	...	·53
Middlesborough (Ormesby) ...	W. S. Tailyour, Esq. ...	·14	2·52*	·13	·42
" (Albert Park) .....	J. M. Parnaby, Esq. ....	·41	2·85	...	...
Mickleton .....	Mr. W. Burney .....	·27	·79	...	·40
<i>Durham.</i>					
Darlington (Elcote, Hurworth)	Rev. W. E. Stewart ...	·19	2·04	·01	·46
" (Cleveland Parade) .....	W. W. Willmott, Esq. ....	·12	2·03	...	·47
Barnard Castle (County Schl.)	E. Wells, Esq. ....	·10	1·28	...	·49
Bishop Auckland (The Castle)	Mr. E. Ford .....	·15	2·38	...	·33
West Hartlepool (Lynn St.)..	Mr. H. Lamb .....	·12	1·45	·10	·17
Wolsingham .....	Mr. A. Mitchell .....	·24	2·14	·02	·30
Eastgate (All Saints' Vicarage)	Rev. J. G. B. Knight ...	...	1·85	...	...
Wearhead .....	Mr. Rust .....	·54	·87	...	·28
Durham (Old Elvet) .....	T. Eustan Hill, Esq. ...	...	3·22	...	...
Ushaw College .....	Rev. J. Corbishley .....	·19	2·34	...	·26
Weardale W.W. (Tunstall)...	R. Askwith, Esq., C.E. ...	·26	2·35	...	·25
" " (Waskerley) .....	" "	·18	1·08	·48	·07
Consett W.W. (Smiddy Shaw)	" "	·19	1·67	...	·22
Seaham Harbour .....	Mr. G. H. Aird .....	·13	2·29	·10	·28
Sunderland (W. Hendon Ho.)	T. W. Backhouse, Esq. ...	·04	3·28	·23	·19
" .....	Councillor Vint .....	...	3·65	...	...
Ryton-on-Tyne .....	J. P. Dalton, Esq. ....	·16	2·34	...	·22
<i>Northumberland.</i>					
Haltwhistle (Unthank Hall)	Rev. D. Dixon Brown ...	...	·56	...	·30
Corbridge (Howden Dene) ...	J. H. Straker, Esq. ....	·27	1·53	...	·20
Newcastle (Clifton Road).....	Dr. Merz .....	·14	2·38	·01	·23
" (Chronicle Office) .....	A. Yarrow, Esq. ....	...	3·72	...	...
" (Town Moor) .....	A. Wright, Esq. ....	·15	3·33	·01	·22
" (Welburn Jesmond) .....	W. H. Holmes, Esq. ...	...	3·68	...	...
North Shields (Chirton Cot.)	J. F. Spence, Esq. ....	·06	3·05	·09	·24
Meldon (Gallowhill Hall).....	Mr. J. J. Bray .....	·25	1·85	...	·13
Scots Gap (Wallington) .....	Mr. Keith .....	·29	2·00	·10	·15
Morpeth (Bothalhaugh Lawn)	Hon. and Rev. W. C. Ellis	·17	3·22	...	·12
" ( " Garden) .....	" "	·20	3·69	...	·13
Rothbury (Crag-side).....	W. Bertram, Esq. ....	·30	2·55	...	·03
Howick Hall .....	Mr. G. H. Ackroyd .....	·07	2·85	·03	...
Bamburgh .....	Mr. W. C. Good ..	·10	2·22	·03	...
Pawston [Coldstream] ... ..	B. P. Selby, Esq. ....	·26	1·26	·02	...

\* Gauge overflowed.

The following notes have been selected to put on record, as far as possible, definite statements, by which the height of the flood can be compared with similar visitations in future. It would be of great scientific interest and much practical utility if the local authorities would put permanent marks of the height reached by the flood, as our old friend, the founder of this Magazine, so often urged in its pages.

## NOTES FROM THE NEWSPAPER PRESS.

*Arranged from South to North.*

### YORKSHIRE.

*Northallerton.*—The town street was inundated from the Town Hall to the Church. The Railway Hotel, and nine adjoining houses, were flooded, and the engine fires of the corn-mill were extinguished.

*Middlesborough.*—Messrs. Sadler's Chemical Works, the Teeside bridge-works, and the North Ormesby Gasworks, were flooded.

### DURHAM.

*Darlington.*—The river Skerne overflowed, and the low-lying streets were flooded, passengers being carried through in carts.

*Stockton.*—In Bedford-street the lower rooms of the houses were flooded, and the inhabitants were removed in a boat; several pigs were drowned. Near Eaglescliffe, the water was so deep that trains had to proceed slowly through it.

*Hartlepool.*—In Murray-street, West Hartlepool, the water was, in places, 6 ft. deep, and hundreds of houses had their basements flooded. At Hart Station, the embankment was seriously undermined, and the end of one of the platforms was washed away.

*Durham.*—The river overflowed its banks, and along Framwell-gate the water was nearly 2 ft. deep in the lower rooms of the houses. The main road, between Coxhoe and Cornforth, was flooded to a depth of 4 ft., near Cornforth-bridge.

*Seaham Harbour.*—The railway embankment, midway between Seaham Harbour and Seaham Colliery, slipped away for a distance of about 20 yards, leaving the rails unsupported.

*Chester-le-Street.*—The main road, which crosses Chester Dene, was seriously damaged, a large portion of it sliding down into the Dene.

*Lamesley.*—At Long Acre Farm, a cow and three sheep were drowned.

*Sunderland.*—At Ashbrooke, about 4 a.m., a family in a house at Glen Path was awakened by the sound of water, and took refuge in a neighbour's; it was subsequently found that the water had risen to a height of 8 ft. in the house. Glen Villa was also flooded to a depth of about 6 ft. In some cottages behind St. Luke's-road, Pallion, the water was 3 ft. deep.

### NORTHUMBERLAND.

*Slaggyford.*—A farmer was drowned on his way home from Haltwhistle, having, it is supposed, missed the footbridge in the darkness.

*Newcastle District.*—At the Teams and Dunston, a huge lake extended from the "Magpie" Inn, at the tram terminus, right round by Canobie-terrace,

Eslington Park Grounds, and along the main road to Dunston. The residents of the "Magpie" Hotel were assisted from the upstairs windows by the aid of a ladder. At the fire-brick works of Messrs. Lucas Bros., the kilns were put out, and it was estimated that 10,000 bricks were washed away. The Team Valley railway was flooded, and the first passenger train did not get through until 10.30 a.m. At Felling Shore two horses were drowned during the night. At Jarrow, at Messrs. Richardson's paper mills, there was four or five feet of water, while at the manager's house it rose almost to the bedroom windows, and at some of the workmen's houses it was above the tops of the street doors. At Jesmond Dene road, stretching for a hundred yards towards the town, there was a great lake, a couple of feet deep, and stretching on either side through the plantations, and on to the Moor. The lake at the Recreation Ground overflowed and flooded the North Road Police Station. The stables behind Jesmond road were flooded so that the policeman on duty deemed it advisable to break open the door, and rescue the horses. At Benton, the farm was standing alone in a lake so deep that the people were driven to the upper storey. The flood reached from the Benton bridge up the burn to the wooden bridge that crosses some hundreds of yards higher up. At Gosforth a carman, who attempted to make his way through the flood by the bridge, had a narrow escape from drowning. In Ash Street an invalid had to be carried from her bed, the water having reached the mattress. At Cullercoats Station the water was level with the platform, a train was derailed and the passengers were taken from it in boats.

The mail train, which left Newcastle at 3.11 a.m., only got between Killingworth and Annitsford, when it had to return, and was sent on to Edinburgh by way of Carlisle.

The South Shields line was blocked, and it was reported that there was nearly 8 ft. of water standing in the Tyne Dock tunnel. At Middle Brunton 50 sheep were drowned, and others at Brunton Farm.

*North Shields.*—The fish quay was flooded as also were the new electric works at the Low Lights. Two horses were drowned in their stables at the latter place. The body of a woman, who had apparently died from exposure to the severe weather, was found on the railway near Percy Main. At Howdon a woman, who lived at North Bank, was drowned in her house, the water being about 10 ft. deep, the rest of the occupants of the house were rescued through a hole in the roof.

*Newsham.*—The Co-operative Society's horsekeeper was found dead in about 2 ft. 6 in. of water near the stables.

*Blyth.*—Turner street, Havelock street, Regent street and Cowpen quay were flooded, and in Folly road four sculling boats were plying during the day, the water being 5 ft. deep in the shop occupied by Mr. Tweedy, printer. In two or three houses the water rose above the key-boards of the pianos. In Folly road the water was up to the window sills of some of the houses.

*Morpeth.*—There was much flooding of basements at Copper Chore, Flint's-yard, Starth-lane, Mill-square and Low Stanners. The Masonic Hall was flooded, also the nave of St. James's Church, and no service was held on Sunday. At the Wansbeck Iron Works there was about 5 ft. of water, the engine and dynamo being all but covered.

*Felton.*—At East Thirston five sheep were drowned.

*Warkworth.*—A retaining wall at Warkworth Bridge was washed away.

Moor Bridge was damaged and Morwick Mill was flooded. It is stated that the Coquet has not been in such flood for about 35 years.

*Alnwick.*—The river Aln rose to a great height and swept away the Monk's Bridge, Duchess Bridge and Swing Bridge. The famed Peter's Bridge at Denwick Mill was also carried away. At Lesbury the foot bridge was washed away. At Broomhouse Farm 37 sheep were drowned. At Hawkhill the water rose to about a foot from the top of the arch of the bridge. At Flint Mill four beasts were drowned.

## OCTOBER WEATHER.

*To the Editor of the Meteorological Magazine.*

SIR,—The warmth during the past few days has been remarkable, although it has been surpassed several times in recent years. My readings for the past 4 days are as follows:—

October 5–8th, mean max.,  $64^{\circ}$ ; mean min.,  $48^{\circ}8$ ; mean,  $56^{\circ}4$ . Max. day,  $67^{\circ}$  on 8th; max. night,  $55^{\circ}$  on 7th. In 1898, October 4–8th, the mean max. was  $61^{\circ}2$ , min.  $53^{\circ}2$ , mean  $57^{\circ}2$ . On the 5th and 6th the night min. was  $56^{\circ}$ . 1897 gave a mean of  $58^{\circ}$  for 5 days, 15th to 19th. The max. on the 19th was  $65^{\circ}$ . The mean for 8 days, 2nd to 9th, in 1896, was  $55^{\circ}9$ .

On October 1st, 1895, the max. was  $68^{\circ}$ . This, however, was entirely put into the shade by a max. of  $74^{\circ}$  on October 4th, 1886. The latter reading, together with the 5-day mean in 1897, make an unbeaten record during the last 20 years. Thus it will be noted that the present warmth, so far, cannot claim to establish a record of any kind.

Yours faithfully,

ARTHUR F. PARBURY.

*Chiddingfold, Godalming, Surrey.*

## THE BRITISH ASSOCIATION AT BRADFORD, 1900.

*Mean Rainfall of the Northern Counties of England, 1881–90.*

*To the Editor of the Meteorological Magazine.*

SIR,—I see that you draw attention to an error in my table on page 130 of the *Met. Mag.* I was not aware that a single copy had gone out without correction of the printer's error. The value for Derbyshire for September should be 3.25 in. The total, 40.23 in., is correct.

Yours truly,

JOHN HOPKINSON.

## REVIEWS.

*Regenkarte der Provinzen Westpreussen und Posen. Mit erläuterndem Text und Tabellen. In amtlichen Auftrage bearbeitet von Professor Dr. G. HELLMANN. Berlin, 1900. Dietrich Reimer (Ernst Vohsen). Royal 8vo., pp. 28. Map.*

PROFESSOR HELLMANN has already published rainfall maps with explanatory text for the provinces of Silesia and East Prussia, and he now continues the series in a map of mean annual rainfall for the decade 1890-99, for the adjoining provinces of West Prussia and Posen. The records discussed are supplied by 213 stations, distributed over an area of 21,000 square miles, equal to that of England north of a line drawn from the Wash to Carnarvon Bay. The rain gauges were of the official Prussian pattern, exposing an area of 31 square inches (about  $6\frac{1}{4}$  inches diameter), at a height of 3 feet 3 inches above ground, and they were read once daily, at 7 a.m.

The provinces under consideration are on the whole low and flat, with a narrow frontage on the Baltic, and running far inland. They are crossed by a low plateau, averaging nearly 300 feet in height, in which one observing station was as high as 900 feet. The area includes the driest part of North Germany, in the low plain, which is separated from the Baltic by the plateau just referred to, and here the mean annual rainfall is under 20 inches. The map distinguishes by six shades of colour differences of rainfall from 450 to 800 mm., or, say, from 18 to 32 inches; and Professor Hellmann points out that in this region of gentle slopes and small elevation the amount of rainfall is roughly proportional to the height of the land, and that the rainfall map closely resembles a map of the vertical relief of the ground. He does not, however, discuss the data of individual stations from this point of view.

The 10-year means, under consideration, are compared with the 45-year means at eleven selected stations, and are found to vary between 7.3 per cent. in excess, and 3.8 per cent. in defect, of the long-period values. The comparison of the rainfall for individual years brings out the fact that the rainfall of the wettest years is more than twice as great as that of the driest years; for a mean rainfall of 25 inches, the heaviest year would be 36, and the lightest 15 inches; or, as 145 per cent. of the average for the wettest year, and 60 per cent. of the average for the driest year. Both these figures are rather lower than the 150 per cent. for the maximum, and 66 per cent. for the minimum, adopted by the late G. J. Symons, as working values for the British Isles, and proved to be applicable to many parts of the world, by Sir A. R. Binnie, in his paper on "Mean or Average Annual Rainfall,"\* read before the Institution of Civil Engineers.

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\* Minutes of Proceedings Inst. C.E. Vol. CIX. Part III.

The number of dry years during which the rainfall is below the average, is rather greater than the number of wet years; the following table for Posen, calculated for 100 years, is fairly representative of the whole region:—

Very dry	(51 to 75 per cent. of average)	...	...	8 years.
Dry	(76 to 100    "       "    )	...	...	30    "
Wet	(100 to 125    "       "    )	...	...	32    "
Very wet	(126 to 130    "       "    )	...	...	10    "

The region is one of summer rain and winter drought; all the stations, at which 45 years means are available, showing a maximum in July, with 13·7 per cent. of the annual rainfall, and a minimum in February with 4·7 per cent.

The greatest short period falls are discussed in some detail, on account of the practical importance of this factor. The average maximum fall in one day was from 1·20 inches to 1·40 inches; but the absolute maximum was 6·07 inches at Wildgarten, in West Prussia, during two thunderstorms on August 2nd, 1896, and of that total no less than 5·28 inches fell in  $2\frac{3}{4}$  hours, an average of 1 inch in 20 minutes. Amongst heavy rains the maximum for a period of under five minutes was at the rate of 0·120 inch per minute; the heaviest for an hour was only at the rate of 0·024 inch per minute (excluding the quite abnormal fall at Wildgarten, which was equal to 0·050 inch per minute). The extremely short duration of very heavy rain leads Prof. Hellmann to remark that the favourite practice of engineers in calculating the intensity of rainfall for periods shorter than an hour to 1 hour as a standard, is unsatisfactory and misleading; but it must not be forgotten that as a rule the engineer does not have to deal with the rain until it has run off the surface on which it falls, and in most cases the varying distances which it has to flow have a great equalizing effect.

H. R. M.

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*New Lands: their resources and prospective advantages*, by HUGH ROBERT MILL, D.Sc., &c. Charles Griffin and Co. London, 1900. 8vo, xii.—280 pages, and 10 maps.

THIS is the introductory volume to Griffin's "New Land" series, edited by Prof. Grenville A. J. Cole. In the preface the author tells us that he desired to give "a short, simple and practical account of the conditions of life in those parts of the world where there is still an opening for the energies of English-speaking people desiring to make their home in a new country." It is, therefore, obvious that it is not intended to give an exhaustive treatise on each of the 17 regions to which a chapter is devoted, but the

amount of knowledge conveyed is great, and appears to us to be of precisely the character requisite to give an intending emigrant a general idea of the different countries, before he turned to other sources, for special and detailed information. The book, moreover, is readable, and thoroughly practical.

Referring to our own branch of knowledge, the descriptions of the various climates are lucid and instructive, without being burdened with masses of figures, which convey little meaning, except to the specialist, while we are thoroughly at one with the author when he says, "In almost every case it will be found that the crux of a new land is the water supply. Water, as rain or rivers, is indeed the very life-blood of the habitable world;" and illustrates this by referring to the common Australian calculation of converting inches of rain into number of sheep, or even pounds of wool, per acre. How many, even educated persons in England, realize that all the fresh water in the world is rain, and rain only, and amongst London's millions, how often does the knowledge of water extend beyond the tap, or at most the water-main.

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*Wragge's Australasian Almanac, 1900, and Weather Guide for Land and Sea.* Sapsford and Co. Brisbane, 8vo.

THE enthusiastic meteorologist, Mr. C. L. Wragge, who was the originator of the observations on Ben Nevis, in 1881, has sent us a copy of his Almanac for 1900, which appears to be a sort of "Whitaker," modified to suit the conditions prevailing at the antipodes. It contains a description and views of his latest achievement in Mountain Meteorology—the establishment of an observatory on Mount Kosciusko, 7,328 ft. above sea level, where observations are made every four hours, day and night.

From a list of Meteorological Stations we see that the Queensland Weather Service now comprises 23 first order stations; 48 second order, and 73 climatological stations. There are various specimens of Mr. Wragge's articles, in which he gives christian names to atmospheric disturbances, with a view to popularize meteorology. A most desirable aim, but we must confess to some doubt whether the method adopted is a successful one.

Incidentally, we may mention a temperature reading, which it would be interesting for our readers to enter on the margin of the page in the article on Meteorological Extremes, II.—Temperature, in the number for October, 1899. At Cloncurry, Lat.  $20^{\circ} 43' S.$ , Lon.  $140^{\circ} 30' E.$ , and 207 miles from the Gulf of Carpentaria, a verified Negretti, maximum, registered  $125^{\circ}$  in shade.



## PREVENTION OF HAIL BY CANNONADING.\*

SEVERAL articles have appeared during the past year in American newspapers and journals urging that some trial be made in this country of the new system of cannonading devised by Mr. Stiger, in order to prevent destruction by hail. Mr. Stiger is a burgomaster of Windisch-Feistritz, Styria, who conceived the idea that by shooting a vortex ring upward into the cloud, he could so disturb the process of the formation of hail as to protect his own vineyards. Within the past five years thousands of the special form of cannon used by him for this purpose, and particularly those devised by G. Suschnig, of the manufacturing firm of Karl Greinitz and Nephews, at Gratz, have been established in northern Italy and southern Austria. Although it is claimed that by firing these cannon frequently, and when placed quite close together, storms have been diverted, yet the details, thus far published, are too meagre to afford a basis for any rational opinion as to whether or no the Stiger system is useful. Inasmuch as there is no reason to believe on *a priori* grounds in its efficacy, we must rely wholly upon a careful discussion of the recorded observations in order to ascertain the efficiency of the cannonading. Such a discussion has not yet come to hand, and will, in fact, be very difficult to make, owing to the absence of the long-continued records that are needed in order to establish normal values. Meanwhile, in order to respond to the popular interest in the subject, the Editor has appealed to Mr. Suschnig for information as to the expense, and other details, attending a fair trial of Stiger's method, and the reply is given below. The printed pamphlets, describing the special shooting apparatus, manufactured at the forges at St. Katharein, on the Lamming, near Bruck, on the Muir, in Styria, enumerate the following types :—

						Crowns.
No. A-200,	cannon	standing	2·8	meters	high, price complete,	110
„ B-250,	„	„	2·9	„	„	130
„ C-300,	„	„	3·3	„	„	160
„ D-350,	„	„	3·9	„	„	200
„ E-400,	„	„	4·5	„	„	240

These prices include all the apparatus required in the experiment. It must not, however, be supposed that a single cannon or shooting station is sufficient to produce any decided effect. On this point, Mr. Suschnig writes, as follows :—

In regard to your question as to where the apparatus can be obtained in America, I must reply that we have not as yet sent any of the apparatus to America, because none have ever been asked for from that country. We have only delivered apparatus on our own continent because on the other continents interest has not yet been awakened in this important matter. The only

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\* Reprinted from the *U.S. Monthly Weather Review*.

exception is the Asiatic Indian government, which has announced to us the visit of its delegates for inspection on their way to the Paris Exposition. We believe that the installation of an observing region of 40 square kilometers, with 40 apparatus in 4 lines would be necessary in order that your Government should obtain reliable studies as material for investigation. We would recommend placing in the first of these lines the apparatus of type E-400; in the second line, type D-350; in the third line, type C-300; and in the fourth line, type B-250; we believe that type A-200 can only be used to advantage at places of high altitude (700 to 1,000 meters above sea level).

The apparatus can be sent to America by us either via Genoa and Gibraltar, or via Hamburg.

We consider that the various types of cannon should be adapted to the altitude of the station above sea level. The larger cannon for the lower stations about as shown in the following :—

For altitude 0-200 meters.....	Type E
For altitude 201-350 meters.....	Type D
For altitude 351-500 meters.....	Type C
For altitude 501-650 meters.....	Type B
For altitude 650 and upwards .....	Type A

It would seem that if there be any small region in this country peculiarly liable to destructive hail, the Stiger method could be satisfactorily tried by covering this region with forty firing stations, arranged in four lines, each 10 kilometers long and 1 kilometer apart, so as to cover 40 square kilometers. A kilometer is about 0.62 mile, so that 10 kilometers would represent a little over 6 miles. The cost of the apparatus would be about 7,300 crowns, in Austria. Probably, if we include all other expenses, it would cost about \$10,000 to start the experiment at any convenient place in the United States. The annual cost of maintenance would depend upon whether each farmer attends to the apparatus himself, or whether several persons are employed to see that the experiment is carried on properly and fairly. We do not recommend any such experiment, since we know of no region of this small size in this country that is troubled, frequently, by destructive hail, and it might easily happen that one would have to wait fifty years before having a good chance to try the efficiency of Stiger's vortices. The frequency with which destructive hail occurs at any spot in this country is about the same as the frequency of local tornadoes, and with hail, as with the tornado, it is more reasonable and cheaper to insure one's self against the financial loss that may be incurred rather than to protect one's self against the material loss that may occur. In either case, we have to spend money, and the loss of money and destroyed material is eventually distributed through the community, just as in the case of fire. Experience has shown that, although up to a certain point, it is wise to protect against fire, yet beyond that point, one may waste his money in attempted protection, and will do better to spend it in insurance against the inevitable accidents of life.

While the above remarks apply more directly to the economy of Stiger's method of preventing hail, they are not to be considered as implying any doubts as to the scientific correctness of his method. On that point we know too little, either for or against, to justify any very decided opinion in this matter.

Inasmuch as we know that hailstorms are usually accompanied by rapidly ascending currents within large cumulus clouds, it may plausibly be supposed that if the vortices from Stiger's cannon could materially interfere with these currents, they might also interfere with the formation of hail. Stiger himself at first supposed that the calm period that preceded the severe local storm was the feature favorable to the formation of hail, and that his cannonading so greatly disturbed this calm as to prevent the hail from forming, but subsequently he thought that his vortices affected the cloud itself.

Our own conviction is that the energy of the movements within the vortex is too slight in comparison with the energy within a hail cloud to justify us in expecting any appreciable mechanical disturbance. On the other hand, the descriptions of the European experiments show that the Stiger vortex is essentially a white cloud of fine particles resulting from the explosion of the gunpowder. Now, a cumulus cloud is, as is well known, composed of aqueous particles condensed primarily upon dust nuclei. We have already (see *Monthly Weather Review*, April, 1900, pp. 156-159) explained how the condensation of moisture within a rising cloud is hindered until a state of extreme supersaturation is attained, because the condensing moisture has no nuclei on which to collect, except the small drops of water already formed. Now, the Stiger vortex brings to the cloud a fresh accession of innumerable dust nuclei, and, moreover, nuclei that are especially favorable to the condensation of moisture. This must, therefore, to a moderate degree, facilitate the formation of new drops of water, and the prevention of that stage of supersaturation as the result of which large drops of water, or large hailstones, or large snowflakes, and balls of snow are formed.

Although this forcible addition of dust nuclei to a thunder cloud may thus possibly have some effect on the cloud and its hail, yet we are bound to confess that even this hypothesis seems to be inapplicable, in view of the fact that in the course of the Dyrenforth experiments, made by himself and others, both in Texas and in New York, both gunpowder and nitroglycerine were sent both by bombshells and small balloons up into the cloud region and exploded there without any appreciable effect, notwithstanding the immense number of particles of dust and powder thus violently thrown into the cloud. The experiments of Carl Barus, for the Weather Bureau, in 1893-94 (see *Weather Bureau Bulletin No. 12*), showed that the vapours of phosphorus and sulphur were peculiarly effective in producing cloudy condensation. We have, therefore, no good reason for believing that the Stiger vortices can influence even the molecular processes within the cloud.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MAY, 1900.

STATIONS.	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
(Those in italics are South of the Equator.)	Temp.	Date.	Temp.	Date.	Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	Cloud
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	73·7	27	35·6	11	63·5	45·1	43·8	70	124·3	30·1	·93	12	6·9
Malta.....	80·4	25	55·4	7	72·3	59·1	57·4	78	...	...	·55	2	2·1
Cape of Good Hope ...	79·3	3	42·1	27	68·8	51·8	54·0	80	...	...	3·28	7	4·9
Mauritius.....	80·6	12	63·1	27	78·8	69·2	65·8	77	142·6	52·8	1·36	17	5·1
Calcutta.....	99·4	23	69·7	7	95·6	76·1	75·0	71	156·0	65·8	4·17	8	3·9
Bombay.....	92·5	2	78·0	11	90·8	80·7	75·3	73	141·5	70·6	·00	0	2·1
Ceylon, Colombo.....	92·7	17	73·8	1	89·8	78·7	77·2	86	143·8	71·7	16·00	14	5·6
Melbourne.....	73·5	7	38·5	16	59·4	47·1	48·0	86	127·6	32·0	3·83	15	7·1
Adelaide.....	79·4	6	41·1	12	63·0	49·5	47·2	74	136·5	33·8	2·42	14	7·1
Sydney.....	70·1	9	43·1	13	63·0	51·8	51·8	83	118·9	35·7	14·28	17	5·0
Wellington.....	62·5	6	37·0	28	57·3	47·8	44·1	73	105·0	30·0	5·66	22	5·3
Auckland.....	68·0	3	41·0	16	62·6	52·8	49·1	73	121·0	36·0	7·98	22	7·3
Jamaica, Halfway Tree	90·0	28	70·0	4	86·2	72·5	70·8	77	...	...	4·22	7	...
Trinidad.....	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada.....	87·0	6	70·8	19	83·7	74·4	71·1	77	149·2	...	7·51	22	4·1
Toronto.....	87·5	14	30·5	7	67·1	44·1	44·9	66	103·0	25·1	1·00	6	5·7
New Brunswick, Fredericton.....	83·7	30	27·0	10	59·1	36·0	33·3	55	...	...	6·18	14	5·5
Manitoba, Winnipeg...	91·5	13	14·0	4	74·2	40·4	...	...	...	...	·11	4	4·2
Victoria, British Columbia.....	65·7	30	42·0	28	59·6	47·6	...	...	...	...	1·04	18	6·8

## REMARKS.

MALTA.—Adopted mean temp. 64°·9, or 0°·7 above average. Mean hourly velocity of wind 11·1 miles, or 1·1 above average. Mean temp. of sea 68°·0. TSS on 4 days; L on 17th and 23rd.

J. F. DOBSON.

MAURITIUS.—Mean temp. of air 1°·1 above, of dew point 1°·4 above, and rainfall 2·86 in. below, their respective averages. Mean hourly velocity of wind 9·7 miles, or 0·5 mile below the average; extremes, 25·1 on 18th and 1·7 on 25th; prevailing direction, E. by S. to S.S.E. L on 25th and L and T on 26th.

T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 82°·7, or 0°·2 above, of dew point 2°·2 above, and rainfall 3·91 in. above, their respective averages. Mean hourly velocity of wind 8 miles; prevailing direction S.W. TSS on 1st and 14th; L alone on the 13th.

H. O. BARNARD.

ADELAIDE.—Mean temp. 1°·3 below average. Cloud much above, but E. 43 in. below, average. Good average rains in the south of the Colony, but far N. and in the interior, light or altogether wanting.

C. TODD, F.R.S.

SYDNEY.—Temperature 1°·0 below, humidity 7°·3 above, and rainfall 8·85 in. above, their respective averages.

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

WELLINGTON.—Generally showery weather during this month; variable winds, and often strong from N.W. and S. Fogs on 9 days; slight earthquakes on 21st, at 1.35 p.m., and on 28th at 8.4 a.m.

R. B. GORE.

AUCKLAND.—An exceedingly wet and stormy month, the total rainfall being more than 3·75 in. above the average of 32 years. Mean temp. close to the average.

T. F. CHEESEMAN.

JAMAICA.—Rainfall 1·56 in. below the average.

MAXWELL HALL.

SUPPLEMENTARY TABLE OF RAINFALL,  
OCTOBER, 1900.

Div	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	2.20	XI.	Builth, Abergwesyn Vic.	9.37
II.	Dorking, Abinger Hall ..	2.11	„	Rhayader, Nantgwillt ...	8.33
„	Birchington, Thor .....	1.92	„	Lake Vyrnwy .....	8.95
„	Hailsham .....	3.35	„	Corwen, Rhug .....	5.53
„	Ryde, Thornbrough .....	...	„	Criccieth, Talarvor .....	4.29
„	Einsworth, Redlands ...	2.50	„	I. of Anglesey, Lligwy..	5.37
„	Alton, Ashdell .....	2.59	„	I. of Man, Douglas .....	5.97
III.	Oxford, Magdalen Coll..	2.30	XII.	Stoneykirk, Ardwell Ho.	4.28
„	Banbury, Bloxham .....	2.26	„	New Galloway, Glenlee	7.89
„	Northampton, Sedgebrook	1.88	„	Moniaive, Maxwellton Ho.	5.59
„	Alconbury .....	...	„	Lilliesleaf, Riddell .....	4.13
„	Wisbech, Bank House...	2.12	XIII.	N. Esk Res. [Penicuik]	5.65
IV.	Southend .....	1.44	XIV.	Glasgow, Queen's Park..	5.05
„	Colchester, Lexden .....	1.50	XV.	Inverary, Newtown .....	8.18
„	Saffron Waldon, Newport	1.97	„	Ballachulish, Ardsheal...	8.97
„	Rendlesham Hall .....	1.62	„	Islay .....	5.87
„	Scole Rectory .....	...	XVI.	Dollar .....	4.50
„	Swaffham .....	2.39	„	Balquhider, Stronvar...	8.09
V.	Salisbury, Alderbury ...	2.53	„	Coupar Angus Station...	3.47
„	Bishop's Cannings .....	3.12	„	Blair Atholl .....	3.37
„	Blandford, Whatcombe ..	3.46	XVII.	Keith H.R.S. ....	4.79
„	Ashburton, Holne Vic. ...	4.74	„	Forres H.R.S. ....	3.22
„	Okehampton, Oaklands.	4.42	XVIII.	Fearn, Lower Pitkerrie..	2.32
„	Hartland Abbey .....	5.23	„	S. Uist, Askernish .....	4.85
„	Lynton, Glenthorne ...	6.80	„	Invergarry .....	3.80
„	Probus, Lamellyn .....	3.01	„	Aviemore, Alvie Manse.	4.12
„	Wellington, The Avenue	3.02	„	Loch Ness, Drumnadrochit	3.49
„	North Cadbury Rectory	2.76	XIX.	Invershin .....	4.81
VI.	Clifton, Pembroke Road	3.99	„	Durness .....	9.80
„	Ross, The Graig .....	4.10	„	Watten H.R.S. ....	3.24
„	Wem, Clive Vicarage ...	3.26	XX.	Dunmanway, Coolkelure	10.43
„	Wolverhampton, Tettenhall	3.01	„	Cork, Wellesley Terrace	5.21
„	Cheadle, The Heath Ho.	3.56	„	Killarney, Woodlawn ..	10.29
„	Coventry, Priory Row ..	2.97	„	Caher, Duneske .....	3.49
VII.	Market Overton .....	1.80	„	Ballingarry, Hazelfort...	4.40
„	Grantham, Stainby .....	2.06	„	Limerick, Kilcornan ...	3.69
„	Horncastle, Bucknall ...	1.68	„	Milton Malbay .....	7.11
„	Workshop, Hodgeck Priory	2.62	XXI.	Gorey, Courtown House	3.79
VIII.	Neston, Hinderton .....	4.57	„	Moynalty, Westland ...	5.05
„	Southport, Hesketh Park	4.57	„	Athlone, Twyford .....	6.55
„	Chatburn, Middlewood.	7.31	„	Mullingar, Belvedere ...	4.78
„	Duddon Val., Seathwaite Vic.	10.50	XXII.	Woodlawn .....	6.98
IX.	Melmerby, Baldersby ...	3.73	„	Crossmolina, Enniscoe ..	8.48
„	Scalby, Silverdale .....	4.05	„	Collooney, Markree Obs.	5.35
„	Ingleby Greenhow Vic..	6.13	XXIII.	Enniskillen, Model Sch.	...
„	Middleton, Mickleton ...	5.62	„	Warrenpoint.....	4.46
X.	Haltwhistle, Unthank H.	4.94	„	Seaforde.....	4.88
„	Bamburgh .....	5.10	„	Belfast, Springfield .....	4.86
„	Keswick, The Bank .....	6.38	„	Bushmills, Dundarave..	5.15
XI.	Llanfrechfa Grange .....	5.87	„	Stewartstown .....	4.78
„	Llandovery .....	7.31	„	Killybegs .....	6.39
„	Castle Malgwyn .....	4.51	„	Horn Head .....	5.96
„	Brecknock, The Barracks	...			

## OCTOBER, 1900.

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.					
				Dpth	Date			Deg.	Date	Deg.	Date		
												inches.	inches.
I.	London (Camden Square) ...	1.86	— 1.03	.54	29	15	73.8	8	34.2	16	0	4	
II.	Tenterden .....	2.07	— 1.96	.51	29	18	75.0	8	34.0	16	0	5	
III.	Hartley Wintney .....	2.22	...	.62	29	15	70.0	9	32.0	22	1	12	
III.	Hitchin .....	2.15	— .92	.43	28	19	70.0	8, 9	32.0	21	1	...	
IV.	Winslow (Addington) .....	2.21	— .88	.46	29	18	71.0	9	31.0	11a	3	9	
IV.	Bury St. Edmunds (Westley) .....	2.25	— 1.02	.41	28	19	70.0	8	32.0	21	1	...	
V.	Norwich (Brundall) .....	2.26	...	.55	26	20	75.0	9	31.5	4	1	2	
V.	Winterbourne Steepleton ...	2.64	...	.42	28	18	61.7	7	32.6	11	0	9	
ENGLAND.	Torquay (Cary Green) .....	2.03	...	.61	4	17	63.4	7	37.2	22	0	0	
VI.	Polapit Tamar [Launceston]..	3.78	— 1.15	.63	3	20	63.9	8, 9	25.0	22	3	3	
VI.	Stroud (Upfield) .....	3.39	+ .36	.63	4	17	68.0	7	33.0	21	0	...	
VI.	Churchstretton (Woolstaston) .....	3.93	+ .16	.62	4	23	67.0	8	34.0	27	0	5	
VI.	Worcester (Diglis Lock) .....	2.41	— .42	.47	4	16	...	...	...	...	...	...	
VII.	Boston .....	2.16	— .95	.96	26	15	75.0	9	31.0	22	2	...	
VII.	Hesley Hall [Tickhill].....	2.80	— .30	.72	4	16	69.0	7	30.0	4	2	...	
VII.	Breadsall Priory .....	2.70	...	.64	4	18	...	...	...	...	...	...	
VIII.	Manchester (Plymouth Grove) .....	4.77	+ 1.40	.84	6	22	71.0	7	33.0	20	0	2	
IX.	Wetherby (Ribston Hall) ...	4.32	+ 1.19	1.02	4	22	...	...	...	...	...	...	
IX.	Skipton (Arnellife) .....	10.20	+ 4.17	1.31	5	25	...	...	...	...	...	...	
IX.	Hull (Pearson Park) .....	2.88	— .77	.82	26	22	70.0	9	29.0	4	2	10	
X.	Newcastle (Town Moor) .....	6.85	+ 3.73	3.33	26	17	...	...	...	...	...	...	
X.	Borrowdale (Seathwaite).....	14.55	+ 3.96	1.91	9	23	61.7	9	30.3	16	2	...	
XI.	Cardiff (Ely) .....	5.81	+ 1.27	.95	25	20	...	...	...	...	...	...	
XI.	Haverfordwest .....	6.11	+ .96	1.21	5	21	62.9	8	29.7	22	1	7	
XI.	Aberystwith (Gogerddan) .....	6.77	+ 1.42	1.05	4	22	68.0	8	...	...	...	...	
XI.	Llandudno .....	5.46	+ 2.07	.75	5	24	65.5	7	38.2	22	0	...	
XII.	Cargen [Dumfries] .....	5.79	+ 2.53	1.26	4	21	62.0	7	28.0	16	2	...	
XIII.	Edinburgh (Blacket Place) ...	4.87	...	.97	17	22	65.3	7	30.4	16	2	7	
XIV.	Colmonell .....	6.11	...	1.17	4	22	65.0	18	28.0	21	...	...	
XV.	Tighnabruaich .....	6.54	...	.88	31	24	54.0	24	31.0	15	1	...	
XV.	Mull (Quinish) .....	8.52	+ 3.23	1.15	7	22	...	...	...	...	...	...	
XVI.	Loch Leven Sluices .....	3.80	+ .84	.70	7	14	...	...	...	...	...	...	
XVI.	Dundee (Eastern Necropolis) .....	3.65	+ 1.41	.65	6	20	62.1	24	27.8	16	3	...	
XVII.	Braemar .....	3.41	— .20	.58	4	23	57.8	8	27.3	26b	5	17	
XVII.	Aberdeen (Cranford) .....	3.38	...	.66	4	24	60.0	24	27.0	25	7	...	
XVII.	Cawdor (Budgate) .....	3.55	+ .82	.40	29	23	...	...	...	...	...	...	
XVIII.	Strathconan [Beaul] .....	6.77	+ 2.12	1.83	8	13	...	...	...	...	...	...	
XVIII.	Glencarron Lodge .....	10.37	...	1.86	7	26	58.0	7, 8	28.0	16	1	...	
XIX.	Dunrobin .....	2.76	— .55	.64	13	15	58.0	8	32.0	26	1	...	
XIX.	S. Ronaldshay (Roeberry) ...	4.40	+ .67	1.02	4	29	56.0	7	37.0	25	0	...	
XX.	Darrynane Abbey .....	4.24	...	.80	29	23	...	...	...	...	...	...	
XX.	Waterford (Brook Lodge) ...	4.16	+ .34	.58	3, 8	19	64.5	24	29.0	11	4	...	
XX.	Broadford (Hurdlestown) ...	...	...	...	...	...	...	...	...	...	...	...	
XXI.	Carlow (Browne's Hill) .....	3.95	+ .66	.55	3	20	...	...	...	...	...	...	
XXI.	Dublin (Fitz William Square) .....	3.47	+ .09	.69	9	21	66.4	7	36.7	28	0	5	
XXII.	Ballinasloe .....	6.30	+ 3.31	.98	8	26	56.0	23	32.0	18	1	...	
XXII.	Clifden (Kylemore) .....	8.90	...	1.16	30	23	...	...	...	...	...	...	
XXIII.	Waringstown .....	4.22	+ 1.51	.55	8	20	64.0	4	30.0	27c	7	10	
XXIII.	Londonderry (Creggan Res.) .....	6.02	+ 2.35	.69	6	30	...	...	...	...	...	...	
XXIII.	Omagh (Edenfel) .....	6.02	+ 2.92	.80	28	25	62.0	7	30.0	26	5	8	

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

a—and 16, 22. b—and 31. c—and 29.

# METEOROLOGICAL NOTES ON OCTOBER, 1900.

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.

TENTERDEN.—Dry till the last week. The mean temp. was similar to that of the previous three Octobers, but there were three warmer days and several colder ones. The nights were warmer than in 1899, but not so warm as in 1898. Duration of sunshine, 125 hours. Fog on 7th and 11th.

HARTLEY WINTNEY.—A remarkably mild month, with warm and sunny days almost throughout. The last 10 days were showery, with T and H on the 29th. Rainfall 1·02 in. below the average. Owing to the absence of severe frost, trees and shrubs retained their foliage till the last. Swallows were last seen on 8th. Ozone registered on 9 days, with a mean of 4·5. S.W. gale on 28th. Fog on 9th.

WINSLOW, ADDINGTON.—A month of changeable weather. R fell on a good many days, but the total was less than the average. Slight frost on several nights, and in low situations tender plants were destroyed, but on higher ground even dahlias were only slightly injured, and there were plenty of blooms on the 31st. A good many chrysalides of the death'shead hawkmoth were found when digging potatoes, a most unusual thing in this part of the country. Fog on 3 mornings. H showers on 14th and 26th.

BURY ST. EDMUNDS, WESTLEY.—Hardly any frost; tender plants not touched. T on the 10th.

NORWICH, BRUNDALL.—Mild, with rainfall about three-quarters of an inch deficient. L on 5th, 14th, 21st and 26th. H on 21st and 26th. The max. temp. is the highest in October since 1895.

WINTERBOURNE STEEPLETON.—There was no very heavy R, and until the last week the fall was only slight, although there were many rainy days. The nights were generally mild, frost being recorded only on the grass.

TORQUAY, CARY GREEN.—R 2·10 in. below the average. Mean temp. 1°·5 above the average. Ozone mean, 5·9; greatest daily amount 7·5 on 27th, with W. wind; least, 4·0 on 8th with S.W. wind, and on 20th with N.W. wind. Duration of sunshine, 28 hours 30 mins. more than the average; four sunless days.

POLAPIT TAMAR [LAUNCESTON].—The temp. was higher than usual throughout the month. S.W. gale on 4th; T and L on 5th; heavy H on 26th.

MANCHESTER, PLYMOUTH GROVE.—Fine autumn weather prevailed during the greater part of the month. Fog occurred on four days; dense on 7th and 8th.

ARNCLIFFE.—A very wet month, with little frost.

NEWCASTLE, TOWN MOOR.—The fall of R on 26th, 3·33 in., is the highest registered here since observations began in 1868. The next largest fall was 2·60 in., on August 12th, 1890.

## WALES.

HAVERFORDWEST.—A wet, cloudy month. From the 4th to the 9th a moderate to fresh gale blew almost without intermission, with L on 4th and TSS on 5th. The temp. throughout the month was high, the min. on several nights being above  $50^{\circ}$ . The duration of sunshine was 58·7 hours. Short TSS at 10 a.m. and 7.40 p.m. on 5th, accompanied by very heavy E and H. Grass was plentiful, but agricultural operations were backward.

ABERYSTWITH, GOGERDDAN.—A very wet month and very mild, but with little sunshine.

## SCOTLAND.

CARGEN [DUMFRIES].—One of the most unpleasant months of October experienced in 40 years. The land has never before been known to be so thoroughly saturated. Farm work almost at a standstill.

COLMONELL, CLACHANTON.—R 1·44 in. above, and mean temp.  $2^{\circ}\cdot3$  above, the average of 24 years.

TIGHNABRUACH.—The bar. was very unsteady, the rainfall above the average, and the temp. low.

ABERDEEN, CRANFORD.—A cold and wet month, with little sunshine.

S. RONALDSHAY, ROEBERRY.—A very wet and cold month. Mean temp.  $45^{\circ}\cdot7$ , or  $1^{\circ}\cdot0$  below the average of 10 years.

## IRELAND.

DARRYNANE ABBEY.—The wettest month since December, 1899. There were a few fine days between the 16th and 23rd, but the last week was very wet, with a fall of 1·90 in. H on 4th; L on 16th.

DUBLIN, FITZWILLIAM SQUARE.—A changeable, rainy, and damp month. A period of unusual warmth occurred from the 6th to the 9th inclusive; the 31st also was warm. Mean temp.  $50^{\circ}\cdot4$ , or  $0^{\circ}\cdot7$  above the average. L and H on 26th; high winds on 11 days, attaining the force of a gale on three. More or less fog on five days. Lunar halos on two days. Duration of sunshine, 127 hours, 15 minutes.

OMAGH, EDENFEL.—The wettest October since 1870, the fall having reached almost twice the average, and on the few rainless days the atmosphere nearly approached saturation. This, accompanied by an equable temp., above the normal, and little or no frost, delayed the autumn tints and the subsequent fall of the leaf by a full fortnight, the latter being far from complete even at the close.



# SYMONS'S

## MONTHLY

# METEOROLOGICAL MAGAZINE.

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### MEMORIAL TO THE LATE G. J. SYMONS, F.R.S.

As mentioned in our June issue, a number of friends of the late G. J. Symons, as widely as possible representative of the various societies with which he was connected, met at the rooms of the Royal Meteorological Society, at the invitation of the President, on May 31st last, to consider the best means of raising a permanent Memorial in commemoration of the services rendered to his country by the founder of the British Rainfall Organization.

An Executive Committee was formed, invited subscriptions, and has received a hearty response. At a recent meeting of this Committee it was resolved to close the lists shortly, and the following letter was sent out to the Press.

We have much pleasure in printing it as a reminder, in case the matter has slipped the memory of any of our readers. For we are sure that in this Magazine, which he conducted for so many years, it is needless to say a word in support of the proposal.

*To the Editor of the Meteorological Magazine.*

SIR,—On May 31st a meeting was held at the rooms of the Royal Meteorological Society, to consider the question of a Memorial to the late Mr. G. J. Symons, F.R.S., the distinguished Meteorologist, and Founder of the British Rainfall Organization.

It was resolved unanimously that the Memorial should take the form of a Gold Medal, to be awarded from time to time by the Council of the Royal Meteorological Society, for distinguished work in connection with Meteorological Science.

An Executive Committee was appointed, to take the necessary steps to raise a fund for that purpose. We have now much pleasure in stating that their appeal has been very heartily responded to; not only by meteorologists, engineers, and representatives of other branches of science and industry, but also by personal friends and admirers of the late Mr. Symons in all classes.

The Committee have decided to keep the list open until the end

of January, 1901, in order to allow all who have in any way benefited by Mr. Symons' advice and assistance to contribute to the Memorial Fund.—Yours faithfully,

C. THEODORE WILLIAMS, M.D., *Treasurer.*  
 R. MELDOLA, F.R.S., }  
 WM. MARRIOTT, } *Secretaries.*

70, Victoria Street, Westminster, S.W.

## A CLASSIFICATION OF FIFTY-NINE WINTERS.

*To the Editor of the Meteorological Magazine.*

SIR,—Perhaps the following classification of winters at Greenwich according to the number of frost days in the second half of the year and the first half following, might interest some of your readers. (Winters are designated by the year in which they end; thus, '42 means 1841-42.) The averages are 18 for the second half-year and 37 for the first half.

1. *Both halves cold (frost days OVER average):—*

'42, '45, '47, '50, '52, '55, '57, '60, '65, '70, '75, '76, '79, }	18
'81, '86, '87, '88, '91 ... ..	

2. *Both halves mild (frost days UNDER average):—*

'43, '44, '46, '48, '49, '51, '62, '63, '66, '69, '73, '74, '77, }	21
'78, '82, '83, '84, '94, '96, '98, '99... ..	

3. *Second half average, first half cold:—*

'89 ... ..	1
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4. *Second average, first mild:—*

'59, '61, '97, 1900 ... ..	4
----------------------------	---

5. *Second average, first average:—*

'67 ... ..	1
------------	---

6. *Second cold, first mild:—*

'54, '56, '68, '71, '72, '80, '90, '93... ..	8
--	---

7. *Second mild, first cold:—*

'53, '58, '64, '85, '92, '95 ... ..	6
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59

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We may note that winters in which both halves are alike (either cold or mild) are nearly three times as numerous as those in which they are opposite. The 11 winters '42 to '52 were all in the former category, also the 12 winters '73 to '84, with one exception ('80).

Yours faithfully,  
 A. B. M.

# CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE FOR THE YEAR 1899.

THE Annual Summary of our Monthly Climatological Tables has been crowded out month after month, and now we have room to comment on it but very briefly. Only one station has had to be omitted for non-arrival of returns, the December table for Trinidad having failed to reach both us and the Royal Meteorological Society. Jamaica and Esquimalt are absent on account of cessation of the observations, but for Jamaica another record has become available.

The extremes set out in the Summary are accredited to much the same stations as usual, and it is difficult to do justice to them in any brief reference, when obviously a volume might be written on a quarter of a century's records at any one of the stations. The max. temp. at Adelaide (113°·6 on February 12th) has only once been exceeded in our tables at that station—viz., by 114°·2 in 1876, while, curiously enough, four days earlier Winnipeg was experiencing an exceptionally low temp (—46°·5 on February 8th), but a reading 4°·0 lower was recorded in 1879. At Adelaide the max. in sun (175°·7) is also unusual, 180°·0 in 1882 being the only higher reading.

The greatest rainfall (73·52 in. at Colombo), though by no means exceptional for that station, is the lowest value that has ever claimed entry in one of our annual summaries as the maximum for the year, the next lowest max. being 73·79 in. at Trinidad in 1889.

The maximum amount of cloud (5·7 at Mauritius) also is the lowest in any of our summaries, the lowest previously being 6·3 in 1886, 1892, and 1894, but in all these years the max. occurred at another station. This extreme has several times been recorded at London, but the 1899 cloud value for that station (5·6) is low, only three out of the preceding 40 years having been less cloudy.

## SUMMARY.

<i>Highest Temp. in shade</i> .....	113°·6 at Adelaide on Feb. 12th.
<i>Lowest</i> " " .....	— 46°·5 at Winnipeg on Feb. 8th.
<i>Greatest Range in year</i> .....	135°·9 at Winnipeg.
<i>Least</i> " " .....	21°·0 at Grenada.
<i>Greatest Mean Daily Range</i> ...	22°·3 at Winnipeg.
<i>Least</i> " " " ..	9°·4 at Grenada.
<i>Highest Mean Temp.</i> .....	81°·9 at Ceylon, Colombo.
<i>Lowest</i> " " .....	34°·2 at Winnipeg.
<i>Driest Station</i> .....	Adelaide, mean humidity 59.
<i>Dampest Station</i> ... ..	Ceylon, Colombo, mean humidity 79.
<i>Highest Temp. in Sun</i> .....	175°·7 at Adelaide.
<i>Lowest Temp. on Grass*</i> .....	— 16°·5 at Toronto.
<i>Greatest Rainfall</i> .....	73·52 in. at Ceylon, Colombo.
<i>Least Rainfall</i> .....	17·87 in. at Malta.
<i>Most Cloudy Station</i> .....	5·7 at Mauritius.
<i>Least Cloudy Station</i> .....	2·3 at Grenada.

\* The min. on grass is not recorded at the other Canadian stations.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE FOR 1899.

STATIONS. <i>Those in Italics are South of the Equator.</i>	ABSOLUTE.		AVERAGE.				ABSOLUTE.		TOTAL RAIN.		AVER- AGE. Cloud.			
	Maximum. Temp. Date.	Minimum. Temp. Date.	Max.	Min.	Mean.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth. in.		Days.		
England, London...	91·2	August 15	19·9	March 21	60·1	43·7	51·9	43·7	77	136·4	15·8	22·54	144	0-10
Malta .....	94·6	July 25	43·2	January 7 & 8	72·7	59·5	66·1	56·9	77	151·6	35·5	17·87	79	5·6
<i>Cape of Good Hope.</i>	98·1	December 15	36·1	May 26	71·0	53·5	62·3	51·8	76	...	...	26·80	88	2·7
<i>Mauritius</i> .....	87·4	February 9	55·0	June 18	79·3	68·9	74·1	65·0	76	163·8	48·1	42·82	203	3·9
Calcutta ... ..	105·4	April 29	44·4	January 20	87·7	70·3	79·0	68·5	73	158·6	34·8	71·95	98	5·7
Bombay .....	93·7	October 21	59·1	January 7	86·3	75·2	80·7	71·2	73	141·3	51·9	35·90	87	4·5
Ceylon, Colombo ...	93·7	February 28	67·5	January 8	88·6	75·2	81·9	...	79	157·5	65·5	73·52	152	3·3
<i>McBourne</i> .....	104·2	December 31	30·6	July 20	67·6	49·3	58·5	47·3	71	156·9	25·2	28·87	116	...
<i>Adelaide</i> .....	113·6	February 12	35·6	July 27	72·9	52·8	62·8	46·5	59	175·7	25·4	18·85	119	5·5
<i>Sydney</i> .....	102·1	December 1	38·8	August 10	69·8	56·6	63·2	...	...	158·5	27·8	55·91	172	4·5
<i>Wellington</i> .....	76·3	Jan. 1, 2, 6	31·0	July 15, 26	61·0	48·6	54·8	45·2	71	141·0	23·0	52·73	177	4·8
<i>Auckland</i> .....	84·5	February 17	37·0	July 26	64·9	52·7	58·8	48·8	70	144·0	31·0	34·44	149	4·4
Grenada .....	88·8	September 7	67·8	February 16	83·1	73·7	78·4	70·0	73	155·4	...	64·29	208	5·0
Toronto .....	92·1	August 19	—12·6	February 11	54·6	37·5	46·0	39·9	76	114·0	—16·5	28·99	147	2·3
New Brunswick, ) Fredericton .....	87·7	July 2	—16·8	January 2	51·2	29·9	40·6	30·0	63	...	...	38·85	121	5·6
Manitoba Winnipeg	89·4	July 22	—46·5	February 8	45·4	23·1	34·2	...	...	...	...	19·81	92	5·2
														5·5

# ON SOLAR CHANGES OF TEMPERATURE AND VARIATIONS IN RAINFALL IN THE REGION SURROUNDING THE INDIAN OCEAN.\*

It is impossible to cut this important paper down to the amount of space available, without practically destroying it, and we would strongly urge all our readers interested in the subject, to get the numbers of *Nature*, for November 29th and December 6th, and study it carefully by the aid of the diagrams there given. We can only cull a few more or less disjointed paragraphs as to rainfall, indicative of the substance of the paper, leaving out all reference to the spectroscopic results.

"The fact that the abnormal behaviour of the widened lines in the spectra of sunspots since 1894 had been accompanied by irregularities in the rainfall of India, suggested the study and correlation of various series of facts which might be expected to throw light upon the subject."

"It has been found, from the actual facts of rainfall in India (during the S.W. monsoon) and Mauritius, between the years 1877 and 1886, as given by Blanford and Meldrum, that the effects of these solar changes are felt in India at sunspot maximum, and in Mauritius at sunspot minimum. Of these the greater is that produced in the Mauritius at sunspot minimum. The pulse at Mauritius at sunspot minimum is also felt in India, and gives rise generally to a secondary maximum in India."

"India, therefore, has two pulses of rainfall, one near the maximum and the other near the minimum of the sunspot period."

"It has been found from a study of the Famine Commission reports, that all the famines therein recorded, which have devastated India during the last half-century, have occurred in the intervals between these two pulses."

"It has been found, from an investigation of the Nile curves between the years 1849 and 1878, that all the lowest Niles recorded have occurred between the same intervals."

One of the diagrams referred to gives the annual rainfall at Cordoba, Cape, Bombay, Mauritius, and Batavia, from 1873 to 1896, compared with the sunspot changes, and although the agreement can scarcely be called convincing, it is sufficient to strongly support the theory of interdependence, the chief doubt suggested to the meteorologist who has seen weather cycles innumerable proved to the satisfaction of their authors, being whether equal agreement would be shown if the period could be considerably prolonged. But the possible prediction of Indian famines is a matter of such vast importance that any serious attempt to throw light upon it should be heartily welcomed.

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\* By Sir Norman Lockyer, K.C.B., F.R.S., and W. J. S. Lockyer, M.A., Ph.D. Paper read before the Royal Society on November 22nd.

As long as the study of meteorology was practically confined to Europe and the temperate regions, where the main phenomena are almost entirely masked by the variations, the advance was naturally slow, but the more recent attempts to correlate the phenomena of distant regions, as instanced by the comparison of Indian and Mauritius Rainfall and Nile floods, are most hopeful, and if the International Meteorological Committee succeeds in establishing observatories at the centres of action of the atmosphere, as proposed by Prof. Hildebrandsson, the probability of rapid advance in the early future seems assured.

## REVIEWS.

*Mémoires originaux sur la circulation générale de l'Atmosphère*:—Halley, Hadley, Maury, Ferrel, W. Siemens, Möller, Oberbeck, von Helmholtz. Annotés et commentés par MARCEL BRILLOUIN. Paris: Carré et Naud. 1900. Pp. xx. + 164.

THIS is a collection of translations into French of a number of papers originally written in English or German by the meteorologists and physicists whose names appear in the title. The memoirs all deal with the theoretical circulation of the atmosphere as a whole on a smooth globe of uniform surface, and they show how the influence of the rotation of the earth has been gradually recognised as of paramount importance in determining the direction of the wind currents. M. Brillouin in his introduction gives prominence to the necessity of taking account of the difference between land and sea surfaces in applying to actual circumstances the theoretical considerations with which the various authors deal. In this connection he calls special attention to the views of M. Maurice de Tastes.

*By Land and Sky.* By the REV. JOHN M. BACON, M.A., F.R.A.S. Isbister and Co. 1900. 8vo. 275 pages, 4 illustrations.

THIS book is essentially scientific, for it adds to our stores, knowledge gained direct from Nature, practically without the intervention of instruments, and, unlike so many modern scientific works, which are a weariness to the flesh, it does not contain from beginning to end an algebraical formula or even a table of figures, and from cover to cover there is not a sentence which the man in the street, if intelligent, could not understand. It suggests the important question, whether science would not have less cause to complain of lack of recognition in England if our leading scientists had more often attempted to make their writings comprehensible by a larger public instead of addressing only the learned few.

The author set himself the task of studying from Nature and not in the laboratory, the anomalies of sound, primarily in connection

with the failure at times of sound signals to prevent accidents at sea. The work is a narrative of questions put to Nature on the subject in many ways, but more especially from balloons. The author makes many references to Glaisher, the father of scientific ballooning, and his work reminds us strongly of the well known "Travels in the Air," in its sustained interest.

The Meteorological element of the work consists in the descriptions of the effects of different strata of air of varying density and temperature on the conveyance of sound, and the author's observations disprove the commonly accepted idea that fog is essentially a bad conductor of sound. He says—"A uniform quiescent fog may offer no obstruction to sound whatever, while, on the other hand, rolling masses of fog of varying temperature and density may impede sound waves or even reflect them."

## ROYAL METEOROLOGICAL SOCIETY.

The first meeting of this society for the present session was held on Wednesday evening, November 21st, at the Institution of Civil Engineers, Dr. C. Theodore Williams, the President, being in the chair.

The Foreign Secretary (Dr. R. H. Scott) read a letter from Prof. Hildebrandsson, of Upsala, stating that the International Meteorological Committee invited observations of the form, amount, and direction of the clouds on the first Thursday of each month during 1901, as well as on the preceding and following days. These cloud observations are to be made in connection with the balloon ascents which will be carried out under the direction of the Aerostation Committee.

Mr. R. H. Curtis read a paper on "An Improved Mounting for the Lens and Bowl of the Campbell Stokes Sunshine Recorder." It has been generally supposed that the sunshine recorders are sent out by the makers ready for use, and a purchaser does not expect to have to examine them for a possible error in the size of the bowl, affecting the time scale of the record, or in the burning of the lens, affecting its amount. Mr. Curtis states that in the majority of instances they fail in one or more of these respects, and, unfortunately, there has not hitherto been provided a ready means of detecting an error, or of remedying it if found to exist.

The improvement consists, first, in giving to the pedestal which carries the lens a simple sliding movement in two directions, at right angles to each other, and also a vertical movement; and by means of these three movements it can be quickly and accurately placed centrally in the bowl, where it is secured by a couple of clamping screws. Secondly, the bowl itself is mounted so that it can be moved through a small arc, sufficient to accommodate it to

the latitude of the station; without the rather clumsy device of tilting the base, which in practice is not only a clumsy but also a rather troublesome adjustment to make.



It has been a point kept in view to have all these movable parts substantially made, so that the adjustment of the instrument being once made no further trouble need be feared from slipping or weakness.

The latitude adjustment of the bowl, and the adjustment of the lens within the bowl, are of course made before the instrument is taken to the site chosen for it. All that then remains to be done is to secure for it a level base, and to place the recorder upon that base correctly adjusted to the meridian of the station.

Mr. F. C. Bayard thought that in a gale of wind the glass ball was liable to be blown out of the frame, and broken, and suggested that some means of preventing this might be adopted.

Mr. W. Marriott, after describing the method which he employed for testing the sunshine recorders in use at the stations of the Society, stated that a few years ago it had been found that the glass ball of the Greenwich sunshine recorder had deteriorated, and consequently registered too little sunshine. He had recently come across another instance of the same thing, in the recorder at Regent's Park. This instrument he exhibited to the meeting; and it was quite apparent that the glass ball had become very dull, and that its definition was indistinct.

Mr. E. Mawley and Mr. F. J. Brodie having described their experiences as to the adjustment of the recorders, Mr. R. H. Curtis, in reply, said that he did not think that the strength of the wind was sufficient to blow the ball out of the frame. He urged that when put into proper adjustment, the frame of the recorder should be firmly fixed, so as to prevent any shifting.

Mr. W. H. Dines read a paper on the "Weekly Death Rate and Temperature Curves, 1890 to 1899." The death rate used was that of the thirty-three large towns of England; and the temperature was that of Greenwich. Temperature is the most important



meteorological element which affects health; and in the author's opinion, no other, save fog, has an appreciable effect.

There were several points of interest about the curves. The influenza epidemics were plainly shown, notably those of January, 1890, May, 1891, January, 1892, and March, 1895, but seem to be independent of weather conditions. Mr. Dines is inclined to attribute the high death rate of January, 1891, to fog, although it may be due to cold. This was the date of the long frost, but then the equally severe and long frost of January and February, 1895, was accompanied by a low death rate, the rise in which, caused by influenza, occurred just before the break-up of the frost. In January, 1891, fog was very prevalent, and the death rate, though high in the towns, was not so in the country. In 1895 the weather conditions were different, and strong winds and bright sunshine prevailed during the severe weather.

The curves of the last four years of the series differed from the others, the maxima occurring in the summer. This was doubtless due to the high temperatures that prevailed. The ordinary summer maximum, shown by the dotted line, comes in the middle of August, the rise commencing in the beginning of July. It was seen that when the summer is a cold one, as in 1890, 1891, 1892, and 1894, the summer rise is delayed and is unimportant; but when the summer is a hot one, as in 1893, 1896, 1897, 1898, and 1899, it is very prominent, the crest just reaching or surpassing the 25 per thousand level. But this is not all; in the hot summers in which the heat occurs in the early part, as in 1893 and 1895, the highest death rate occurs before its usual time; on the other hand, in the years in which extreme heat comes towards the end of the summer, as in 1898 and 1899, the maximum comes later than usual.

The author is of opinion that from the health point of view, the English climate is one of the best in the world, and this is proved by the relatively low rate (19.7) shown in these curves. A more pleasant climate may well be found, but the majority of the health resorts which Englishmen frequent in the winter have a higher death rate than London has at the same season, and a far higher rate than any of the country districts of the British Isles.

Surgeon-Major Black called attention to the increased mortality of infants in summer, and of old people in winter. He also referred to the influence of personal hygiene, *e.g.*, clothing, food, &c.

Mr. F. J. Brodie agreed with Mr. Dines that cold winters were not necessarily unhealthy unless accompanied by fog. He could trace no connection between influenza and the weather.

Mr. W. Marriott thought that Mr. Dines would have obtained better results if he had confined his discussion to London only, rather than grouping together the death rates of the 33 large towns of England, and comparing the result with the temperature at Greenwich.

The President (Dr. Theodore Williams) said that many factors

had to be taken into consideration in dealing with the death rate, besides the weather. He mentioned three, viz.—strikes, which occasion greater poverty; the greater consumption of fruit in a hot summer; and imperfect drainage. He was a great admirer of the English climate. Its great changes, no doubt, caused much illness, but not a high death rate. People left England in winter not only for the sake of their health, but to obtain more sunshine and the greater enjoyment of open air life. The healthiness of this country was no doubt due to its better sanitary conditions, for, with the possible exception of America, they were more perfect than in any other country, and sanitary conditions had more to do with the death rate than weather.

Mr. Baldwin Latham said that he had found, from experience, that it did not do to take large areas in tabulating health results, owing to the great variety of conditions spread over a large area. He referred to the enormous number of deaths of children in London, in summer, from diarrhœa, and said that the rise in the death rate from this complaint in the districts supplied by the Kent Water Company, from the chalk, took place a fortnight later than in the districts supplied by the Thames Water Companies. This was no doubt owing to the water from the former being much colder in starting through the mains, and took longer to become heated than that from the Thames, which started at a high temperature through the mains. Percolation also played an important part in influencing the death rate, and should be taken into consideration.

Mr. W. H. Dines, in reply, said that, speaking generally, a hot or cold period at Greenwich was also a hot or cold period over England. He had preferred to take the death rate of the 33 large towns, because the various factors mentioned by Dr. Williams were thus largely eliminated.

The following new Fellows were elected:—Mr. F. March, Miss F. E. A. P. Parker, Mr. A. H. Waller, Mr. B. R. Williams, and Mr. C. A. Woolnough.

## A WET AUTUMN IN EDINBURGH.

*(Reprinted from the "Scotsman.")*

THE most striking feature of the meteorology of Edinburgh since the beginning of October has been the excessive and quite unprecedented rainfall, and the almost complete absence of spells of fine weather, which are not unfrequently experienced in the autumn months. The excessive rainfall of October—the wettest in Edinburgh since 1864—has been followed by an even more remarkable downfall in November, which seems to have been the rainiest since the year 1772. In the Newington district 10·29 in. of rain fell in the two months under review, while at Leith the precipitation was a third of an inch less, or 9·92 in. For the purpose of comparison we have rainfall observations made in Edinburgh from 1770 to 1776, for the year 1780, and again from 1785 down to the present time, or 124 years in all. Reference to these tables of

monthly rainfall shows that on no previous occasion has the downfall for the two months under consideration amounted to ten inches. The following are the instances in which eight inches or more was precipitated during October and November :—

Year.	October. Inches.	November. Inches.	Total Inches.	Year.	October. Inches.	November. Inches.	Total Inches.
1771.....	5·59	3·76	9·35	1795.....	4·87	4·58	9·45
1772.....	3·51	5·66	9·17	1824.....	4·73	4·38	9·11
1775.....	5·31	3·62	8·93	1864.....	6·90	1·79	8·69
1789.....	3·46	5·21	8·67	1900.....	4·87	5·42	10·29
1794.....	3·58	4·46	8·04				

It is possible that, had returns been available for 1778, they would have indicated a heavier rainfall for the two months than in 1900. From an old register I find that the rainfall at Peebles in 1778 was 5·54 inches in October and 5·66 inches in November, a total for the two months of 11·20 inches, while the corresponding values at Dumfries were 6·74 inches and 5·50 inches—an aggregate of 12·24 inches. But it is, of course, unsafe to assume that the rainfall in Edinburgh would have been as large as at the two inland places.

In order to ascertain the distribution of the rainfall last month in the Edinburgh district the following returns, kindly supplied by several local observers, may be of interest, indicating as they do the somewhat capricious manner in which this element of climate varies even within narrow limits.

	Ins.		Ins.
Edinburgh—		Swanston .....	5·53
Napier Road .....	5·38	Corstorphine .....	5·15
Royal Observatory .....	4·60	Colinton .....	5·61
City Observatory .....	5·18	Davidson's Mains .....	4·78
Blacket Place .....	5·42	Dalkeith .....	3·95
Charlotte Square.....	5·02	Smeaton .....	4·05
George Square.....	5·46	Rosewell .....	4·52
Leith .....	5·49	Strathmiglio (Fife) .....	5·71

A notable feature of the rainfall of last month was the absence of any great downfall in twenty-four hours, the wettest day being the 22nd, when rather less than three-quarters of an inch fell. In the very wet November of 1770 no less than 2·30 inches fell on the 7th, 1·06 inches on the 9th, and 1·20 inches on the 14th—a total for three days of over 4½ inches. Again in 1772 nearly 2 ins. fell on the 1st of the month. The record November rainstorm occurred in 1795, when on the 18th of the month there fell 2·89 in. It will thus be seen that the Novembers of 1770, 1772 and 1795 were characterised by great and short-lived rainstorms; while the month that has just closed has been noteworthy for the steadiness and persistence of the rainfall, there having been only three dry days in many districts. The land has thus never had a chance to become dry, and its saturated condition may be imagined when we remember that the rainfall of 10·29 in. recorded in Edinburgh during the last two months, is equal to 1,039 tons, or 232,800 gallons of water per acre. Over the Edinburgh registration area of 8,804 acres, this amounts to 9,150,000 tons; while if we assume an average rainfall of 10 in., over the drainage area of the Pentland and Moorfoot Waterworks, we have a downfall of over forty-three millions of tons of water on the 42,577 acres covered by the combined systems.

R. C. MOSSMAN.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JUNE, 1900.

STATIONS.  (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
London, Camden Square	90·1	11	45·8	5	72·2	52·3	51·4	73	134·3	43·3	2·26	14	6·1
Malta.....	94·0	27	56·7	5	80·7	64·9	62·2	72	146·9	54·2	·38	4	1·9
Cape of Good Hope ...	77·9	29	37·9	9	65·9	49·8	51·9	81	...	...	1·57	9	4·9
Mauritius.....	79·5	6	53·0	29a	76·1	64·2	61·1	75	137·8	43·3	1·33	3	4·7
Calcutta.....	99·3	18	70·2	2	92·1	79·3	78·5	81	153·5	68·6	10·15	13	7·1
Bombay.....	93·4	8	75·0	25	90·3	81·6	77·8	78	141·2	72·7	18·26	13	6·6
Ceylon, Colombo .....	90·7	2, 3	72·0	25	87·4	78·5	75·7	84	148·0	71·0	7·83	21	6·7
Melbourne.....	67·5	4	36·4	12	57·5	44·1	44·3	81	121·4	29·9	1·76	11	6·3
Adelaide .....	66·0	3, 4	37·6	8	59·6	46·2	44·9	77	126·0	28·6	3·61	21	6·5
Sydney .....	67·1	3	43·7	30	60·4	51·5	47·2	85	107·9	33·0	10·48	20	6·1
Wellington .....	61·5	6	36·0	20	54·4	43·6	40·7	73	103·0	28·6	2·44	15	5·0
Auckland .....	64·0	3	44·0	20	59·4	48·7	42·7	66	125·0	38·0	3·10	16	5·5
Jamaica, Halfway Tree	92·0	26	70·6	1	87·9	72·3	71·4	78	...	...	3·58	9	4·3
Trinidad .....	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada.....	85·5	25	66·0	27	79·5	73·3	71·2	78	161·0	...	6·90	24	5·1
Toronto .....	89·4	24	44·4	30	76·5	54·6	55·1	71	109·6	38·8	2·43	9	4·0
New Brunswick, Fredericton .....	85·7	21	38·0	4	72·0	47·6	47·4	57	...	...	3·74	9	5·0
Manitoba, Winnipeg ..	100·5	23	33·0	8	81·4	51·2	...	...	...	...	1·85	10	4·5
Victoria, British Columbia .....	77·4	13	45·3	7	64·6	51·3	...	...	...	...	1·61	16	6·4

a—and 30.

## REMARKS.

MALTA.—Adopted mean temp. 71°·8, or 0°·2 above average. Mean hourly velocity of wind 7·7 miles, or 1·1 below average. Mean temp. of sea 72°·3. TSS on 5th and 29th; L on 4th. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·1, and of dew point 0°·5, above average; rainfall ·61 in. below average. Mean hourly velocity of wind 9·2 miles, or 2·1 miles below average; extremes, 24·8 on 26th and 2·0 on 15th; prevailing direction S.E. by S. to E.S.E. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 1°·0 above, of dew point 1°·6 above, and rainfall ·54 in. below, their respective averages. Mean hourly velocity of wind 11 miles; prevailing direction S.W. TSS on 7 days; L also on 18th and 19th. H. O. BARNARD.

Adelaide.—Good general rains fell in the latter half of the month. Mean temp. 0°·6 below the average for 43 years. Rain ·82 in. above average. C. TODD, F.R.S.

Sydney.—Temperature 1°·5 above, humidity 6·3 above, and rainfall 4·67 in. above, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—On the whole a showery month, although the total rain is below the average. Prevailing winds from S., frequently cold and frosty. Fogs on 8 days; T on 30th. Mean temp. equal to, and R 2·66 in. below, the average. R. B. GORE.

Auckland.—On the whole a showery month, but no heavy falls of rain, excepting one of 1·13 in. on the 26th. Mean temp. close to the average. Rainfall 1·50 in. below average. T. F. CHEESEMAN.

SUPPLEMENTARY TABLE OF RAINFALL,  
NOVEMBER, 1900.

Div	STATION.	Total Rain.	Div	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	2 31	XI.	Builth, Abergwesyn Vic.	6 67
II.	Dorking, Abinger Hall.	3 01	„	Rhayader, Nantgwillt ...	5 46
„	Birchington, Thor .....	2 33	„	Lake Vyrnwy .....	5 92
„	Hailsham .....	3 54	„	Corwen, Rhug .....	4 56
„	Ryde, Thornbrough .....	...	„	Criccieth, Talarvor .....	4 76
„	Emsworth, Redlands ...	3 06	„	I. of Anglesey, Lligwy..	3 99
„	Alton, Ashdell .....	3 04	„	I. of Man, Douglas .....	5 97
III.	Oxford, Magdalen Coll..	1 71	XII.	Stoneykirk, Ardwell Ho.	5 66
„	Banbury, Bloxham .....	2 01	„	New Galloway, Glenlee	5 96
„	Northampton, Sedgebrook	1 94	„	Moniaive, Maxwellton Ho.	4 96
„	Alconbury .....	...	„	Lilliesleaf, Riddell .....	4 78
„	Wisbech, Bank House...	2 17	XIII.	N. Esk Res. [Penicuik]	5 60
IV.	Southend .....	2 02	XIV.	Glasgow, Queen's Park..	6 20
„	Colchester, Lexden .....	2 00	XV.	Inverary, Newtown .....	5 73
„	Saffron Waldon, Newport	2 03	„	Ballachulish, Ardsheal...	5 73
„	Rendlesham Hall .....	2 31	„	Islay .....	6 05
„	Scole Rectory .....	...	XVI.	Dollar .....	5 77
„	Swaffham .....	2 73	„	Balquhidder, Stronvar...	6 59
V.	Salisbury, Alderbury ...	3 10	„	Coupar Angus Station...	3 86
„	Bishop's Cannings .....	2 70	„	Blair Atholl .....	3 56
„	Blandford, Whatcombe .	4 26	XVII.	Keith H.R.S. ....	3 03
„	Ashburton, Holne Vic...	5 79	„	Forres H.R.S. ....	2 47
„	Okehampton, Oaklands.	5 55	XVIII.	Fearn, Lower Pitkerrie..	3 03
„	Hartland Abbey .....	6 00	„	S. Uist, Askernish .....	3 59
„	Lynton, Glenthorne ...	6 15	„	Invergarry .....	3 58
„	Probus, Lamellyn .....	5 61	„	Aviemore, Alvie Manse.	2 48
„	Wellington, The Avenue	4 08	„	Loch Ness, Drumnadrochit	3 41
„	North Cadbury Rectory	2 81	XIX.	Invershin .....	4 38
VI.	Clifton, Pembroke Road	2 90	„	Durness .....	5 14
„	Ross, The Graig .....	2 18	„	Watten H.R.S. ....	3 09
„	Wem, Clive Vicarage ...	2 86	XX.	Dunmanway, Coolkelure	10 11
„	Wolverhampton, Tettenhall	2 45	„	Cork, Wellesley Terrace	4 52
„	Cheadle, The Heath Ho.	3 19	„	Killarney, Woodlawn ..	8 11
„	Coventry, Priory Row ..	2 15	„	Caher, Duneske .....	...
VII.	Market Overton .....	2 30	„	Ballingarry, Hazelfort...	4 15
„	Grantham, Stainby .....	1 87	„	Limerick, Kilcornan ...	4 81
„	Horncastle, Bucknall ...	1 64	„	Miltown Malbay .....	5 66
„	Worksop, Hodsck Priory	1 93	XXI.	Gorey, Courtown House	7 22
VIII.	Neston, Hinderton .....	3 04	„	Moynalty, Westland ...	6 00
„	Southport, Hesketh Park	3 13	„	Athlone, Twyford .....	4 52
„	Chatburn, Middlewood.	3 78	„	Mullingar, Belvedere ...	5 07
„	Duddon Val., Seathwaite Vic.	9 40	XXII.	Woodlawn .....	4 62
IX.	Melmerby, Baldersby ...	3 19	„	Crossmolina, Enniscoe ..	6 64
„	Scalby, Silverdale .....	2 88	„	Collooney, Markree Obs.	4 90
„	Ingleby Greenhow Vic..	3 40	XXIII.	Enniskillen, Model Sch.	...
„	Middleton, Mickleton ...	3 76	„	Warrenpoint .....	5 94
X.	Haltwhistle, Unthank H.	5 24	„	Seaforde .....	6 06
„	Bamburgh .....	4 00	„	Belfast, Springfield .....	5 53
„	Keswick, The Bank .....	4 58	„	Bushmills, Dundarave..	5 63
XI.	Llanfrechfa Grange .....	4 26	„	Stewartstown .....	5 67
„	Llandoverly .....	3 93	„	Killybegs .....	8 22
„	Castle Malgwyn .....	5 04	„	Horn Head .....	6 14
„	Brecknock, The Barracks	...			

## NOVEMBER, 1900.

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.			
				Dpth	Date		Deg.	Date	Deg.	Date		
I.	London (Camden Square) ...	1.90	— .76	.41	16	18	62.0	1	28.3	11	2	10
II.	Tenterden .....	2.99	— .40	.57	15	18	62.0	1	31.0	11	2	4
	Hartley Wintney .....	1.86	...	.24	28	20	63.0	1	30.0	23	5	9
III.	Hitchin .....	1.93	— .75	.38	24	20	60.0	1	27.0	10	4	...
	Winslow (Addington) .....	2.04	— .89	.31	24	23	61.0	1	21.0	11	4	7
IV.	Bury St. Edmunds (Westley) ..	2.19	— .36	.35	1	19	60.0	1	30.0	10	...	...
	Norwich (Brundall) .....	2.17	...	.33	12	25	60.6	1	28.0	11	2	13
V.	Winterbourne Steepleton ...	5.08	...	.81	28	21	59.4	2	28.0	23	3	13
"	Torquay (Cary Green) ...	2.84	...	.45	5	20	62.2	4	33.9	11	0	6
	Polapit Tamar [Launceston]..	5.73	+ 1.39	1.30	6	21	59.5	4	24.5	22	8	11
VI.	Stroud (Upfield) .....	2.21	+ 1.12	.34	24	21	60.0	1	30.0	10	1	...
"	Church Stretton (Woolstaston)	3.24	— .28	.56	6a	25	59.0	2	31.5	19	2	9
"	Worcester (Diglis Lock) .....	2.16	— .68	.31	6b	23	...	...	...	...	...	...
VII.	Boston .....	1.82	— .38	.26	5	18	60.0	1	26.0	11	4	...
"	Hesley Hall [Tickhill] .....	2.14	+ .12	.33	12	19	54.0	2	29.0	24	3	...
"	Breadsall Priory .....	2.65	...	.40	6	24	...	...	...	...	...	...
VIII.	Manchester (Plymouth Grove) ..	2.10	— .90	.35	3	17	65.0	1	30.0	22	2	5
IX.	Wetherby (Ribston Hall) ...	4.00	+ 1.93	.60	28	25	...	...	...	...	...	...
"	Skipton (Arnccliffe) .....	6.91	+ .16	.83	12	27	...	...	...	...	...	...
"	Hull (Pearson Park) .....	2.67	+ .66	.34	4	22	60.0	1	29.0	11	2	9
X.	Newcastle (Town Moor) .....	2.87	+ .47	.55	3	21	...	...	...	...	...	...
"	Borrowdale (Seathwaite) .....	9.96	+ 4.83	1.53	8	21	58.5	1	27.4	19	3	...
XI.	Cardiff (Ely) .....	5.20	+ .29	.65	24	23	...	...	...	...	...	...
"	Haverfordwest .....	5.16	— .70	.89	24	21	58.2	1	27.2	21	3	15
"	Aberystwith (Gogerddan) ...	5.70	+ .59	1.21	24	20	57.0	1	...	...	...	...
	Llandudno .....	3.66	+ .57	.75	24	19	59.0	1	31.5	19	1	...
XII.	Cargen [Dumfries] .....	4.83	+ .27	.71	3	19	59.0	1	26.0	19	3	...
XIII.	Edinburgh (Blacket Place) ...	5.42	...	...	...	...	56.5	...	29.0	...	...	...
XIV.	Colmonell .....	4.62	...	.78	3	14	63.0	1	25.0	17g	...	...
XV.	Tighnabruaich .....	7.57	...	1.08	26	17	52.0	1, 6	28.0	17g	6	...
	Mull (Quinish) .....	6.36	— .63	1.20	5	17	...	...	...	...	...	...
XVI.	Loch Leven Sluices .....	5.80	+ 1.84	.60	1c	18	...	...	...	...	...	...
"	Dundee (Eastern Necropolis) ..	4.60	+ 1.90	.65	26	23	57.4	1	26.2	19	6	...
XVII.	Braemar .....	...	...	...	...	...	...	...	...	...	...	...
"	Aberdeen (Cranford) .....	5.10	...	1.12	15	28	63.0	1	26.0	27	10	...
"	Cawdor (Budgate) .....	3.39	+ .54	.99	6	17	...	...	...	...	...	...
XVIII.	Strathconan [Beaully] .....	5.21	+ 1.35	1.50	12	11	...	...	...	...	...	...
"	Glencarron Lodge .....	5.56	...	1.02	6	21	58.6	1, 3	26.6	20	7	...
XIX.	Dunrobin .....	4.34	+ 1.51	1.10	8	16	54.0	1	30.0	28	5	...
"	S. Ronaldshay (Roeberry) ...	3.66	+ .24	.65	6d	26	54.0	1	34.0	17	0	...
XX.	Darrynane Abbey .....	7.53	...	1.11	21	24	...	...	...	...	...	...
"	Waterford (Brook Lodge) ...	7.43	+ 3.76	1.00	6	19	59.0	1	26.0	21	6	...
"	Broadford (Hurdlestown) .....	4.88	...	.77	27	23	...	...	...	...	...	...
XXI.	Carlow (Browne's Hill) .....	9.26	+ 6.20	2.14	6	21	...	...	...	...	...	...
"	Dublin (Fitz William Square) ..	4.87	+ 2.04	1.13	27	19	62.8	3	32.0	22	1	7
XXII.	Ballinasloe .....	4.90	+ .99	.64	5	26	57.0	2e	22.0	19	12	...
"	Clifden (Kylemore) .....	6.39	...	...	...	...	...	...	...	...	...	...
XXIII.	Waringstown .....	5.13	+ 2.03	.90	24	16	59.0	5f	25.0	18	15	22
"	Londonderry (Creggan Res.) ..	4.85	+ .33	.58	6	22	...	...	...	...	...	...
"	Omagh (Edenfel) .....	6.55	+ 2.68	1.32	27	17	58.0	1	23.0	21	12	14

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

a—and 28. b—and 12, 27. c—and 4, 15. d—and 26. e—and 3, 4, 5. f—and 6, 7, 8, 9.

g—and 18.

## METEOROLOGICAL NOTES ON NOVEMBER, 1900.

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.

TENTERDEN.—Rainfall again below the average, but it was the wettest month since February. Mean temp.  $46^{\circ}$ . Duration of sunshine only 45 hours 30 mins. Distant L in the evening on 10th. Swallows were seen as late as the 7th. On the 22nd the depth of water in the well was the same as a year ago, only 16 inches.

HARTLEY WINTNEY.—Although R fell on two-thirds of the days of the month, the amount was less than the average by  $\cdot 11$  in. There were many calm and mild days. An absence of frost, and no fog until the 23rd. Ozone occurred on 8 days, with a mean of  $4\cdot 4$ . On the 10th the duration of sunshine was 6 hours, and on the 26th 5 hours.

WINSLOW, ADDINGTON.—A dull and damp month, with very little fog, but R on many days. The only sharp frost was on the 11th, when all tender outdoor plants were destroyed. Distant T on 14th.

BURY ST. EDMUNDS, WESTLEY.—A dull, mild and dreary month, with very little frost.

NORWICH, BRUNDALL.—An exceedingly damp and gloomy month, but very mild. Mean temp. nearly  $3^{\circ}\cdot 0$  above the average, making the fourth very mild November in succession. Fog on 2nd; L on 15th; gale from N. on 17th.

WINTERBOURNE STEEPLTON.—A wet month, but not unusually so for November. The weather kept very open, and there was but little frost.

TORQUAY, CARY GREEN.—R  $1\cdot 10$  in. below the average; mean temp.  $0^{\circ}\cdot 7$  above the average. Duration of sunshine, 87 hours 10 mins.; 6 sunless days, Ozone mean,  $5\cdot 3$ , the max. being  $7\cdot 0$  on 25th and 26th.

POLAPIT TAMAR [LAUNCESTON].—A cold, dull and wet month. Fog on 3rd and 21st. H on 9th, 10th, and 15th. For the 11 months of the year the rainfall exceeds the average by  $2\cdot 33$  in.

### WALES.

HAVERFORDWEST.—A wet, mild month, with very little sunshine. From the 18th to 23rd it was colder, the min. on grass on 19th being  $17^{\circ}\cdot 3$ . The total R for the 11 months of the year is slightly below the average.

ABERYSTWITH, GOGERDDAN.—A very wet month; mild, with very little sunshine.

### SCOTLAND.

CARGEN [DUMFRIES].—A wet and sunless month. Strong westerly gale on the 8th.

EDINBURGH, BLACKET PLACE.—The wettest November since at least 1785 : the R was exceeded in November in 1770 with 6·78 in., and in 1772 with 5·66 in. Duration of sunshine, only 22 hours.

CLACHANTON, COLMONELL.—R 55 in. below, and mean temp. ( $43^{\circ}5$ )  $2^{\circ}1$  above, the average of 24 years.

TIGHNABRUACH, CRAIGANDARAICH.—A cold and wet month ; the prevailing winds were from E. and N.E.

ABERDEEN, CRANFORD.—It was admitted by the “ oldest inhabitants ” that such continuous wet weather had never been seen before. Sickness was very prevalent, especially among the young.

S. RONALDSHAY, ROEBERRY.—A very fair month upon the whole. No heavy gales. Mean temp.  $43^{\circ}5$ , or  $0^{\circ}1$  above the average.

### IRELAND.

DARRYNANE ABBEY.—A wet month, especially the last twelve days, 4·78 in. of R falling in the eight days from 21st to 28th, or an average of ·60 in. per day. H showers on the 8th and 9th. On the 21st 1·11 in. of R fell in less than 15 hours.

WATERFORD, BROOK LODGE.—The first S fell on the Comeragh Mountains on the 10th, and more fell on the 29th.

BROADFORD, HURDLESTOWN.—A very wet month. R 1·50 in., and rainy days 3, above the average of 16 years. Dense fog on 4th.

CARLOW, BROWNE'S HILL.—During the 36 years that a record has been kept here, there never was so great an amount of R for one month, and only once a heavier fall in 24 hours than that of 2·14 in. on 6th.

DUBLIN, FITZWILLIAM SQUARE.—In the main dull, damp and foggy, with excessive R. At the beginning the temp. was uncommonly high. In an anti-cyclonic period, from 17th to 20th, and for some days subsequently, it was cold, with much fog and dampness. The closing days were extremely unsettled, gloomy and rainy. Mean temp.  $45^{\circ}6$ , or  $0^{\circ}9$  above the average. High winds were noted on 10 days, attaining the force of a gale on 27th and 28th. More or less fog on 9 days.

OMAGH, EDENFEL.—The weather till the 16th was dull, raw and gloomy, with saturating rains, when there followed a dry and cold period until the 24th, with frosts more or less severe every night, but no S. The last week was again extremely wet, 2·65 in. of R falling on four wet days, bringing the total of the month to nearly twice the average, and that of October and November together to 12·68 in.



# SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

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CCCCXX.]

JANUARY, 1901.

[PRICE FOURPENCE,  
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## THE EDITORSHIP OF THE METEOROLOGICAL MAGAZINE.

With the present number of the *Meteorological Magazine*, which completes the thirty-fifth volume, my control ends, and I purpose devoting what measure of strength remains to me entirely to the Rainfall Organization. The Editorship of the Magazine will be taken up by my friend and colleague, Hugh Robert Mill, D.Sc., LL.D., who, for nearly 20 years, has been one of the leaders of the science of physiography, and in connection therewith has devoted a considerable amount of attention to Rainfall and Meteorology.

The intimate knowledge of the configuration of the Earth's surface is the true foundation for a comprehensive grasp of the problems of meteorology and we have no doubt that the Magazine, while retaining its special interest in rainfall, will deal more fully with the science in all its branches than it has done in the past.

*Symons's Monthly Meteorological Magazine* is the only journal in the English language devoted to the subject, which has attained to a ripe age; but it must be confessed that it owes its long life to some extent to its usefulness as the organ of the Rainfall Organization, for had it been obliged to stand alone, it is probable that it would not have received sufficient support to justify its continuance.

Since the lamented death of the Founder and first Editor, a somewhat different policy has been adopted, and several new contributors have been good enough to write for the Magazine. It is hoped that this co-operation will be continued, and that by devoting more attention to current topics and the branches of the science, which are of general interest, a larger circulation will be secured, and that it will be possible to introduce illustrations more frequently.

It is hoped that the readers will favour the Editor promptly with notes of any exceptional phenomena and with criticisms and suggestions which will tend to increase the interest of the Magazine.



a strip of country stretching from near Bristol and Chepstow to Coventry, a distance of 85 miles in a north-east direction, and it is remarkable that no fall of 3·00 in. or upwards is reported from any station more than 10 miles to the right or left of the straight line joining Avonmouth and Coventry. This belt of heaviest rain covers an area of nearly 1,000 square miles, almost entirely in the valley of the Lower Severn and the Warwickshire Avon, which flow almost exactly along the centre of it—the south-eastern edge of the strip being sharply defined by the steep slope of the Cotswold Hills and the escarpment stretching north-eastward from them. The area of rainfall over 2·50 in. surrounds this belt, and is very much more extensive, appearing to form a great triangle, with its angles near Gillingham, Dorset, Hereford and Melton Mowbray, a total surface of about 3,500 square miles, including the north of Somerset, the west of Wiltshire and Oxford, the east of Monmouth and Hereford, and the whole of Gloucester, Worcester, Warwick and Leicester. The rainfall exceeded 2·00 in. in the twenty-four hours over a wider area, also triangular in outline and measuring altogether about 7,000 square miles. Outside this larger triangle the amount of rainfall diminished rapidly, especially along the northern edge, but a large part of England recorded rain over 1·00 in.

The weather during the 30th is shown by the Meteorological Office Weather Charts to have been under the influence of a cyclone, the centre of which was over the middle of Ireland on the morning of the 30th, and moved south-eastward, passing Bristol a little before 6 that evening, and being in the English Channel on the morning of the 31st. The region of heavy rain thus was successively under the front and the rear of a cyclone in an unusually short time, and the wind, which was blowing from the S.W. on Sunday morning, blew with greater strength from N.E. on Monday morning over the whole area affected by the rains. The recording rain gauges at the Midland Institute, Birmingham, and at West Bromwich, showed that the heaviest fall commenced about 3 p.m., on the 30th, and lasted until midnight.

Many observers have favoured us with notes of the progress of the storm at their stations; and the newspapers have been full of reports of the disastrous floods at Coventry, Stratford-on-Avon, Warwick, Bristol, Leicester, and other places. From our correspondence we make the following selection:—

*Beckford.*—The close of the 19th century was marked by the record rainfall of 3·10 in. registered here. It commenced to rain on the 30th December, at 9 a.m., and continued without interruption till 5 a.m. on the 31st. At 4 p.m. the gauge had collected 0·62 in., and 2·48 in. fell between 4 p.m. and 5 o'clock the next morning. You will, doubtless, have records from other places, but from newspaper and private sources I gather that the fall was very general over the midland and south-west districts. At Kenilworth it was 3·17 in., at Evesham 3·14 in., at Beckford 3·10 in., at Winchcombe 3·17 in., at

Gloucester 3.11 in., at Chepstow 3.20 in. The flood in this district was the highest on record, being 9 inches higher than the previously recorded highest on October 1st, 1848.—FREDK. SLADE.

*Dollarward, Cirencester.*—The rain commenced about 10 a.m., but was not very heavy until 1 p.m.; it was very heavy all afternoon, wind light S.W., S.E., E.; by 10 p.m. 1.19 in. were measured. About that time the wind suddenly rose from the N. and soon blew a severe gale; the barometer, which had fallen to 28.71 in., commenced to rise. Between 12 and 3 a.m. the gale was at its height, and was exceedingly severe, doing much damage. Rain continued all night and appears to have been heaviest from 4 to 6 a.m., accompanied by snow. It had ceased by 9 a.m., and by 2 p.m., 31st, the wind had almost died down. The floods here are the worst ever known. My own guage was blown over in the night.—CHARLES P. HOOKER.

*Stratford-on-Avon.*—Before sending you the usual returns of rain, I desire to report the marvellous amount that fell on Sunday last, 3.60 ins. On the 26th there fell 0.55, and 0.22 in. during the next three days. The flood here on the 31st was the highest of the century; a board at the mill, which marks the height of floods, shows that it was 6 inches higher than that in 1801, the next highest.

The greatest falls I had registered here previously were on October 24th, 1882, 1.52 inches, and on August 6th, 1898, 1.46 inches. At Moville, in the north of Ireland, I had registered 2.54, November 13th, 1875; and in Londonderry in 1869 there fell on July 16th 2.04, on 20th 0.52, on 21st 0.50, on 23rd 2.15, so the fall of last Sunday far surpasses any I have registered in 40 years.

F. SMITH.

*The Spring, Kenilworth.*—A very exceptional fall of rain has occurred here. I register for the 24 hours, ending 9 a.m. on the 31st, 3.23 inches. Of this .38 fell before 4.15 p.m. yesterday, and the remainder (2.85 inches) fell between 4.15 p.m. and 9 a.m. on the 31st.—W. EVANS.

*North Cadbury Rectory, Somerset.*—A remarkable rain began about 9.30 a.m. on the 30th, and fell steadily at uniform rate till 4.45 p.m., when exactly .50 in. had fallen. From that time till about 9 p.m. it did not quite leave off, but the rain was very small, and I walked to church at 6.30 and returned at 7.45 without an umbrella.

The barometer, which had been falling steadily all day, reached 29.04 in. just before 6.30, and was at that or at 29.03 in. at 7.45. Wind all day from S.W. But while we were in church the wind increased somewhat, and at the end of the service was blowing in at the N. door, being then N.W., and still increasing.

At 9.30 p.m., or thereabouts, it began raining in earnest, beating on the W. windows, while the barometer showed an inclination to rise.

At 8 a.m., December 31st, the surface of the ground and the trees were dry, with a fairly strong N. wind blowing, and grey sky. But from my window I could see floods to S.W., which are never visible unless they are considerable. Going out on the lawn I found

it to be in no way sloppy, and when I looked into the gauge I was fairly astonished. It had 1·51 in. in it, of which almost all must have fallen between 9.30 p.m. and about 3 or 4 a.m.

At a farmhouse in the neighbourhood, on low ground, the farmer had got up at 3 a.m. to rescue his poultry and cows from the rising flood; he said it was not then raining anything to speak of, and he was of opinion that the flood was at its height some time between 3 and 6, and higher than the flood of February, 1900.

This seems to point to the conclusion that the rain came down pretty hard, but not torrentially, for about five or six hours from 9.30 p.m. But it is clear from the newspapers that this rain was *not* a local one; and you may be glad of these notes of the time when it fell, to aid you in any investigation.

I should emphasize that there were Two rains—one of ·50 in. between 9.30 a.m. and 4.45 p.m.; another of 1·51 in., of which *almost all* fell between 9.30 p.m. and 3 or 4 a.m.

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

In addition to the serious damage which was done in the large low-lying towns of the Severn and Avon valleys, where the rain was the heaviest, the outskirts of the rainy belt also suffered severely; one of the great trilithons at Stonehenge being overthrown by the storm, mainly, it is believed, on account of the washing away of the soil from around the base of the stones.

## THE MILD DECEMBER.

Mr. H. Sowerby Wallis thus describes in a letter to *The Times*, of January 2nd, the remarkable features of the last month of the nineteenth century as regards temperature.

*Temperature at Camden Square, London, N.W., December, 1900.*

	9 a.m.	9 p.m.	Max.	Min.	Mean.
Mean Temperature .....	45°·0	46°·0	50°·1	40°·6	45°·4
Difference from the average of 40 years ...	+6°·0	+6°·4	+6°·1	+6°·2	+6°·2
Highest in 1900 .....	53°·6	55°·7	56°·5	51°·1	53°·1
No. of days above 50° .....	6	8	19	3	5

Dealing with the above columns *seriatim*, we find that the mean 9 a.m. temperature was 6°·0 above the average, but it has been exceeded by 45°·4 for December, 1898, and by 46°·1 for December, 1868, while the highest 9 a.m. reading has been exceeded a dozen times.

The mean 9 p.m. temperature was 6°·4 above the average, and has been exceeded only by 46°·4 for December, 1868, but the highest 9 p.m. reading has been exceeded four times.

The mean *maximum* temperature was  $6^{\circ}\cdot 1$  above the average, and has been exceeded only by  $50^{\circ}\cdot 7$  for December, 1868, but the highest *maximum* has been exceeded ten times; nevertheless, the number of days on which the temperature exceeded  $50^{\circ}$  (19) is unprecedented, for there were only 18 such days in 1868 and 17 in 1898.

The mean *minimum* was  $6^{\circ}\cdot 2$  above the average, and has been exceeded by  $40^{\circ}\cdot 8$  for 1898 and  $41^{\circ}\cdot 0$  for 1868, but the highest *minimum* has been exceeded five times.

The mean temperature for the month was  $6^{\circ}\cdot 2$  above the average, and has been exceeded only by  $46^{\circ}\cdot 0$  for 1868, but the highest mean was exceeded in both 1868 and 1898. The number of days with mean temperature above  $50^{\circ}$  (5) was also exceeded in both those years.

From the foregoing it is clear that December, 1900, while it ranks with the mildest of the last half century, was equalled in mildness by December, 1898, and exceeded by December, 1868 :—

*Temperature of December at Camden Square, London, N.W.*

	9 a.m.		9 p.m.		Maximum.		Minimum.		Mean Temp.
	Mean.	Highest	Mean.	Highest	Mean.	Highest	Mean.	Highest	
1868.....	$46^{\circ}\cdot 1$	$53^{\circ}\cdot 5$	$46^{\circ}\cdot 4$	$56^{\circ}\cdot 2$	$50^{\circ}\cdot 7$	$58^{\circ}\cdot 2$	$41^{\circ}\cdot 0$	$50^{\circ}\cdot 8$	$46^{\circ}\cdot 0$
1898.....	$45^{\circ}\cdot 4$	$54^{\circ}\cdot 8$	$45^{\circ}\cdot 7$	$55^{\circ}\cdot 1$	$49^{\circ}\cdot 8$	$57^{\circ}\cdot 1$	$40^{\circ}\cdot 8$	$53^{\circ}\cdot 9$	$45^{\circ}\cdot 4$
1900.....	$45^{\circ}\cdot 0$	$53^{\circ}\cdot 6$	$46^{\circ}\cdot 0$	$55^{\circ}\cdot 7$	$50^{\circ}\cdot 1$	$56^{\circ}\cdot 5$	$40^{\circ}\cdot 6$	$51^{\circ}\cdot 1$	$45^{\circ}\cdot 4$

In December, 1868, frost in shade occurred on only one day; in December, 1898, on three days; and in December, 1900, on two days.

The features of the past month were—almost entire absence of frost and an exceptional number of mild days, rather than a few days of remarkably high temperature.

### DECEMBER BLOSSOMS.

IN connection with the remarkable mildness of December, the following list of the varieties of flowers in full bloom at Farnham Lodge, near Knaresborough, Yorkshire, 170 feet above sea level, is of interest. The list is sent by Mr. R. Elmhurst, and represents a floral census taken by him in his garden on January 1st, 1901.

Marigold.	Pansy.	Rocket.
White Verbena.	Wallflower.	Potentilla.
Laurustinus.	Helleboras foetida.	Hepatica.
Blue Gentian.	Winter Jasmine.	Violet.
Christmas Rose.	Roses, various.	Periwinkle.
Carnation.	Feverfew.	Orobis Vernus.
Polyanthus.	Chrysanthemums,	Anemone.
White Primula.	various.	Yellow Button
Cowslip.	Arabis.	( <i>Pyrethrum</i> sp.)

# ROYAL METEOROLOGICAL SOCIETY.

The monthly meeting of this society was held on Wednesday evening, December 19th, at the Institution of Civil Engineers, Westminster. The President, Dr. C. Theodore Williams, was in the chair.

The following gentlemen were elected Fellows:—Sir C. T. D. Acland, Bart., A. M. Bell, C.E., Captain J. G. Bickford, S. Brocklehurst, Lieut. M. H. Clarke, R.N.R.; R. Downs, J. C. Eckersley, E. O. Evans, Captain A. M. Field, R.N., H. D. Gardner, J. Kitching, O. T. Olsen, K. Otani, E. J. B. Sopp, J. R. Tustin, Colonel F. R. W. Sibthorp, and C. L. Weller.

Mr. Henry Mellish, F.R.Met.Soc., read a paper on “The Seasonal Rainfall of the British Isles,” which he illustrated with a number of lantern slides. He discussed the rainfall records from 210 stations, for the 25 years, 1866-90, and gave the monthly and seasonal percentages of the mean annual rainfall for each station.

From a consideration of the seasonal charts, Mr. Mellish drew the following conclusions:—

*Winter.*—In winter the largest percentages of rainfall are found, as a rule, at the wet stations, and the smallest at the dry ones, so that the chart of percentages for this quarter bears a strong resemblance to the chart of mean annual rainfall. This accordingly is the season in which the differences in the actual rainfalls in the different districts are the largest; and this is especially the case in January, which is the wettest month of the year in some of the very wettest districts.

During these three months more than 30 per cent. of the yearly total falls in Cornwall and part of Devon, in the English Lake District, and over a good deal of the west coast of Scotland, and also in the south and west of Ireland, these being the districts in which the wettest month in the year is either December or January. The highest percentage of all, 34 per cent., is found in the Kyles of Loch Alsh; while areas with more than 32 per cent. exist to the north of the Clyde, in the English Lake District, and in the extreme south of Ireland. On the other hand, less than 24 per cent. of the yearly total is recorded over the whole of the central plain and east coast of England, and parts of the east coast of Scotland, a minimum of 19 per cent. being found near Ely, and minima of under 22 per cent. near the estuary of the Forth and in Elginshire. In Ireland a strip with less than 26 per cent. extends from near Parsonstown to the north-east coast. Besides the maxima at wet stations already mentioned, we find in this quarter also the minima, at a few stations in February on the east coast of England.

*Spring.*—Spring is everywhere the driest quarter, and the percentages are very uniform over the country; rather larger in the east than in the west. The west coast of Great Britain receives

rather less than 18 per cent. of the annual mean, and the central plain and the east coast rather more than 20 per cent., with a local maximum of 22 per cent. in Nottinghamshire. Ireland has about 20 per cent., rather more in the south-east, rather less in the west. During this quarter the driest month of the year occurs at nearly all stations, except a few on the east coast of England, where, as already mentioned, the minimum is found in February, and at other stations in the south-west of England, and on the east coasts of Scotland and Ireland, where the minimum occurs as late as June. Over the greater part of the country, either March or April is the driest month.

*Summer.*—The chart for the summer months is almost exactly the reverse of the winter one; the highest percentages are now found in the dry districts, and the lowest in the wet ones, but they are, on the whole, slightly lower than in winter. There are now only three stations with 30 per cent. of the total fall, one near Ely (where we found the minimum in winter), and two near Edinburgh. The central plain, and parts of the east coast of England and Scotland, receive more than 26 per cent.; while the only districts with less than 20 per cent. are those where we found the maximum in winter, viz.—Cornwall, the English Lake District, and some parts of the west of Scotland, the minimum being rather under 18 per cent. in the Kyles of Loch Alsh, where very nearly twice as much rain falls in the three winter months as in the three summer ones. In Ireland the line of 26 per cent. occupies nearly the same place as in winter, but it now encloses an area of maximum, the percentage falling to about 20 on the south coast. This quarter includes months with extremes of rainfall at comparatively few stations; the districts with a minimum in June have already been mentioned; the maximum occurs in July or August at only a few places in the east of England and Scotland.

*Autumn.*—As the spring is everywhere dry, so is the autumn everywhere wet, and there is little difference in the proportion of the annual total which falls in the different districts. In Great Britain the percentage is slightly larger on the coasts, and especially on the west coasts, than inland, the minimum, under 28 per cent., being found near Bedford, and also in the estuaries of the Forth and of the Tay, while the maximum, 34 per cent., occurs in the Orkneys. In Ireland the values are rather below 28 per cent. in the south-east, and above this figure in the north-west. In no district is the driest month found in this quarter, while the maximum occurs in either September, October, or November over the whole country, except central and western Scotland, the south of Ireland, and a few small districts in England.

After some remarks on the percentages of rain falling in each month of the year at several typical stations, Mr. Mellish said:

“As regards the relation between the amount of rain which falls in the wettest and the driest month at any station, it seems to be



generally the case that the range is larger for wet stations than for dry ones; but this rule is by no means universal, and has some well-marked exceptions at some of the dry stations. Thus, Ely and Nairn are among the driest stations in England and Scotland respectively, and at each the ratio between the rainfall in the wettest and the driest month is large. However, to put it generally, we may say that in wet districts rather more than twice as much rain falls in the wettest month as in the driest, and in dry districts rather less than twice."

In the discussion which followed the reading of this paper, Mr. F. Gaster said that the irregularities in the monthly rainfall were no doubt due to the varying distribution of atmospheric pressure. In the wet districts, which were mostly mountainous, it was hardly to be wondered at that the winter rainfall was greatest. In the drier quarters the summer maximum was, in his opinion, largely due to thunderstorm disturbances.

Mr. Sowerby Wallis said he felt much indebted to Mr. Mellish for what he considered an exhaustive discussion of the subject, although the author did not call it so. In the two diagrams exhibited, drawn from Bartholomew's "Atlas of Meteorology," of the driest and wettest months, he thought the values would be greatly modified, if a longer period than 25 years had been available.

Mr. Hopkinson said that he had collected records of the monthly rainfall from 288 stations, in England alone, for the 10 years 1881-90. These records give a mean annual fall of 31·58 ins.; the seasonal percentages being, winter 24 per cent., spring 21 per cent., summer 25 per cent., and autumn 30 per cent.

Mr. Eaton said that the Dorset rainfall observations, taken since 1848, which he had discussed at length, proved that a period of 25 years was hardly long enough to give definite results of the monthly distribution of the rain.

Dr. H. R. Mill said that he considered the selection of the stations to be discussed was of great importance in all rainfall work. It was important that they should be chosen so as to represent proportionally the different rainfall divisions of the district in question, though he confessed that it would be very difficult to do this.

After some remarks by Mr. Bayard, Rev. Dr. J. D. Parker, and Captain Carpenter, Mr. Gaster urged the desirability of taking the different types of weather, such as that associated with south-west winds, and comparing them with periods of north-east winds, instead of holding hard and fast to the arbitrarily chosen calendar months.

Mr. Mellish, in reply, said that he could not help thinking that, for a discussion of the causes of the distribution of rainfall, it would be better to deal with individual months, or shorter periods, rather than with averages of a number of years. There was a difficulty in using a greater number of years, as the longer the period, the fewer the stations available.

## THE INTERNATIONAL METEOROLOGICAL COMMITTEE.

The report of the meeting of the International Meteorological Committee, held at St. Petersburg from September 2nd to 7th, 1899, has just been issued by the Meteorological Office.

The following were the principal subjects considered :—

1. Report of Professor Rücker on Terrestrial Magnetism and Atmospheric Electricity.
2. Report of M. Hildebrandsson on Clouds.
3. Report of M. Hergesell on Balloon Ascents.
4. Report of M. Violle on Radiation and Insolation.
5. Is it desirable that the Committee should deal with Seismological Observations? (M. Rykatcheff.)
6. Antarctic Exploration. (Dr. von Bezold.)
7. Centres of Atmospheric Action. (M. Hildebrandsson.)
8. Definition of the Meteorological Day. (M. Rykatcheff.)
9. Instructions for the use of Sunshine Recorders. (M. Rykatcheff.)
10. Rules for the Determination of the Temperature of the Soil. (M. Rykatcheff.)
11. Precautions to be Adopted in the use of Alcohol Thermometers. (M. Rykatcheff.)
12. The Symbol to Indicate Low Fog. (M. Rykatcheff.)
13. Further Definition of the Meaning of the Symbols Employed to Indicate Thunderstorms. (M. Rykatcheff.)
14. Protection of Magnetic Observatories against Electric Supply Currents. (Dr. von Bezold.)
15. Proposal for the Publication, in a Special Form, of the Diurnal March of Temperature for each Country. (Dr. Hann.)
16. The Importance of Actinometric Observations. (Dr. Hann.)
17. The Installation of Anemometers in the Open Country under Identical Conditions. (M. Teisserenc de Bort.)
18. The Use of Carrier Pigeons by Transatlantic Steamships for Transmitting Information about the Weather off the European Coasts. (M. Teisserenc de Bort.)
19. Publication Fortnightly, or every Ten Days, of Recent Reports of Weather in the Atlantic Portion of the Northern Temperate Zone. (Dr. von Bezold.)
20. The Desirability of Restricting the Use of the Psychrometer as far as possible, and of Recommending the Use of the Hair Hygrometer for Regular Hygrometric Observations. (Dr. Pernter.)
21. Establishment of a Telegraph Cable to Iceland. (M. Paulsen.)
22. International Ten-day Weather Reports. (MM. von Bezold and Neumayer.)

The report on balloon ascents details the International simultaneous ascents up to the date of the meeting, and contains a somewhat full discussion as to the requirements for successful work, both as regards instruments and general equipment, with special details of the observations at Trappes by M. Teisserenc de Bort, at Blue Hill by Mr. A. Lawrence Rotch, and at Berlin by Dr. Assmann.

The expression, "Centres of Atmospheric Action," may not convey much meaning to some of our readers, but the following extracts will make it clear, and give an outline of what is proposed :—

"It is evident that we shall never discover the laws which govern the general movements of the atmosphere if the only observations we make on the Earth's surface are those in certain civilised countries. . . .

"On any isobaric chart for any month there will be found determinate regions of barometrical maxima and minima. The most constant maxima are located over the oceans to the north and south of the equator, near the Tropics, and the most important minima on the oceans near the Arctic and Antarctic circles. On the continents of the temperate zones we have maxima in winter and minima in summer. These maxima and minima have been termed by M. Teisserenc de Bort *centres of action*. In fact, thanks to his investigations and the more recent work of MM. van Bebber and Köppen, we know that a certain relation exists between the general character of the weather of a season in Europe and the variations in the barometrical heights at the surrounding centres of action ; that is to say, in Iceland, at the Azores, and in Siberia. A season has a different *type* according to whether Europe is under the influence of one or other of these centres of action. If the depression over the sea near Iceland extends in winter over the whole north-west of Europe, we have a mild and rainy winter, while the winter is severe if either the Azores maximum or that from Siberia extends over Europe, and so on. It seems that direct relations exist between all the centres of action over the globe."

This appears to us, as regards practical meteorology, one of the most promising fields of research, for if we can prove a connection between the conditions existing in different regions, as indicated above, or in the relation between Nile floods and monsoon rains in India, we shall have made a great step towards finding the cause of both. There may be difficulty in finding funds for meteorological observatories in remote regions, but with such observatories, to give a broad view of the horizontal distribution of atmospheric phenomena, and with kite and balloon observations, to study its vertical variations, meteorology should make greater advances in the coming century than it has done in the past.

M. Violle's report on radiations is a full discussion of the advances made up to 1898 in methods and apparatus for measuring solar radiation. The various instruments are described and criticised, and the list of references to original sources of information is exceptionally complete.

The meeting of the International Committee at St. Petersburg was, from several causes, a small one ; but the subjects dealt with were of great importance, and the decisions arrived at seem likely to advance the scientific study of meteorology.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JULY, 1900.

STATIONS.	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
<i>(Those in italics are South of the Equator.)</i>	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	95·2	16	44·5	8	80·7	57·6	..	...	137·1	43·9	1·50	7	4·2
Malta.....	92·1	4	59·1	12	88·0	70·6	68·4	70	149·0	53·0	·00	0	0·8
Cape of Good Hope ...	72·8	7	38·5	24	62·8	48·5	47·8	81	...	...	4·77	17	6·2
Mauritius.....	75·2	8	57·6	30	73·3	62·4	58·7	75	135·3	48·2	2·29	18	5·3
Calcutta.....	97·0	1	75·2	20	89·5	79·2	78·7	85	153·4	74·0	8·68	20	2·3
Bombay.....	89·2	5	74·2	13	86·5	79·3	77·8	85	143·4	71·8	25·75	28	8·5
Ceylon, Colombo .....	89·1	6	73·0	24	86·3	76·5	74·2	84	146·0	72·0	6·77	17	5·4
Melbourne.....	64·8	20	30·2	3	54·7	41·7	45·5	80	118·0	24·0	1·07	10	6·6
Adelaide .....	66·1	29	35·4	19	57·8	43·5	43·4	79	134·0	28·3	1·55	14	6·4
Sydney .....	66·1	25	39·3	17	57·1	45·3	43·2	83	105·9	31·2	13·21	12	4·9
Wellington .....	61·0	29a	34·0	13b	54·1	41·6	38·3	71	98·0	23·0	8·09	18	4·7
Auckland .....	63·0	17	40·0	10	57·7	47·0	41·6	68	128·0	36·0	3·68	23	6·1
Jamaica, Halfway Tree	94·0	18	70·0	25	88·6	72·5	70·0	75	...	...	2·34	8	4·4
Trinidad .....	89·0	sev.	69·0	23	87·0	71·6	74·4	85	168·0	65·0	7·95	22	...
Grenada.....	85·8	18	67·0	13	83·7	72·1	72·4	80	160·5	...	8·81	27	5·0
Toronto.....	94·4	6	48·1	1	80·9	58·0	58·8	72	112·4	42·8	2·73	12	4·8
New Brunswick, Fredericton	85·7	24	45·0	1	75·8	53·9	55·1	65	...	...	2·13	15	5·6
Manitoba, Winnipeg }	86·2	20	41·0	25	78·1	51·7	...	...	...	...	4·06	10	4·8
Victoria, British Columbia }	79·6	31	50·0	10	67·3	52·9	...	...	...	...	·40	3	4·0

a—and 31. b—and 19, 20.

## REMARKS.

MALTA.—Adopted mean temp. 78°·6, or 1°·3 above average. Mean hourly velocity of wind 7·9 miles, or 0·2 above average. L on 1st, 13th, 18th. J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·2, and of dew point 0°·7, below, and rainfall 0·2 in. above their respective averages. Mean hourly velocity of wind 10·9 miles, or 1·0 below average; extremes, 24·3 on 3rd and 1·6 on 10th. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 0°·5 below, of dew point 0°·2 above, and rainfall 2·39 in. below, their respective averages. Mean hourly velocity of wind 10 miles; prevailing direction S.W. L was seen on five days. H. O. BARNARD.

Adelaide.—Very cloudy month, but rain though falling on 14 days was light, the total being 1·03 in., less than the average. Seventeen hours less sunshine than the average of previous years. Mean temp. 50°·6, or 0°·9, below average. C. TODD, F.R.S.

Sydney.—Temperature 1°·2 below, humidity 6·0 above, and rainfall 8·72 in. above, their respective averages. A heavy snowfall on 5th covered the central highlands over an area 180 miles N. and S. and 130 E. and W., the Western Railway for 80 miles was blocked by S. This storm was more severe than any ever recorded here. It was caused by the meeting of warm tropical rains coming southwards and an intensely cold southerly wind, the most severe on record. H. C. RUSSELL, F.R.S.

Wellington.—Heavy rain early in the month, and generally showery up to 19th; generally cold weather and frosty nights during the latter part; winds variable. Mean temp. 0°·2 above, and rain 1·75 in. above the averages. R. B. GORE.

Auckland.—Barometer and mean temperature close to the average of the previous 32 years; rainfall rather more than 1·00 in. below, the average. T. F. CHEESEMAN.

Trinidad.—Rain 1·50 inches below the 30 years average. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,  
 DECEMBER, 1900.

Div	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	3.12	XI.	Builth, Abergwesyn Vic.	12.20
II.	Dorking, Abinger Hall ..	3.53	„	Rhayader, Nantgwillt ...	9.12
„	Birchington, Thor .....	2.15	„	Lake Vyrnwy .....	9.75
„	Hailsham .....	4.67	„	Corwen, Rhug .....	4.88
„	Ryde, Thornbrough .....	...	„	Criccieth, Talarvor .....	4.82
„	Emsworth, Redlands ...	3.46	„	I. of Anglesey, Lligwy..	6.68
„	Alton, Ashdell .....	4.85	„	I. of Man, Douglas .....	5.04
III.	Oxford, Magdalen Coll..	3.27	XII.	Stoneykirk, Ardwell Ho.	4.90
„	Banbury, Bloxham .....	3.65	„	New Galloway, Glenlee	11.09
„	Northampton, Sedgebrook	3.56	„	Monraive, Maxwelton Ho.	8.38
„	Alconbury .....	...	„	Lilliesleaf, Riddell .....	4.61
„	Wisbech, Bank House...	2.81	XIII.	N. Esk Res. [Penicuik]	8.75
IV.	Southend .....	1.50	XIV.	Glasgow, Queen's Park..	7.71
„	Colchester, Lexden .....	2.59	XV.	Inveraray, Newtown ...	14.81
„	Saffron Waldon, Newport	2.64	„	Ballachulish, Ardsheal...	16.15
„	Rendlesham Hall .....	2.56	„	Islay .....	8.14
„	Scole Rectory .....	...	XVI.	Dollar .....	5.99
„	Swaffham .....	2.94	„	Balquhiddel, Stronvar...	19.44
V.	Salisbury, Alderbury ...	4.57	„	Coupar Angus Station...	3.96
„	Bishop's Cannings .....	5.00	„	Blair Atholl .....	6.03
„	Blandford, Whatcombe ..	6.93	XVII.	Keith H.R.S. ....	3.28
„	Ashburton, Holne Vic...	11.13	„	Forres H.R.S. ....	3.60
„	Okehampton, Oaklands.	7.50	XVIII.	Fearn, Lower Pitkerrie..	3.84
„	Hartland Abbey .....	5.61	„	S. Uist, Askernish .....	6.66
„	Lynton, Glenthorne ...	9.60	„	Invergarry .....	15.18
„	Probus, Lamellyn .....	6.42	„	Aviemore, Alvie Manse.	5.21
„	Wellington, The Avenue	5.33	„	Loch Ness, Drumnadrochit	8.78
„	North Cadbury Rectory	5.50	XIX.	Invershin .....	5.93
VI.	Clifton, Pembroke Road	5.97	„	Durness .....	9.12
„	Ross. The Graig .....	5.55	„	Watten H.R.S. ....	2.86
„	Wem, Clive Vicarage ...	3.60	XX.	Dunmanway, Coolkelure	13.68
„	Wolverhampton, Tettenhall	3.48	„	Cork, Wellesley Terrace	5.98
„	Cheadle, The Heath Ho.	4.81	„	Killarney, Woodlawn ..	11.08
„	Coventry, Priory Row ..	5.36	„	Caher, Duneske .....	4.34
VII.	Market Overton .....	4.90	„	Ballingarry, Hazelfort...	3.90
„	Grantham, Stainby .....	4.02	„	Limerick, Kilcornan ...	4.40
„	Horncastle, Bucknall ...	3.12	„	Miltown Malbay .....	6.11
„	Worksop, Hodsck Priory	3.00	XI.	Gorey, Courtown House	3.20
VIII.	Neston, Hinderton .....	2.66	„	Moynalty, Westland ...	4.48
„	Southport, Hesketh Park	3.51	„	Athlone, Twyford .....	4.43
„	Chatburn, Middlewood.	5.76	„	Mullingar, Belvedere ...	4.83
„	Duddon Val., Seathwaite Vic.	14.34	XXII.	Woodlawn .....	5.94
IX.	Melmerby, Baldersby ...	2.29	„	Crossmolina, Enniscoe ..	9.30
„	Scalby, Silverdale .....	3.52	„	Collooney, Markree Obs.	5.19
„	Ingleby Greenhow Vic..	2.28	XXIII.	Enniskillen, Model Sch.	5.12
„	Middleton, Mickleton ...	3.70	„	Warrenpoint .....	4.18
X.	Haltwhistle, Unthank H.	4.64	„	Seaforde .....	5.26
„	Bamburgh .....	2.04	„	Belfast, Springfield .....	3.47
„	Keswick, The Bank .....	11.73	„	Bushmills, Dundarave..	4.16
XI.	Llanfrechfa Grange .....	8.10	„	Stewartstown .....	4.15
„	Llandovery .....	8.74	„	Killybegs .....	6.61
„	Castle Malgwyn .....	6.32	„	Horn Head .....	5.90
„	Brecknock, The Barracks	...			

## DECEMBER, 1900.

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.		Dpth Date		Max.		Min.			
				inches.	in.			Deg.	Date	Deg.	Date.		
I.	London (Camden Square) ...	2.55	+	.48	.71	30	21	56.5	12	28.3	23	2	9
II.	Tenterden .....	3.48	+	.85	.80	30	22	55.5	5	29.5	23	2	10
III.	Hartley Wintney .....	3.15	...	...	.75	30	26	55.0	9b	30.0	23c	4	9
	Hitchin .....	2.54	+	.51	.78	30	20	55.0	12	24.0	22	2	...
IV.	Winslow (Addington) .....	3.02	+	.57	1.28	30	21	55.0	5, 12	22.0	23	5	9
	Bury St. Edmunds (Westley) .....	2.54	+	.30	.93	30	21	54.0	18	27.0	22	...	...
V.	Norwich (Brundall) .....	2.98	...	...	1.23	30	22	57.0	12	25.8	23	4	11
	Winterbourne Steepleton ...	7.26	...	...	2.02	30	26	54.9	5	28.1	1	7	13
VI.	Torquay (Cary Green) ...	5.91	...	...	.78	30	26	56.3	4	33.7	3	0	3
	Polapit Tamar [Launceston]..	5.82	+	1.59	1.18	30	25	56.0	5	26.6	1	6	...
VII.	Stroud (Upfield) .....	6.54	+	4.09	3.09	30	23	54.0	8c	29.0	22	3	...
	Church Stretton (Woolstaston) .....	3.89	+	.84	1.07	30	18	56.0	12d	31.0	23	1	8
VIII.	Worcester (Diglis Lock) .....	4.63	+	2.65	1.81	30	26	...	...	...	...	...	...
	Boston .....	3.80	+	1.95	1.75	30	14	55.0	15	25.0	23	5	...
IX.	Hesley Hall [Tickhill].....	2.78	+	.80	.95	30	17	60.0	11	27.0	23	2	...
	Breadsall Priory .....	4.19	...	...	1.75	30	21	...	...	...	...	...	...
X.	Manchester (Plymouth Grove) .....	4.28	...	...	.58	5	21	...	...	...	...	...	...
XI.	Wetherby (Ribston Hall) ...	2.92	+	.48	.70	5	17	...	...	...	...	...	...
	Skipton (Arncliffe) .....	8.77	+	1.96	1.29	3	30	...	...	...	...	...	...
XII.	Hull (Pearson Park) .....	3.00	+	.73	.90	30	18	56.0	20	24.0	23	4	5
	Newcastle (Town Moor) .....	1.82	—	.48	.57	3	12	...	...	...	...	...	...
XIII.	Borrowdale (Seathwaite).....	27.15	+	12.34	5.32	14	28	54.5	20	32.3	30	0	...
	Cardiff (Ely).....	7.17	+	2.62	1.77	30	26	...	...	...	...	...	...
XIV.	Haverfordwest .....	6.90	+	1.91	.81	3	24	55.6	20	31.2	19	4	11
	Aberystwith (Gogerddan) ...	5.58	+	.70	.73	30	19	54.0	25	...	...	...	...
XV.	Llandudno .....	2.66	—	.30	.51	27	16	62.0	20	35.5	23	0	...
	Cargen [Dumfries] .....	8.92	+	4.90	1.04	19	25	54.0	12	32.0	29a	2	...
XVI.	Edinburgh (Blacket Place)...	4.43	...	...	...	...	...	57.1	8	32.4	30	0	...
	Colmonell .....	6.01	...	...	.85	27	21	56.0	8	32.0	7	1	...
XVII.	Tighnabruaich .....	9.51	...	...	1.38	5	28	50.0	12d	32.0	3f	3	...
	Mull (Quinish) .....	...	...	...	...	...	...	...	...	...	...	...	...
XVIII.	Loch Leven Sluices .....	5.70	+	2.39	1.20	6	21	...	...	...	...	...	...
	Dundee (Eastern Necropolis) .....	3.65	+	1.57	.90	5	24	56.4	20	30.0	29	3	...
XIX.	Braemar .....	5.31	+	2.84	.81	20	27	57.4	25	24.8	5	8	16
	Aberdeen (Cranford) .....	3.44	...	...	.59	27	23	54.0	8, 11	25.0	4	8	...
XX.	Cawdor (Budgate) .....	5.11	+	2.65	.54	28a	24	...	...	...	...	...	...
	Strathconan [Beaul] .....	11.55	+	5.78	1.70	21	20	...	...	...	...	...	...
XXI.	Glencarron Lodge.....	16.91	...	...	1.58	19	29	56.0	26	27.0	4	6	...
	Dunrobin .....	5.19	+	1.82	.52	17	22	54.5	17	31.0	4	5	...
XXII.	S. Ronaldshay (Roeberry) ...	4.20	+	.54	.43	7	29	53.0	20	38.0	6	0	...
	Darrynane Abbey.....	4.84	...	...	1.05	1	30	...	...	...	...	...	...
XXIII.	Waterford (Brook Lodge) ...	5.37	+	1.73	.78	19	23	55.0	20	27.0	23	6	...
	Broadford (Hurdlestown) ...	4.76	...	...	.70	25	28	...	...	...	...	...	...
XXIV.	Carlow (Browne's Hill) .....	4.26	+	1.14	.61	19	22	...	...	...	...	...	...
	Dublin (Fitz William Square) .....	1.60	—	.56	.27	5	20	59.8	20	31.8	23	1	5
XXV.	Ballinasloe .....	5.47	+	2.05	.69	4	27	53.0	20	26.0	23	11	...
	Clifden (Kylemore) .....	8.77	...	...	1.33	27	27	...	...	...	...	...	...
XXVI.	Waringstown .....	2.99	—	.05	.44	3	13	...	...	...	...	...	...
	Londonderry (Creggan Res.) .....	5.61	+	1.40	.51	3	28	...	...	...	...	...	...
XXVII.	Omagh (Edenfel) .....	5.04	+	1.36	.64	3	25	56.0	21	29.0	23	6	10

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

a—and 30. b—and 12, 25. c—and 20, 25. d—and 20. e—and 24. f—and 28, 30.

# METEOROLOGICAL NOTES ON DECEMBER, 1900.

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.

TENTERDEN.—Remarkably warm; temp. above 50° in the shade on 18 days, and calceolarias and roses in bloom at the end. There was no rise of water in the well, but ponds filled up some inches. Duration of sunshine, 37 hours. Fog on 2 days. Solar halo on 22nd.

HARTLEY WINTNEY.—An abnormally mild month, with R on every day except five, and the total 59 in. above the average. The wind was S. to S.W. on 26 days; there were gales on 20th, 28th and 31st. Dense fog on 23rd and 24th. Ozone on 12 days, with a mean of 4.4. Daisy, japonica and Christmas rose in flower on 4th.

WINSLOW, ADDINGTON.—Generally open and mild weather for the time of year. On two days only was the max. temp. below 40°, and on 19 days it was between 50° to 55°. Strong gale on 28th, with bar. 28.876 in. (corr'd.) at 9 a.m. Great storm of wind and R on 30th and 31st, causing the brooks to overflow the meadows. Fog on 10th and 24th.

BURY ST. EDMUNDS, WESTLEY.—A very mild month, with rapid variations of bar. Southerly winds on 24 days.

NORWICH, BRUNDALL.—Exceedingly mild, the mean temp. being almost identical with that of December, 1898, which was the mildest since 1868. The temp. exceeded 50° on 15 days, and there was but little frost. The R on 30th was the heaviest fall here since June, 1898, and has only twice been exceeded in 10 years. N.E. gale on 31st.

WINTERBOURNE STEEPLETON.—Very mild, the mean temp. being 44°·7. The min. temp. on grass was specially high, the mean being 36°·3. Although R fell on 26 days, the amount was not excessive until the latter part of the month, R fell each day after the 18th, the total for the 14 days being 4.79 in.; of which 2.02 in. fell on 30th. L on 19th.

TORQUAY, CARY GREEN.—R 2.24 in. above the average. Mean temp. 47°·8, or 4°·5 above the average. Duration of sunshine 16 hours 5 mins. below the average; 15 sunless days. Mean amount of ozone, 5.7; greatest, 8.0 on 6th with W.S.W. wind, and on 31st with N.W. wind; least, 0.5 on 2nd, with N. wind.

POLAPIT TAMAR [LAUNCESTON].—Particularly wet and rather stormy. Temp. generally unseasonably high. Gales on 19th, 20th and 28th. H on 20th, 21st and 28th.

STROUD, UPPFIELD.—S.W. gales on 5th, 27th and 30th. The R on the 30th amounted to 47 per cent. of the total for the month.

BREADSALL PRIORY.—Terrible storm on 30th, followed by floods all over the district.

ARNCLIFFE VICARAGE.—An exceedingly wet month. In October, November and December 25·88 in. of R fell.

SEATHWATE.—On seven days more than an inch of R fell, on five days more than two inches, and on three days more than three inches.

#### WALES.

HAVERFORDWEST.—A stormy and wet month, very mild with only one bright day. Gales occurred on 14 days, that on 27th and 28th being the heaviest for several years, and it causing much damage throughout the county on 28th. The R for the year exceeded the average of 50 years by 3·60 in.

ABERYSTWITH, GOGERDDAN.—Very mild and showery throughout, with very little sunshine.

#### SCOTLAND.

CARGEN [DUMFRIES].—One of the wettest Decembers on record. T on 3rd.

EDINBURGH, BLACKET PLACE.—Very wet and sunless. Mean temp. 44°·3, being the highest in December since 1857, when it was 46°·5. No frost recorded. Heavy S.W. gale on 20th. Solar halos on 4 days, lunar halos on 2.

COLMONELL, CLACHANTON.—R ·88 in. above the average. Mean temp. 45°·5, or 8°·1 above, the average of 24 years.

TIGHNABRUAICH, CRAIGANDARAICH.—The temp. was above the average, and the R the heaviest in any month of the twelve. Total for the year, 66·24 in.

ABERDEEN, CRANFORD.—Very fine for December, the wind being S.W. and W. for the most part.

#### IRELAND.

DARRYNANE ABBEY.—Mild, but wet and stormy. The strongest gale for years occurred on the night of the 28th. R for the year 40·53 in., being a good deal below the average.

WATERFORD, BROOK LODGE.—Storms from S.W. on 11th, 20th and 28th. H showers on 25th.

BROADFORD, HURDLESTOWN.—A wet month, but mild. R 1·29 in. above, and rainy days 6 above, the average of 16 years. S.W. gale on 19th and 20th; N.W. on 27th and 28th. Fog on 18th and 27th.

DUBLIN, FITZWILLIAM SQUARE.—Like December, 1899, it was unsettled, dull and wet, but warm. There was an almost constant prevalence of S.W. winds, which blew at frequent intervals with gale force, and on 20th and 28th reached nearly hurricane velocity. To these winds the remarkably high temp. is chiefly to be attributed. Mean temp. 47°·1, or 5°·8 above the average. High winds on 18 days, attaining the force of a gale on 8. Fog on 6 days. L on 20th.

OMAGH, EDENFEL.—Mild, wet and unsettled, with temp. and R much above the average. The most violent gale since that of December 21st, 1894, took place on 20th and 21st, attended by great damage to trees and buildings, although somewhat less than in 1894; and less than at the stations to N. and E. of Edenfel.