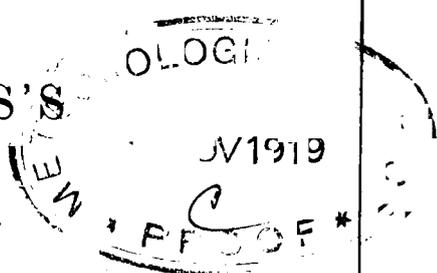


SYMONS'S

MONTHLY



METEOROLOGICAL
MAGAZINE.

VOLUME THE TWENTY-NINTH.

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Manley
D. H. H. H. H.

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ERRATUM.

On pp. 164, 165, the date in the headline should have been *October 20th* not *October 11th*.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCXXXVII.] FEBRUARY, 1894. [PRICE FOURPENCE,
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THE JANUARY FROST.

THE very highest compliment which readers can pay to a book or periodical, is to show that they read it. We are very glad to say that that compliment seems to be always paid to the *Meteorological Magazine*, because when the Editor makes a mistake—as everyone does more or less frequently—he hears of it instanter. We had not studied exhaustively the frost of January 5th to 7th, in fact the majority of the records had not reached us, but we did what time permitted, and gave various facts, which are not contested; but we concluded with an opinion which was incorrect; we said, “we do not think that the air temperature fell to zero in any part of England.” The excellence of the instruments employed by Mr. Mellish, of Hodsock Priory, Worksop, and his careful reading of them are beyond all question, and he had $-4^{\circ}4$, and several other indisputable records below zero have now been received.

However, our error and the criticism of it, have perhaps done good: they have induced us to go thoroughly into the subject, to tabulate several hundred records, and to epitomize them in the following pages.

Before dealing with them, or allowing our readers to draw conclusions from them, we wish to say a few words as to low temperatures and why we always doubt them—yes, doubt even our own readings so much that we take them in duplicate.

Unfortunately the only really workable mercurial minimum thermometer (Casella's) is extremely difficult to make, and therefore costly; consequently even at the best equipped stations, Rutherford's, or as it is generally called, a “spirit minimum” is used. This, no matter how much may have been paid for it, or what certificate it may have, can indicate wrongly from two causes (1) some of the spirit may evaporate from the column and condense at the top of the tube; and unfortunately, even though the spirit in the bulb and stem may be coloured, that which will evaporate and condense may be nearly colourless. Spirit thermometers vary in their liability to this error, but they should always be suspected of it and two or three precautions should be taken to ensure its detection; it is an excellent plan to have duplicate instruments, as the two are not likely to go simultaneously wrong to an equal extent; it is well to see that at

9 a.m. the reading (not the index) of the minimum, is nearly the same as that of the dry bulb thermometer; it is well to look at the top of the tube and see that no spirit is there. This error, when it exists, always makes the minima too low. It is easily cured by swinging the thermometer at arm's length, bulb downwards, and then standing it for an hour, bulb down, to drain.

Another error also tends to produce too low a reading. It is usual, and probably right, to advise that the bulb end of a minimum should be rather ($\frac{1}{2}$ inch or so) lower than the other end; provided that the thermometer and the screen be firmly fixed, no harm occurs. If, however, the thermometer hangs very freely, or the thermometer screen vibrates much, the repeated slight vibrations will sometimes cause the index to move several degrees towards the bulb.

These are dangers incident to high class stations—these *and others* may occur to ordinary observers. Uninspected stations may have incorrect thermometers; as the errors are equally likely to be in excess or in defect, we can say only that the sooner persons realize that their time and thought are worth more than the few shillings they keep—not *save*—by buying rubbish, the better.

Worse than this is the confusion which arises from the endless variety of positions in which thermometers are placed. At a first-class station, there are at least two minimum thermometers, one (for recording the lowest temperature of the air) is in a Stevenson screen, the other (for recording the lowest temperature produced by radiation) is laid upon grass—and this will read on a cloudy night much the same as the one in the screen, and on a clear night 10° or more degrees below it. The non-inspected stations rarely have a proper screen; the thermometers are against a window or a wall, or on a post, 1, 2, 3, or perhaps 4 feet above the ground, and very rarely screened from radiation to the sky, therefore, as a rule, they in times of severe frost, read too low; read in fact as their positions necessitate *between* the true minimum in air and the true minimum on grass.

It was consciousness of these facts, coupled with our not having seen zero recorded at any inspected station which led us into error.

In the following table we give all the minima below 10° which we have been able to collect, and as a rule they are sufficiently accordant to show that our criticisms are far from being universally applicable—the stations are grouped in counties approximately in the order adopted in *British Rainfall*. All stations at which we believe that the thermometers are in a Stevenson screen have an S prefixed, and returns quoted from the publications of the Meteorological Office, have a † in addition.

Records of a Temperature (in shade) below 10° between Jan. 5th & 8th, 1894.

COUNTY.	STATION.	Min.	Date.
Surrey	Woodhatch, Reigate.....	$8^{\circ}0$	... 5
„	S Upper Gatton, Merstham	8·1	... 5
„	S Asylum, Caterham	9·0	... 5
„	S Wallington	7·7	... 7

COUNTY.	STATION.	Min. °	Date.
Kent	Cranbrook	6 0	5
	Dover	9 0	5
	Camden Park, Tunbridge Wells	9 0	5
	River Hill, Sevenoaks	8 0	5
Sussex	Foxwold, Brasted	4 0	5
	§ Keston	8 0	7
	Bramber	7 0	6
Hants	§ Ditchling	9 0	7
	Hayward's Heath	8 0	7
Berks	Newport, I. of Wight	9 5	7
	Swanmore, Bishop's Waltham	8 0	6
Herts	Portland Place, Reading	9 5	6
	Welford Park, Newbury	9 0	6
Oxon	Broxbourne (Stafford Ho.)	5 0	7
	Henley on-Thames	5 0	5
Northampton	Bloxham, Banbury	9 0	6
	§ Sedgebrook	9 0	6
Essex	§ Chelmsford	1 9	6
	Sheering, Harlow	8 0	6 & 8
	§ Old House, Dedham	-2 0	6
Suffolk	§ Halstead	-1 5	6
	Ipswich	6 0	6
	„ (Thornham Hall)	3 0	6
	§ Rendlesham Hall	9 0	8
Norfolk	§ Great Thurlow, Haverhill	-0 5	6
	Framlingham	8 0	5
	§ Somerleyton, Lowestoft	9 1	8
Wilts	Scole	-1 5	—
	§ Diss	1 0	5 & 6
Dorset	§† Geldeston [Beccles]	9 0	—
	Devizes	9 0	5
Devon	Pickwick, Corshan	9 0	5
	§ Whatcombe	7 0	5
Gloucester	§ Buckfastleigh	8 0	7
	§ Cullompton	8 2	7
Hereford	Highlands, Minchinhampton	8 0	5
	§† Cirencester	9 0	—
Shropshire	§ Burghill, Hereford	9 8	6
	Ludlow	5 0	6
Stafford	Woolstaston	8 0	6
	Clive Vicarage	5 0	5
	§ Wrottesley, Wolverhampton	8 3	6
Worcester	Weston Park [Shifnal]	6 0	7
	§ Hoar Cross, Burton	5 0	5
Warwick	§ The Heath House, Cheadle	9 9	6
	§ Diglis, Worcester	8 0	6
	Orleton, Tenbury	5 5	6
Leicester	§ Kings Norton [Birmingham]	0 0	6
	§ Kenilworth	8 2	6
	Chadwick Manor, Knowle	1 0	6
	Springfield	-4 0	6
Rutland	§ Olton, Solihull	-0 5	5
	Priory Row, Coventry	4 0	6
	Stoke	-3 0	6
Lincoln	Wellington Rd., Birmingham	9 0	6
	§ Barkby	7 0	5
Lincoln	§† Loughborough	5 0	5
	§ Ketton Hall	6 0	6
Lincoln	Branston Hall	4 0	6

COUNTY.	STATION.	Min.	Date.
Lincoln	§ The Close, Lincoln	9·8	... 6
"	Hemingby	6·4	... 6
Nottingham	§ Hodsock Priory, Worksop	-4·4	... 6
"	Hesley Hall [Tickhill]	-0·2	... 6
Derby	§ Buxton	9·2	... 8
"	Norton Hall [Sheffield]	2·0	... 6
Cheshire	Kelsall, Chester	8·0	... 6
Lancashire	Esthwaite, Hawkshead	8·1	... 6
Yorkshire, W.R.	Parliament St., Sheffield	1·0	... 6
"	Weston Park	8·0	... 7
"	Beckett Hospital, Barnsley	4·0	... 6
"	Wentworth Castle, "	4·0	... 6
"	St. George's Gardens, Barnsley	0·5	... 6
"	§ Harewood Lodge, Meltham	6·7	... 6
"	Huddersfield	7·0	... 6
"	§ Prison, Wakefield	1·0	... 6
"	Bermerside, Halifax	3·0	... 6
"	The Stray, Harrogate	1·8	... 6
"	§ Knaresboro'	5·0	... 6
"	Burton House, Masham	-5·0	... 6
"	E.R. § Driffeld	-0·8	... 6
"	N.R. E. Layton [Darlington]	4·0	... 6
Durham	Whorlton, Barnard Castle	5·0	... 6
"	§† Durham	6·0	... 7
"	§ Ushaw	5·0	... 6
"	Hermitage, Chester-le-Street	5·0	... 6
"	Deanery Gardens, "	3·0	... 6
"	Houghton-le-Spring	5·0	... 6
"	New Herrington, Houghton-le-Spring	4·5	... 6
"	Mowbray Park, Sunderland	7·0	... 6
Northumberland.	Newcastle-on-Tyne	6·0	... 6
"	Royal Nurseries, Hexham	-6·0	... 7
"	South Park, "	-6·0	... 7
"	Hackwood, "	-5·0	... 7
"	Dilston, "	-1·0	... 7
"	Unthank Hall, Haltwhistle	4·0	... 6
"	§ Craggside, Rothbury	5·0	... 7
Westmoreland ..	§ Windermere	8·0	... 6
"	Appleby	7·0	... 7
Monmouth	The Hendre	9·0	... 5
"	Llanvihangel Court	8·0	... 6
Radnor	Downton	5·0	... 6
"	Llandrindod	2·0	... 5
Montgomery	Pool Quay, Welshpool	8·0	... 6
Kirkcudbright ...	§ Cargen [Dumfries]	6·8	... 6
Dumfries	Langholm	4·0	... 6
Roxburgh	Hawick	0·0	... 6
"	Jedburgh	1·0	... 7
"	Abbeigate, Melrose	-6·0	... 7
Selkirk	Galashiels	2·0	... 6
"	Stow	-2·0	... 6
Peebles	N. Esk Reservoir	6·0	... 6
Berwick	Berwick	8·0	... 6
"	§† Marchmont	6·0	... 7
"	Sisterpath, Greenlaw	-2·0	... 6
"	Duns	0·0	... 6
"	" (Whitsomelaws)	-3·0	... 6
"	" (Langton)	-1·0	... 6
Edinburgh	Royal Botanic Gardens, Edinburgh ..	9·0	... 7

COUNTY.	STATION.	Min.	Date
Stirling	Denny	2°0	7
"	Bridge of Allan	-6°0	7
Fife	Markinch	1°0	7
"	Ladybank	-8°0	7
Perth	Dunblane	0°0	7
"	Muthill	-6°0	7
"	" (Pitkellony)	-3°0	7
"	Bridge of Earn	-8°0	7
"	Seggiedan, Kinfauns	-3°0	7
"	Stronvar	-1°0	7
"	Ochertyre	2°0	6
"	Dunkeld	-8°0	7
"	Aberfeldy	-5°0	7
"	Alyth	9°0	7
"	" (Drumnacree)	-5°0	7
"	Ballinluig	-2°5	7
"	Pitlochry	-3°0	7
Forfar	E. Necropolis, Dundee	6°2	7
"	Invergowrie, "	8°0	6
"	Broughty Ferry	0°0	6
"	Asylum, Dundee	3°0	7
"	Cupar Angus	-11°0	6
Aberdeen	Braemar	-4°0	6
"	Cranford, Aberdeen	6°0	6
Elgin	Mossbrae, Elgin	8°0	7
Sutherland	Laing	8°0	—
Cork	Douglas, Cork	8°0	7
"	Crawford Observatory, Cork	9°4	7
Waterford	Brook Lodge	2°0	7
Kilkenny	Kilkenny	7°0	—
King's County	Parsonstown	6°0	6
Longford	Edgeworthstown	5°0	—
Armagh	Observatory, Armagh	6°3	6
Down	Seaforde	7°0	5
"	Waringstown	0°0	5
Tyrone	Edenfel, Omagh	8°0	6

On plotting the above entries on a map, their general agreement is very striking. In South Wales, Devon, Cornwall, Somerset, and all along the coast from the Isle of Wight, round to the Land's End, and thence to Carlisle, there is but one record of a minimum of 10°, although few other portions of England and Wales are without considerably lower values; and there are five widely separated localities at which there can be little doubt that the shade minimum fell below zero. It has been stated that zero was reached at Tunbridge Wells and at Dover, but we can see no reason for believing, it any more than the fiction of 10° below zero at Fowey in Cornwall.* We have heard that zero and below it, were recorded in parts of Essex; and looking at the -1°·5 at Scole and -2°·0 at Old House, Dedham, it seems probable. The next area with very low temperatures, was the high land in Warwickshire, where there are several records below zero, one being in a Stevenson screen. N.E. of this area, we find North Nottinghamshire with the best obtainable instruments in a proper screen, giving an air minimum of -4°·4 at Hodssock Priory, backed by a record of -0°·2

* Really 10° below freezing—i.e. 22°.

at the nearest station, Hesley Hall. Finally—as regards England—we have a group of very low readings in the South of Northumberland. We have no information respecting these thermometers or their mounting, but the records agree so well that it seems hypercritical to assume that all are wrong.

In Scotland the South Eastern district around Melrose was as usual very cold, there being five reports of below zero; but this was surpassed in Perthshire and the west of Forfarsire, where the majority of the returns were below zero, eight of them were 5° or more below zero, and one, Cupar Angus, was $-11^{\circ}0$.

Probably the Irish returns, though not nearly so cold, were more remarkable. We do not think that any precedent can be found for nine records spread from Cork to Tyrone all below 10° .

The following notes may be of interest and help to complete the account:—

London.—The shade temperature did not fall below $13^{\circ}1$, whereas $6^{\circ}7$ was touched on Dec. 25th, 1860, and on January 4th, 1867, but the max. was almost unprecedentedly low.

Devon & Cornwall.—The cold of the past few days has been very severe in N. Cornwall and N. Devon. A correspondent from Stratton writes that a day or two ago he went to Newland, Bradworthy—between eight and nine miles. He says:—“When we reached the farmstead we found icicles, each three to four inches long, hanging from the horse’s nostrils, whilst the outside parts of the bit were encased with ice from the breathing of the animal. My pipe was encircled with ice as thick as a penny just beyond where the lips came, and a drop of water falling on a gun barrel was converted into ice before one could stoop to brush it away. On the return journey, in the absence of a muffler, a handkerchief was used as a respirator, and then my breathing caused my coat collar on one side to be covered with ice.—*Western Morning News, Jan. 9th.*”

Mowbray Park, Sunderland.—Min. on 6th $7^{\circ}0$, the lowest for at least 20 years; the nearest was 9° on Dec. 4th, 1879.

THE RECENT COLD IN GUERNSEY.

To the Editor of the Times.

SIR,—Systematical meteorological observations have been taken in Guernsey during the last 50 years with standard certified instruments, and last Friday’s readings broke the record for low temperatures. The mean temperature of that day was $21^{\circ}9$, which is (excepting Thursday’s, the 4th, mean) $5^{\circ}9$ lower than the lowest daily mean previously recorded.

The air temperature at 8 a.m. on Friday, January 5th last, was $18^{\circ}1$, the *maximum* for the day $26^{\circ}5$, the 9 p.m. reading $24^{\circ}8$, and the *minimum* for the day $16^{\circ}2$. The mean, as above stated, was $21^{\circ}9$ —that is, no less than 20° too cold for that day of the year. The coldest day on record previous to this cold snap occurred on February 11th, 1870, the *minimum* for that day being 26° and the daily mean $27^{\circ}8$.

These local observations were commenced 51 years ago by the late Dr. Hoskins, F.R.S., and are now carried on by Mr. A. Collenette, F.R. Met. Soc.

The still lower air reading of $16^{\circ}2$ was taken by myself, with a certified instrument in a Stevenson screen at 8 a.m. on the 5th inst., while the *minimum* air

reading recorded during that night in the same screen was 15°·5. This reading is therefore 0°·7 lower than Mr. Collenette's observation. My station, however, is somewhat more exposed than Mr. Collenette's, and some 100 feet higher above the sea.

These unprecedented low temperatures, in an island with a climate generally so mild, are, I think, worthy of record in your columns.

Your obedient servant,

BASIL T. ROWSWELL.

St. Martin's, Guernsey, Jan. 9th.

Bridge of Earn, Perth.—Min. 8°·0; hen's eggs in the nest were split by the cold.

Finally, to sum up the whole matter, we have prepared the following table of the relative intensity of the frosts of December, 1879, January, 1881, and January, 1894, the facts as to the first two being taken from two excellent papers by Mr. Marriott in the *Quar. Jour. Roy. Met. Soc.* :—

YEAR.	Sheering, Essex.	Somerleyton, Suffolk.	Goldeston, Suffolk.	Cirencester, Gloucester.	Heath House, Stafford.	Coventry, Warwick.	Loughborough, Leicester.	Hodsock, Notts.	Buxton, Derby.	Wakefield, Yorks.	Durham, Durham.	Braemar, Aberdeen.	Parsonstown, King's Co.	Armagh, Armagh.	Waringstown, Down.	Mean
1879	1·0	10·0	11·0	14·0	17·6	5·0	1·5	-5·8	-3·8	0·0	4·4	-0·8	9·8	17·6	12·0	6·2
1881	9·0	4·9	3·5	-0·3	9·9	3·0	1·9	1·6	1·2	12·1	0·2	-4·0	6·0	9·8	-1·0	3·9
1894	8·0	9·1	9·0	9·0	9·9	4·0	5·0	-4·4	9·2	1·0	5·0	-4·0	6·0	6·3	0·0	4·7
Mean	6·0	8·0	7·8	7·6	12·5	4·0	2·8	-2·9	2·2	4·3	3·2	-2·0	7·3	11·2	3·7	5·0

The lowest temperature at each station is in heavy type, and this shows at once that the cold of 1881 was much more remarkable than that of 1894 or of 1879. The means for the three periods are interesting. Heath House, Cheadle, *looks* too high, but the explanation is that it is 650 feet above sea level, and the cold air can flow away from it. Hodsock Priory comes out lowest, and about equally so with Braemar, the reason probably being its low altitude (56 feet) and its rather central position, but it is not easy to see why it should be so much colder than Loughborough.

THE METEORIC PHENOMENA OF JANUARY 25TH.

I was induced by notices which appeared in the *Times* of January 29th, of a brilliant meteor observed on the above date, to ask for further information to be sent me on the subject. I have been favoured by a large number of reports, some sent direct, others collected by Mr. Symons, and others forwarded by Mr. H. C. Moore, the Secretary of the Woolhope Field Club.

The result of a comparison of these reports, is to shew that instead of one meteor on the night in question, there were several, while the attendant phenomena were remarkably similar.

I proceed to state, as briefly as the case will admit, the facts as reported in chronological order:—

6.45 p.m.—At *Whitecliff, near Seaton, Dorset*, a meteor brighter than Jupiter passed from E. to W. ; light of trail lasted 3 to 4 seconds. Two other meteors crossed S. to N. later in the evening ; time not stated.

8.10 p.m., “*about.*”—The Vicar of *Pool Quay, near Welshpool*, saw a meteor pass from N.W. to S.E., from 45° down to 25° above horizon, giving sufficient light to cause the observer to turn round to see it. It shone through a haze.

I am inclined to think that this is the same as the one next to be noticed.

8.30 p.m.—At *Wallasey Hill, near Liverpool*, observer looking S.E. by S., saw a very large meteor fall in a nearly vertical line (slightly inclining W.) right ahead of him ; no explosion occurred ; sky covered with fleecy clouds ; heavy bank on southern horizon, into which meteor passed from sight.

Time not named.—Possibly the same as the last two. From near *Flint* a meteor was seen passing from Zenith to S.E., between two dense black clouds, and disappearing into another bank. Quivering light as of aurora visible from 10 to 11 seconds after disappearance.

9.30 p.m.—At *Llanthomas, near Hay*, a working man walking along the road, was “startled by the sudden appearance of a very brilliant light in the dark sky ; it seemed to be right overhead, and, as he looked up the sky seemed to open, and the light spread out gradually so bright, that you might pick up a pin in the road. The whole lasted quite a minute, and was accompanied by a rumbling sound towards the mountain E.S.E.”

At the same place a woman described the light as coming through the window blind and lighting up the whole room for quite a minute if not more, and followed by a “rumbling, bumping noise.”

Both these persons are positive that the time was 9.30 and not 10 p.m.

From the same place my correspondent reports that it was noticed to be remarkably warm just before the concussion occurred, and that several flashes of lightning were seen during the night.

At *Clifford* (2 miles from *Hay*) a low rumbling noise was heard, followed by a slight shake of the earth at 9.30 p.m. “About the

same time a comet [!] was seen flying in a southerly direction."—*Hereford Times*, Feb. 3rd.

10 *p.m.*—At this hour occurred the most remarkable event of the series. The observers agree very well as to the time. Some say the clocks were striking; most put it at 10.1 and only one as late as 10.4. It will be best to take the places in order from N. to S.

Chester.—Meteor emerged from behind a dense mass of black cloud in N.N.W., 40° above horizon; passed slowly across sky until hidden by another bank of cloud in S.S.E., about 30° above horizon. Sky between covered with filmy clouds. Visible for barely a minute; bluish green hue; brilliancy of a half-moon.

Stokesay Vicarage, Shropshire.—Sky covered with dense clouds; no meteor seen; but suddenly the whole landscape illuminated with a light so bright that objects were nearly as visible as in ordinary daylight. This lasted certainly more than half a minute. The light flickered and died out rapidly, not suddenly.

Bodenham, near Leominster.—Brilliant reflection, but meteor itself not seen. Explosion as of a cannon firing, apparently in the neighbouring valley. Further east, noise as of tiles falling. Concussion felt in houses.

Worcester.—Light as of an extremely vivid flash of lightning. The meteor appeared to burst to the southward, and after an interval, variously estimated at from 30 seconds (the most approximate) to 2 minutes, this was followed by a rushing, hissing sound, ending in an explosion like a tremendous peal of thunder.

Another correspondent from the same place, states that a ball of fire with a long tail was seen; doors and windows rattled and china was overturned.

Hereford.—Mr. H. C. Moore did not see the meteor or light, but heard a "report as of a well charged fowling piece in an enclosed space." There was no rumbling echo or vibration.

King's Pyon, near Hereford.—The Rev. H. A. Barker writes:—"Very overcast and dark; meteor resembling an incandescent lamp, having that peculiar luminosity which recalls the electric light, apparently half the size of the moon, rushing from N.E. to S. or S.W., followed by train of wavy bluish light; seemed to have a zig-zag irregular motion; lasted 5 or 6 seconds; from 3 to 5 minutes afterwards loud report as of cannon."

Ross.—At the Graig (2 miles N.W.) a light was seen as "an appearance as of fireworks through the clouds," and an explosion was heard, accompanied by a distinct tremor with a wavy motion. At *Parkfields* (3 miles S.E.), two explosions were heard, with a rumbling between, which lasted until the second explosion occurred. Two shocks felt in upper floors of the house with undulating motion.

At midnight a violent squall of wind and rain burst half a mile west of *Ross*, felling a large tree and partially unroofing a gentleman's house.

Ashchurch, Tewkesbury.—I have no reports from the place, but

Mr. W. F. Denning, F.R.A.S., in *The Times* of January 31st, locates the meteor's disappearance at a point four miles north of this village. I do not venture to criticize his letter, as I do not know on what observations his conclusion is based, but I find it difficult to make it fit in with some of the reports noted in this paper.

But all the reports tend to show that the explosion (whatever that term in fact represents) did occur somewhere in the neighbourhood of *Ashchurch*.

Cheltenham.—Mr. Walker (*Times* of January 29th) saw the meteor pass over the town, travelling from N. to S., and exploding with a sound like distant thunder.

Brimscombe Vic., Stroud.—Mr. Lloyd looking N., saw a ball of fire passing from N. to S. Its sudden disappearance was followed in 1 or $1\frac{1}{2}$ minutes by a series of explosions apparently from N.E., "like a number of field pieces fired in rapid succession, followed by a volley of musketry." There had been heavy rain and the meteor, which gave from 4 to 6 times the light of Venus, shone through clouds.

Sarsden, near Chipping Norton.—A lady writes that she and four others were walking at 10 p.m. and were "surprised to find that very gradually from having been very dark, we seemed to be in daylight for a space of what I should judge to be about two whole minutes. We looked to see whether there was any change in the sky to warrant it, but it seemed to be still quite dark up there."

Brixworth, Northampton.—"The firmament blazed out in all directions, N., S., E. and W. This lasted 7 or 8 seconds." No explosion reported.

Correspondents also mention brilliant meteors seen from *Streatham* and *Merstham* at 6.20 p.m. on January 26th, and from *Southwold* at 8.15 p.m. on January 28th, and from *Bodenham* on February 8th, at 0.31 p.m., in bright sunshine.

I certainly do not intend to theorize upon the foregoing facts, but there are some points to which it is well to direct attention.

The evening and night appear to have been generally stormy and electrical, ending with the violent squall at *Ross*. The light is described in many places, and as to more than one of the meteors, as coming on gradually, dying out gradually and flickering. One observer noticed a zig zag motion, while almost all agree that there was not a single sound but a continued series of sounds, which most compared to thunder.

These points suggest for consideration whether in this class of meteor we are dealing with aerolites at all, and not rather with electrical phenomena arising within the limits of our own atmosphere.

In this connection I may relate that in August, 1890, I was at *Tunbridge Wells*, and about 8 p.m. from *Mount Ephraim*, saw a "meteor" very brilliant in the early twilight, shoot right across the sky from N. to S., and disappear low down in the horizon over *Hastings*. Two hours later, at that spot in the horizon, sheet lightning

was visible. By the next morning the storm had crossed the Channel from France, and by the succeeding evening had burst on *Tunbridge Wells*, thus directly following up the path of the meteor in the reverse direction.

At the same time (for I do not suggest that "November meteors" are other than aerolites) I must add that my observance of the coincidence of meteors and electrical phenomena, dates from the November meteor shower of 1866, which I observed from Cambridge with an aurora lighting up the northern sky, and sheet lightning lighting up the southern.

I have enquired of Mr. W. H. Preece, F.R.S. whether any electrical disturbances of the telegraph and telephones in Worcester and adjoining counties were reported on the night of January 25th. He has been good enough to inform me that he has made inquiries and finds there are no records of such disturbances on that night, but all the telegraph offices in those counties would, with one or two exceptions, be closed at the hour I named (10 p.m.), and so if any disturbance actually occurred there would be no record.

JAMES G. WOOD.

A WET TIME IN THE WEST OF SCOTLAND.

To the Editor of the Meteorological Magazine.

SIR,—The rainfall at this station between October 1st, 1893, and January 31st, 1894, is perhaps worthy of a special record. I append a summary of it:—

		RAINFALL.
		in.
1893.	October	10·63
	,, November	13·25
	,, December ..	7·65
1894.	January	11·38
Total in four months ...		<u>42·91</u>
Average monthly fall		10·73

Yours truly,

W. D. ANDERSON.

Ardsheal, Ballachulish, Argyleshire, Feb. 1st, 1894.

EXCEPTIONAL FROST FORMATION.

To the Editor of the Meteorological Magazine.

SIR,—Your correspondent, Mr. White Wallis, will find in *Nature*, vol. xxxi. (Nov. 1884 to April 1885) pp. 5, 81, 193, 264, 480, letters referring to the ice formation which he describes. The last letter gives reference to other letters in preceding volumes. See also vol. xxxiii., p. 461.

Yours faithfully,

B. WOODD-SMITH.

Branch Hill Lodge, Hampstead Heath, N. W., Feb. 6th, 1894.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, AUGUST, 1893.

STATIONS. <i>(Those in italics are South of the Equator.)</i>	Absolute.				Average.				Absolute.		Total Rain.		Aver. Cloud.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
England, London	93·6	18	44·8	29	77·1	56·4	53·5	66	131·9	39·0	1·61	11	5·0
Malta.....	95·1	2	66·2	11	86·9	70·1	67·5	71	148·8	60·8	·03	1	1·4
<i>Cape of Good Hope</i> ...	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>Mauritius</i>	74·7	4	57·4	16	73·3	62·8	58·4	74	126·8	48·2	2·06	26	6·0
Calcutta.....	91·6	14	76·4	9	87·7	78·7	78·8	87	154·8	75·1	8·37	18	8·1
Bombay.....	86·2	1	74·8	16	84·2	76·8	75·1	84	140·5	72·3	13·55	28	8·8
Ceylon, Colombo ...	86·2	30	73·1	5	84·7	76·9	70·6	75	150·5	70·0	1·01	13	4·4
<i>Melbourne</i>	65·5	12	33·5	1	58·8	43·9	44·4	77	121·2	27·9	1·71	16	6·3
<i>Adelaide</i>	72·4	28	36·6	20	61·8	46·0	45·2	72	128·6	27·7	2·74	14	5·4
<i>Sydney</i>	72·4	15	42·8	4	61·9	43·5	43·0	82	120·9	29·1	2·08	14	3·7
<i>Wellington</i>	62·3	14	35·0	12	58·0	46·5	44·4	75	119·0	24·0	8·23	15	4·7
<i>Auckland</i>	64·0	24 ^a	38·5	12	60·4	50·0	48·5	79	132·0	34·0	5·04	21	5·8
Jamaica, Kingston.....	91·5	25	68·2	28	89·1	73·7	72·3	80	...	...	2·21	9	6·1
Trinidad	93·0	29	68·0	21 ^b	88·4	69·8	75·8	87	...	...	16·32	21	...
Toronto	88·8	11	43·7	14	76·7	56·6	57·3	74	...	44·0	5·76	12	3·7
New Brunswick, Fredericton }	94·7	11	47·1	31	76·8	55·4	57·1	71	...	...	6·70	13	5·3
Manitoba, Winnipeg ...	89·8	7	35·0	28	75·7	50·1	...	...	...	...	1·52	12	4·5
British Columbia, Esquimalt.....	75·7	1	42·2	31	68·4	49·4	52·3	83	...	...	·06	3	2·5

^a And 27. ^b And 22, 24, 30.

REMARKS.

MALTA.—Mean temp. 77°·7; mean hourly velocity of wind 6·0 miles. Lightning on 6th. J. SCOLES.

Mauritius.—Mean temp. of air 1°·2 below, of dew point 0°·7 below, and rainfall 0·10 in. below, their respective averages. Mean hourly velocity of wind 12·0 miles, or 0·2 mile below average; extremes, 32·1 on 29th, and 0·0 on 18th; prevailing direction, E.S.E. C. MELDRUM, F.R.S.

Melbourne.—Dense fog on the 11th; frost on 6 days; hail, thunder and lightning on the 24th. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean temp. 0°·3 below the average of 36 years. Rainfall 0·40 in. above the average. A splendid season, fine winter rains being general over the pastoral and agricultural districts. C. TODD, F.R.S.

Sydney.—Temperature 0°·2 above, humidity 8°·7 above, and rainfall ·89 in. below, the average of 35 years. H. C. RUSSELL, F.R.S.

Wellington.—Heavy showers up to the 7th, 1·26 in. being recorded on 3rd, and 1·65 in. on 5th; showery on 10th and 11th, then fine weather for the remainder of the month, with showers at intervals. Prevailing winds N.W., frequently strong; snow on the hills on the 11th; hail on 11th; fog on 3rd and 4th; earthquakes on 4th and on 23rd; lunar rainbow on 25th. Mean temp. 4°·2, and rainfall 3·03 in., above the average. R. B. GORE.

Auckland.—From the 1st to the 19th wet, stormy and disagreeable; from thence to the end of the month much finer, excepting a heavy fall of rain on the 26th. Total rainfall much in excess of the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Fair, with afternoon showers and thunder; Rainfall half the average. Globular lightning seen near Kingston on 26th, and a shock of earthquake felt on 22nd. Mean hourly velocity of wind 3·7 miles. The first half of the month was free of depressions, but in the latter half three cyclones occurred within barometric range, but far to the N.E. and N. ROBT. JOHNSTONE.

TRINIDAD.—Rainfall 6·00 in. above the 30 years' average, and only exceeded by the all for 1880, which was 17·39 in. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,
JANUARY, 1894.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			
II.	Dorking, Abinger Hall.	4.26	XI.	Rhayader, Nantgwillt..	7.77
„	Birchington, Thor	1.96	„	Lake Vyrnwy	8.36
„	Hailsham	4.07	„	Corwen, Rhug	3.70
„	Ryde, Thornbrough	4.82	„	Carnarvon, Cocksida ...	4.69
„	Emsworth, Redlands ...	5.25	„	I. of Man, Douglas	4.11
„	Alton, Ashdell	4.31	XII.	Stoneykirk, Ardwell Ho.	5.06
III.	Oxford, Magdalen Col...	1.64	„	New Galloway, Glenlee	8.23
„	Banbury, Bloxham	1.64	„	Melrose, Abbey Gate ..	3.44
„	Northampton, Sedgebrook	1.16	XIII.	N. Esk Res. [Penicuick]	5.35
„	Alconbury	1.53	„	Edinburgh, Blacket Pl..	2.47
„	Wisbech, Bank House..	1.88	XIV.	Glasgow, Queen's Park.	4.87
IV.	Southend	1.93	„	Inverary, Newtown	12.07
„	Harlow, Sheering	2.19	XV.	Islay, Gruinart School..	3.28
„	Colchester, Lexden.....	1.80	XVI.	Dollar	4.49
„	Rendlesham Hall	2.01	„	Balquhider, Stronvar..	14.92
„	Diss	2.33	„	Dunkeld, Inver Braan..	...
„	Swaffham	1.82	„	Dalnaspidal H.R.S.	11.92
V.	Salisbury, Alderbury ...	2.81	XVII.	Keith H.R.S.	1.71
„	Bishop's Cannings	2.25	„	Forres H.R.S.	1.61
„	Blandford, Whatcombe .	4.47	XVIII.	Fearn, Lower Pitkerrie.	1.22
„	Ashburton, Holne Vic....	7.22	„	Loch Shiel, Glenaladale	15.91
„	Okehampton, Oaklands .	5.40	„	N. Uist. Loch Maddy ...	7.49
„	Hartland Abbey	4.03	„	Invergarry	9.69
„	Lynmouth, Glenthorne .	4.91	„	Aviemore H.R.S.	4.49
„	Probus, Lamellyn	4.99	„	Loch Ness, Drumnadrochit	3.75
„	Wellington, Sunnyside..	3.28	XIX.	Invershin	2.88
„	Wincanton, Stowell Rec.	3.01	„	Scourie	4.47
VI.	Clifton, Pembroke Road	3.17	„	Watten H.R.S.	2.12
„	Ross, The Graig	2.73	XX.	Dunmanway, Coolkelure	9.52
„	Wem, Clive Vicarage ...	2.30	„	Fermoy, Gas Works ...	5.95
„	Cheadle, The Heath Ho.	2.45	„	Killarney, Woodlawn ...	9.34
„	Worcester, Diglis Lock	1.92	„	Tipperary, Henry Street	5.39
„	Coventry, Coundon	1.61	„	Limerick, Kilcornan ...	4.03
VII.	Ketton Hall [Stamford]	1.61	„	Ennis	4.72
„	Grantham, Stainby	1.66	„	Miltown Malbay	4.73
„	Horncastle, Bucknall ...	1.94	XXI.	Gorey, Courtown House	3.94
„	Worksop, Hodsek Priory	1.37	„	Athlone, Twyford	3.96
VIII.	Neston, Hinderton	1.38	„	Mullingar, Belvedere ...	4.50
„	Lancaster, Rose Bank...	3.56	„	Longford, Currygrane...	4.03
„	Broughton-in-Furness...	6.33	XXII.	Galway, Queen's Coll...	4.90
„	Ripon, Mickley	4.32	„	Crossmolina, Enniscoe..	8.94
IX.	Scarborough, South Cliff	...	„	Collooney, Markree Obs.	5.92
„	EastLayton [Darlington]	1.79	„	Ballinamore, Lawderdale	5.15
„	Middleton, Mickleton...	3.72	XXIII.	Galway, Queen's Coll...	4.43
„	Haltwhistle, Unthank..	3.16	„	Warrenpoint	3.50
X.	Bainburgh	1.33	„	Seaforde	4.56
„	Newton Reigny .....	...	„	Belfast, Springfield	4.81
XI.	Llanfrechfa Grange	4.05	„	Bushmills, Dundarave...	4.57
„	Llandoverly	5.87	„	Stewartstown	4.51
„	Castle Malgwyn	6.75	„	Buncrana	5.46
„	Builth, Abergwessin Vic.	...	„	LoughSwilly, Carrablagh	5.57

JANUARY, 1894.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					TEMPERATURE.				No. of Nights below 32°.	
		Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours		Days on which ≥ 0.1 or more fell.	Max.		Min.		In shade.	On grass.
				Dpth	Date		Deg.	Date	Deg.	Date		
I.	London (Camden Square) ...	2.87	+ 1.25	.34	22	25	52.0	11c	13.1	5	14	18
II.	Maidstone (Hunton Court)...	2.16	+ .61	.53	25	18	...	...	...	...	...	...
III.	Strathfield Turgiss	3.13	+ 1.32	.28	21	26	51.2	11	12.8	5	13	24
IV.	Hitchin	1.69	+ .15	.28	14	22	52.0	12	10.0	5	13	...
V.	Bury St. Edmunds (Westley) ...	1.88	+ .07	.35	22	19	54.0	11	11.0	6	12	18
VI.	Norwich (Brundall)	1.83	+ .36	.41	14	22	52.0	17	...	...	...	...
VII.	Weymouth (Langton Herring) ...	3.37	+ 1.03	.57	8	26	50.0	17c	14.0	5	10	...
VIII.	Torquay (Cary Green)	4.49	...	.51	8	26	53.1	11	19.4	6, 7	9	11
IX.	Polapit Tamar [Launceston]..	4.19	+ 1.17	.60	10	22	56.5	11	16.0	7	4	13
X.	Stroud (Upfield)	2.55	+ .35	.29	9, 19	25	52.0	17	15.0	5	11	...
XI.	Church Stretton (Woolstaston) ..	3.02	+ .86	.43	8	26	49.5	11a	8.0	6	13	18
XII.	Tenbury (Orleton)	2.86	+ .72	.35	4	18	55.0	11	5.5	6	11	16
XIII.	Leicester (Barkby)	1.32	- .44	.15	30	23	53.0	11	7.0	5	14	23
XIV.	Boston	1.66	+ .27	.25	14	20	50.0	12e	12.0	6	...	...
XV.	Hesley Hall [Tickhill].....	1.41	- .36	.27	17	20	53.0	26	-0.2	6	13	...
XVI.	Manchester (Plymouth Grove) ..	2.51	+ .05	.26	28	23	54.0	11	13.0	5	12	15
XVII.	Wetherby (Ribston Hall)	2.31	+ .42	.33	10a	15	...	...	...	...	...	...
XVIII.	Skipton (Arncliffe)	9.70	+ 4.06	.33	15	28	...	...	...	...	...	...
XIX.	Hull (Pearson Park)	1.45	- .32	.21	17	19	52.0	27	10.0	6, 7	17	18
XX.	Newcastle (Town Moor)	1.47	- .34	.18	1	20	...	...	...	...	...	...
XXI.	Borrowdale (Seathwaite).....	21.46	+ 9.28	.43	26	25	...	...	...	...	...	...
XXII.	Cardiff (Ely).....	3.45	+ .16	.46	15	23	...	...	...	...	...	...
XXIII.	Haverfordwest	6.48	+ 2.06	.70	12	25	51.9	11	15.0	7	11	16
XXIV.	Aberystwith, Gogerddan	3.43	- .10	.65	21	19	52.0	10	14.0	5	12	...
XXV.	Llandudno.....	3.02	+ .74	.48	10b	23	57.4	16	15.0	6	8	...
XXVI.	Cargen [Dumfries]	6.00	+ 2.23	.84	29	22	51.2	11	6.8	6	14	...
XXVII.	Jedburgh (Sunnyside).....	2.53	+ .81	.70	27	13	51.0	13	1.0	7	13	...
XXVIII.	Old Cumnock	4.62	+ .63	.78	27	24	...	...	...	...	...	...
XXIX.	Lochgilphed (Kilmory)	9.32	+ 3.18	.90	26	26	...	...	20.0	1, 6	16	...
XXX.	Mull (Quinish)	6.74	+ 1.07	1.06	15	24	...	...	...	...	...	...
XXXI.	Loch Leven Sluices	6.20	+ 3.30	1.00	22	16	...	...	...	...	...	...
XXXII.	Dundee (Easteru Necropolis) ..	3.15	+ 1.18	.50	30	22	50.0	16	6.2	7	17	...
XXXIII.	Braemar	6.37	+ 3.68	.99	29	24	46.3	11	-4.0	6	20	26
XXXIV.	Aberdeen (Cranford)	2.51	...	.42	29	23	48.0	16f	6.0	6	17	...
XXXV.	Strathconan [Beaully]	7.35	+ 2.47	1.32	27	13	...	...	...	...	...	...
XXXVI.	Glencarron Lodge.....	11.03	...	1.75	26	24	...	...	...	...	...	...
XXXVII.	Cawdor [Nairn]	2.40	+ .23	.36	25	22	...	...	...	...	...	...
XXXVIII.	Dunrobin	2.98	+ .52	.41	26	18	50.0	24	22.0	7	17	...
XXXIX.	S. Ronaldsay (Roeberry).....	3.33	+ .38	.26	22	28	48.0	13	26.0	5g	15	...
XL.	Darrynane Abbey.....	6.02	...	.85	8	26	...	...	...	...	...	...
XLI.	Waterford (Brook Lodge)	5.98	+ 2.42	1.30	10	24	51.5	10	2.0	7	14	...
XLII.	O'Briensbridge (Ross)	4.32	...	.59	31	26	...	...	...	...	...	...
XLIII.	Carlow (Browne's Hill)	3.70	+ .80	.41	30	23	...	...	...	...	...	...
XLIV.	Dublin (Fitz William Square) ..	2.84	+ .98	.33	12	23	54.7	11	18.6	7	7	17
XLV.	Ballinasloe	4.48	+ 1.40	.55	16	25	53.0	23	15.0	6, 7	15	...
XLVI.	Clifden (Kylemore)	9.89	...	1.12	15	24	...	...	...	...	...	...
XLVII.	Waringstown	3.40	+ .75	.34	27	23	54.0	10	0.0	5	20	23
XLVIII.	Londonderry (Creggan Res.) ..	5.41	+ 1.99	.48	12	24	...	...	...	...	...	...
XLIX.	Omagh (Edenfel)	6.64	+ 3.62	.72	26	24	50.0	10	8.0	6	17	21

a And 18. b And 30. c And 27. d And 16. e And 17. f And 21, 24, 26. g And 6, 22.
 +Shows that the fall was above the average; -that it was below it.

METEOROLOGICAL NOTES ON JANUARY, 1894.

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

ENGLAND.

STRATHFIELD TURGISS.—January was a wet month, with a very severe snap of cold in the early part, the thermometer indicating a lower temp. on the 5th and 6th than has been recorded at this station, with the exception of December 25th, 1860, and January 17th, 1881.

ADDINGTON.—Severe frost from 1st to 8th, but very little afterwards. The 4th was a bitterly cold day, with high wind and frost, and the 5th was remarkable for its very low max. (15°), the min. of the month (11°) really occurring on the evening of that day. S fell on the 4th and 5th, and on the evening of the 31st.

BURY ST. EDMUNDS.—R or S fell in small quantities on 22 days. A sharp spell of cold occurred from the 3rd to the 9th, the max. on the 5th being 18° , and the min. on 6th (exposed ther.) 3° . The rest of the month was comparatively mild. S daily from 2nd to 6th.

NORWICH, BRUNDALL.—January was remarkable for its extreme variations of temperature, the first week giving lower readings than are sometimes recorded in our most severe winters. On each of the four nights 5th to 8th inclusive the temp. fell below 20° in the screen. The remainder of the month was mild, and the weather of the cyclonic type, the result being that the mean temp. of the month (mean of max. and min.) was $37^{\circ}\cdot3$, or in close agreement with the average. Snowdrops and winter aconites in full flower before the close of the month.

LANGTON HERRING.—A most unsettled month. The weather was very severe on the first nine days; for five days (3rd to 7th inclusive) it did not cease freezing, and the intense cold on the 5th was quite exceptional, the max. between sunrise and sunset being only 17° ; the temp. fell to 16° at 4 p.m., rose to 20° by 9 p.m., and to 23° by 9 a.m. on the 6th; the 5th was the coldest day for 22 years. From the 10th to the 22nd it was mild and very damp. From the 23rd to the end of the month the temp. was very variable. The mean for the month at 9 a.m. ($37^{\circ}\cdot9$) is just 1° below the average of 23 years. Fogs on 4 days. L on the 30th.

TORQUAY, CARY GREEN.—S on the 4th, 5th, and 6th, about 12 inches deep.

POLAPIT TAMAR.—Very cold during the first eight days, the ther. on grass on the morning of the 7th reading $4^{\circ}\cdot5$ above zero, the lowest observed here during the past eight-and-a-half years. Altogether unusually wet and stormy. T on 28th. H on 31st.

STROUD, UPFIELD.—A slight fall of S on the 2nd; on the 4th, bitter easterly gale with S at times, and S on the 5th and 6th; S.W. gales on 27th and 30th, and S. gale on 29th. The meteor of the 25th was seen by few in this neighbourhood.

WOOLSTASTON.—A rather wet month. S fell on 6 days. The first 9 days were bitterly cold, the 5th exceptionally so, the max. temp. being $18^{\circ}\cdot5$; the coldest day remembered here. This was succeeded by some days of warm spring-like weather, but the latter part of the month was again cold. Mean temp. $36^{\circ}\cdot7$. Violent H on the 29th.

LEICESTER, BARKBY.—A fine month on the whole; sharp frost in the first week. The R fell in small quantities, mostly at night, and more is needed. Very strong winds for many days. Mean temp. $36^{\circ}\cdot3$.

MANCHESTER.—The first day was spring-like, then followed bitterly cold weather, with very low temp. on the 5th. Spring-like weather prevailed from 10th to 13th. Thick fog on the 23rd up to 10 or 11 a.m. From 24th to the end of the month very unsettled. Mean temp. 38° .

HULL, PEARSON PARK.—Sleet on 1st and 24th. Showers of H and S on 2nd, 3rd and 4th. S on 5th and 6th. Fogs on 7th, 8th and 31st. Stormy on 26th, 27th and 29th.

SEATHWAITE.—Falls of R exceeding an inch occurred on 8 days. S on 5th, 9th, and 28th to 30th. H on the 26th.

WALES.

Haverfordwest.—The first eight days of the month were exceptionally severe, partly owing to the dryness of the air and the severity of the furious easterly gale, which blew with exceptional violence from the 4th to the 6th, the sky all the time covered with a black pall of cloud, notwithstanding which the mercury did not rise higher than 22° during the 5th; on the 6th, at 3 p.m., a regular blizzard occurred, 4 inches of S falling in an hour. The S in several places near the coast and to the south of the county varied from 5 to 8 inches in depth. The remainder of the month was continuously wet, stormy and mild, prevailing winds S., S.W. and W.

Gogerddan.—Very stormy and changeable throughout the month; very little sunshine.

SCOTLAND.

Cargen.—A very unsettled, stormy month; very marked and extreme fluctuation of pressure. A remarkable lunar halo was observed on the 20th, two distinct rings with marked prismatic colours. S on 8th.

Jedburgh.—In the early part of the month the weather was mild and occasionally agreeable; towards the close it was cold with storms of wind and R, and low temp. and pressure.

Old Cumnock.—Stormy on 11th and 12th, S on 2nd, 3rd, 5th, 25th to 28th, and 31st.

Mull Quinish.—A wild and stormy month with continual gales from all quarters, and much S and R.

Braemar.—On 6th the temp. in shade fell to $-4^{\circ}0$, and on grass to -9° . The same temp. occurred on the same date in 1893.

Roeberry.—A very coarse unsettled month throughout; mean temp. $37^{\circ}7$.

IRELAND.

Darrynane Abbey.—Very hard frost from 4th to 7th. Aurora on 9th. The rest of the month very wild and changeable. Heavy H shower on 28th. S on 6th.

Waterford, Brook Lodge.—A very wild, cold month. S on 5 days. H on 17th. Gale from S.W. on 11th, and from S. on 19th. Mean temp. $39^{\circ}8$.

O'Brien's Bridge, Ross.—A decidedly wintry and unpleasant month; R every day after the first week, with gales of wind chiefly from S.E., at times violent. L on 28th and 29th. S, H, and sleet at the end of the month, with frost on the last three days.

Dublin.—The month opened with a spell of easterly winds and intensely cold weather, but ultimately proved wet, open, and stormy, with an almost uninterrupted prevalence of S.W. and W. winds. Mean temp. $41^{\circ}0$, slightly below the average. Lunar coronæ were seen on the 16th and 17th. Foggy on three days. High winds on 21 days, reaching the force of a gale on 9 days. H fell on 7 days, and S or sleet on 7 days. Temp. exceeded 50° in the screen on 13 days, and fell below 32° on only 7 nights. L on the 7th.

Waringstown.—An intense frost was registered on the morning of the 6th; no sign of it on the previous night, which seemed to promise heavy S; the extreme cold lasted only a few hours in the early morning, but the effect on shrubs was most disastrous; herbaceous plants escaped, being covered with S. The lowest temp. previously registered were $-1^{\circ}0$ on January 21st, 1881; 6° on December 23rd, 1870; 2° on January 2nd, 1867; 7° on December 24th, 1860.

Omagh, Edenfel.—The month commenced in fine, dry, and frosty weather preparatory to the S which fell to an average depth of 6 inches on the 4th and 5th, accompanied and followed by temperatures falling as low as 8° at 10 a.m. on 6th (from 15° at 9 a.m. the same morning). On the 8th the frost and S disappeared in a mild spell and a rainfall that increased in persistence and amount to the end of the month, varied by sleet, S, H, and high winds and weather of extreme rawness and severity. The wettest January in 30 years except 1877.

SYMONS'S

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A WET FEBRUARY IN EDINBURGH.

WHEN the rainfall in any month is double the average due to that month, few persons can deny that it has been a wet one. When the fall is three times the average, the fact is so exceptional that it ought to be put on record. And there can be but few instances such as that we have to quote of more than $4\frac{1}{2}$ times the average. In different parts of Edinburgh observations of rainfall have been made for 116 years, the wettest previous February was 1848 with 5·21 in. ; in 1894 at Napier-road, it was 7·62 in., and in Charlotte-square, 6·38 in.

The following little table gives six stations at which the fall practically reached or exceeded three times the average :—

COUNTY.	STATION.	FEBRUARY.		1894. per cent of average.
		Average for 1880-89 in.	1894. in.	
Edinburgh	Charlotte Square, Edinburgh ...	1·39 ...	6·38 ...	459
„	Alnwick Hill, Liberton	2·07 ...	7·60 ...	368
Kinross	Loch Leven Sluice	2·75 ...	9·20 ...	335
Edinburgh	Glencorse, Pentland Hills	2·89 ...	9·30 ...	322
Renfrew	Queen's Park, Glasgow	2·95 ...	8·96 ...	305
Haddington ...	Smeaton, Prestonkirk	1·22 ...	3·65 ...	299

From the above district, with the vicinity of Edinburgh for a centre, the exceptional character of the fall gradually decreased, so that in the extreme W. and N. the fall was very slightly above the average.

The fall was excessive both actually and relatively, chiefly the latter, with which we have already dealt as far as the data yet received enabled us.

As regards the total fall we have received 21 Scotch records, each exceeding 11 inches, the highest being 32·30 in. on Ben Nevis, and 19·43 in. at Glen Quoich ; although neither is unprecedented for one or more months in the year, we can find no instances of greater falls in February at those two stations.

We are indebted to Mr. Mossman for details respecting the excessive rainfall of February in Edinburgh, and for some extra returns.

MILD WINTER WEATHER.

To the Editor of the Meteorological Magazine.

SIR,—I do not know whether it has ever been observed, that for a long time past (since the beginning of the century at least), we have had a conspicuously mild *first quarter* of the year (judging by mean temperature) every 12 or 13 years.

Noting that the average mean temperature for this quarter for 130 years (according to Buchan) is $39^{\circ}\cdot 8$, we have the following :—

	Mean Temp.	1st quarter.	Interval.
1809	42·1 —
1822	43·1	..... 13 years.
1834	43·7	..... 12 „
1846	44·3	..... 12 „
1859	43·8	..... 13 „
1872	44·2	..... 13 „
1884	43·6	..... 12 „

There are no other values over $43^{\circ}\cdot 0$ since 1800.

According to this we might expect the first quarter of 1896 or 1897 to have a very high mean temperature.

Those mild first quarters seem to have been followed (with one exception, 1809, the lowest), by fine hot summers. I append a few notes about this from Baker's *Records of the Seasons, &c.* :—

1822.—“Hot summer.” “No rain from May 2nd to July 5th.” “Nine weeks of very hot days.” “Full average produce. Quality universally good.”

1834.—“Long drought.” “A most productive harvest.” “Extremely hot all the summer.”

1846.—“This was a notably hot summer.” “June, July, and August, $4^{\circ}\cdot 2$ above average temperature.” “The hottest June on record.”

1859.—“Good crops of hay and corn.” “Early harvest.” “An extremely hot summer.” “The hottest July on record.”

1872.—“In South of England, good crops and fine weather to secure them.”

1884 (Mr. Glaisher).—“The weather was very favourable for harvest work, and the grain crops were gathered in good condition.”

I find in the *Met. Mag.* for June, 1870 (p. 80) Mr. Brumham offering proof that where January or February is dry and mild, the summer following is hotter than the average.—Yours faithfully,

A.B.M.

METEORS AND ELECTRICAL PHENOMENA.

To the Editor of the Meteorological Magazine.

SIR,—With reference to Mr. J. G. Wood's letter in your February number, descriptive of certain bright meteors seen on January 25th, 1894, I fancy that the question as to their coincidence with electrical phenomena is not a promising one for discussion. Though I have habitually observed meteors for some years, and taken care to note other appearances, such as auroræ, lightning, &c., when visible during

my watches, I could never trace evidence of association between them. Occasionally there have been coincidences of apparition, but these must have occurred in the ordinary course of nature, and cannot be supposed to have indicated mutual relation.

On August 9th, 1893, during the progress of the Perseid shower of meteors, lightning was surprisingly frequent and vivid the whole night long. Mr. E. J. Lowe, at Chepstow, estimated the number of flashes as 11,540! But no one supposes the two phenomena to have had any correlation. One was purely astronomical, having an extra-terrestrial origin and a general operation; the other was merely atmospheric and local in its action.

Your correspondent suggests that in the case of large meteors similar to that of January 25th last, "we may not be dealing with aerolites at all, but with electrical phenomena arising within our own atmosphere." I think such an idea has little to recommend it. It is going back to the untenable theories of our forefathers. Among other features, the visible aspect of the recent fireball afforded the clearest indication of its aerolitic character. Its appearance was that of a projectile in a state of incandescence rapidly undergoing violent disruption. Near the end of its flight it broke up into fragments, and finally scattered its material in a train of sparks, which disappeared immediately. Many persons must have been impressed with the correct idea that it was a body of solid matter being dissipated under the action of intense heat.

The real path of the fireball in our atmosphere, where it fell from a height of 89 to 16 miles, affords also very strong proof that it came from an exterior source.

The descent and destruction of a large aerolite comparatively near the earth's surface must cause a certain amount of disturbance in the atmosphere, and the shock may possibly be such as to induce a shower of rain. But the ordinary height of meteors is so far above that of rain-clouds that the latter are not likely to be much affected except in particular cases.

I have witnessed many fine showers of meteors without noticing any simultaneous evidences of electrical action of a visible nature. Large isolated meteors of very brilliant character have also been recorded without any accompanying phenomena.

It seems to me that the astronomical theory of meteors, in its general application, explains the observed features of these bodies so well that we have no need to go farther afield for another. There are, it is true, one or two details in the behaviour of meteoric radiant points which are perhaps not quite consistent with approved ideas; but this branch of astronomy is of modern date only, and further observation will doubtless clear away the trifling anomalies at present existing.

Mr. Wood, in referring to my computation of the real path of the fireball of January 25th, says he "finds it difficult to make it fit in with some of the reports" noted in his paper. Surely your

correspondent does not need the experience to see that it is an impossible feat to obtain a definite result that shall be accordant with the whole of such a miscellaneous collection of descriptions? Newspaper reports are notoriously erroneous, and it is rarely that inexperienced persons are accurate in their impressions of an event so sudden and startling as the outburst of a brilliant meteor. No deduction will satisfy the whole of the records, as they disagree amongst themselves. Fortunately, several reliable amateur astronomers observed the recent fireball, and I think I may consider my computation approximately correct. If it does not fit in with every account, there is really nothing surprising in the circumstance.

W. F. DENNING.

Bristol, February 23rd, 1894.

A NOONDAY METEOR.

To the Editor of the Meteorological Magazine.

SIR,—You may think it worth recording in your Magazine that a fine meteor was seen here by my brother on the 8th inst. at 0.35 p.m. travelling from West to East. The sun was shining at the time, but my brother had his back to the sun and the meteor was low down in the northern half of the sky. I observe by the newspapers that others saw it on that day, thereby confirming what I had almost doubted as an accurate observation, so bright was the day.

Yours faithfully,

M. LEWELLYN EVANS.

2, Naunton Park Villas, Cheltenham, Feb. 18th, 1894.

[This meteor (an exceptionally fine one), was seen from Dublin by Dr. Rambaut, the Royal Astronomer of Ireland, who subsequently collected observations and published an account of it. It was seen from scores of places of which the limits seem to be W. Ballinasloe (Galway), E. Lynn (Norfolk), S. London, N. Glaslough (Monaghan), and Beverley (York.)

Dr. Rambaut found the positions to be—

APPEARANCE.		DISAPPEARANCE.	
<i>Longitude</i> 3°52' W	}	||	<i>Longitude</i> 1°36' W
<i>Latitude</i> 53 36 N			<i>Latitude</i> 53 44 N
{ or about 20 miles N. of Llan- dudno.		{ or in a triangle formed by Leeds, Halifax and Wakefield.	
<i>Altitude</i> About 87 miles.		<i>Altitude</i> About 20 miles.	

On plotting the localities whence Dr. Rambaut received reports, we find that almost all are south of the path of the meteor, and very naturally so, because magnificent as it was, few persons would notice it while looking southwards, *i.e.*, towards the sun, which was shining brilliantly.

It must have been a very grand object to have been distinctly visible in broad sunshine from distances exceeding 200 miles.

Before concluding, we must point out that the time records are again bad. Dr. Rambaut gave 0 h. 28 m. Greenwich time, but Miss Compton said "at noon," the Rev. R. P. Dansey, of Stourbridge, 0 h. 30 m., and the above letter gives 0 h. 35 m. p.m.—Ed.]

THE AURORA OF FEBRUARY 28TH.

To the Editor of the Meteorological Magazine.

SIR,—The brilliant aurora of February 28th was observed here under conditions so favourable that I think it may be worth while to send you some notes of my observations, in the hope that from a comparison of these with similar observations made by others elsewhere, it may be possible to compute the position and altitude of the luminous arches which were so conspicuous a feature in the display.

The characteristic arc of yellowish light in the northern sky was first observed at 6.45 p.m., and was unusually bright, the southern edge cutting the horizon at points a few degrees N. of E. and S. of W., thus showing that the diameter of the arc was, as usual, in the line of the magnetic meridian. The centre of interest was, however, not here, but in the southern heavens, where from 7 to 8 p.m. there were visible two lines of luminous patches or streaks, forming broken arches, extending from the eastern to the western horizon.

In appearance these were not unlike the gauzy, filmy cloudlets which are sometimes seen early on a fine summer's day, when the morning mist is dispersing and breaking up. They varied greatly in brightness from time to time, sometimes glowing brilliantly and then fading, and at times they disappeared quite suddenly, and after a few moments re-appeared as suddenly, always maintaining their relative positions. Neither of the lines of luminosity formed a complete arch at any time; there were always distinct intervals between them; and the whole system (if I may so express myself) underwent a slow but distinct movement from N. to S. and from E. to W. The southward movement was estimated at 60° in 35 minutes; the westward movement at 10° in 20 minutes.

At 7.10 p.m. a large luminous patch in the line of the upper arch was a little above Procyon, and a similar patch in the line of the lower arch was a little below that star.

At 7.25 p.m. the lower edge of the lower patch was just above Sirius.

At 7.34 p.m. the central portion of a luminous patch covered the belt of Orion.

About 7.45 p.m. both of the luminous arches began to fade, and by 8 p.m. had entirely disappeared, and, as far as my observations went, did not re appear. The luminous arc in the North, though gradually becoming fainter, was visible till a late hour, but, with the exception of one sudden outburst of red streamers at 9 p.m., which lasted only three or four minutes, did not emit any of the coruscations which are usually associated with bright displays of the aurora. Another peculiarity of this display was the absence of any flashing or undulatory movement in the detached luminous patches, the changes in brightness, though frequent, being gradual and steady, as in the case of a lamp when the wick is very gradually raised and lowered.

G. T. RYVES, F.R.Met.Soc.

Team Vicarage, Stoke-on-Trent, March 7th, 1894.

Lat. $52^\circ 57'$ N. Long. $1^\circ 59'$ W.

SUN SPOTS AND AIR TEMPERATURE.

To the Editor of the Meteorological Magazine.

SIR,—In the number of your Magazine for September last there is a discussion by “A. B. M.” of the relation between sun spots and air temperature, employing for the purpose the mean monthly temperatures for London, as given by Dr. Buchan in a paper on “The Temperature of London for 130 years, from 1763 to 1892,” *Journal of the Scottish Meteorological Society*, vol. 9, p. 213. Combining all the years of sun spot minimum, he compared the resulting mean monthly temperature with the corresponding mean monthly temperature, obtained by combining all the years of sun spot maximum, confining the comparison, however, to the six months from April to September. He treated similarly the series of years preceding by one year the years of sun spot minimum and sun spot maximum, and also the series of years following by one year the same epochs. This gave 18 differences, the monthly means in the minimum years being greater than in maximum years in 14 cases, and smaller only in 4 cases, a considerable preponderance, which “A. B. M.” thought to be “perhaps noteworthy.”

A result of this kind cannot be accepted as in any way valid without some conclusive proof that it is really due to the assigned cause; for, it is to be remarked that the resulting differences are small as compared with the very large variations of temperature which examination of any considerable table of temperature reveals, and may be simply accidental errors arising from the combination of the temperatures of the particular years involved. If, however, the differences are real, a different combination of the data employed by “A. B. M.” should bring out a corroborative result. In doing this I have extended the comparison to all months of the year, since there appears to be no reason for confining it to the summer months. Instead of combining *all* the years of sun spot minimum, I have divided the whole series into two groups, including in group No. 1 the first, third, fifth, &c., years of sun spot minimum, and in group No. 2 the second, fourth, sixth, &c., years, forming monthly mean temperatures for both groups, which two sets of concluded means should be alike representative of the whole period discussed. The years of sun spot maximum were similarly formed into two groups, which, as referring to sun spot maximum, should also be representative of the whole series. In each case the year immediately preceding and the year immediately following sun spot minimum or maximum is included, in order to render the results strictly comparative with those of “A. B. M.”; the very same years are indeed employed, the only difference being that, to save space, the three years at each epoch are combined, instead of forming in each case three sets of numbers.

Comparing now the means of minimum group No. 1 with those of maximum group No. 1, and the means of minimum group No. 2

with those of maximum group No. 2, we have as follows:—

MONTH.	SUN SPOT GROUPS No. 1.		Excess of former.	SUN SPOT GROUPS No. 2.		Excess of former.
	Min.	Max.		Min.	Max.	
January	37 ^o 61	37 ^o 74	—0 ^o 13	37 ^o 34	36 ^o 86	+0 ^o 48
February	39 ^o 87	40 ^o 72	—0 ^o 85	39 ^o 97	40 ^o 29	—0 ^o 32
March	41 ^o 76	41 ^o 93	—0 ^o 17	42 ^o 38	43 ^o 30	—0 ^o 92
April	47 ^o 69	45 ^o 81	+1 ^o 88	48 ^o 12	48 ^o 50	—0 ^o 38
May	55 ^o 06	54 ^o 02	+1 ^o 04	54 ^o 98	55 ^o 49	—0 ^o 51
June	60 ^o 64	59 ^o 53	+1 ^o 11	60 ^o 71	59 ^o 83	+0 ^o 88
July	63 ^o 64	62 ^o 69	+0 ^o 95	62 ^o 88	64 ^o 33	—1 ^o 45
August	63 ^o 53	62 ^o 43	+1 ^o 10	62 ^o 71	63 ^o 52	—0 ^o 81
September	59 ^o 44	57 ^o 29	+2 ^o 15	58 ^o 75	58 ^o 40	+0 ^o 35
October	52 ^o 38	50 ^o 72	+1 ^o 66	50 ^o 52	51 ^o 83	—1 ^o 31
November.....	44 ^o 38	42 ^o 20	+2 ^o 18	44 ^o 08	43 ^o 95	+0 ^o 13
December.....	39 ^o 00	39 ^o 21	—0 ^o 21	39 ^o 51	39 ^o 53	—0 ^o 02
THE YEAR	50 ^o 41	49 ^o 53	+0 ^o 88	50 ^o 16	50 ^o 48	—0 ^o 32

In regard to sun spot effect, the two sets of monthly differences are directly comparable, and should give a like indication. But in six of the months the signs are different; in three other months they are similar and both +, and in the three remaining months also similar, but both -. The result is in every way contradictory. Had minimum group No. 1 been compared with maximum group No. 2, and minimum group No. 2 with maximum group No. 1, a result no more harmonious would have been obtained.

It always seems well, when the suggestion of sun spot influence appears to be in some degree supported by figures, to probe the matter as completely as possible, in order to see whether they truly indicate any real effect.

W. E.

February 28th, 1894.

ROYAL METEOROLOGICAL SOCIETY.

The annual meeting of this Society, was held on Wednesday evening, January 17th, at the Institution of Civil Engineers, Westminster, Dr. C. Theodore Williams, President, in the chair.

The Council in their report, stated that the Society had made steady and uninterrupted progress during the year, there being an increase in the number of Fellows, and the balance of income over expenditure, being greater than in 1892. They also reported that Dr. C. Theodore Williams, previous to vacating the office of President, had expressed a desire for the formation of a fund for carrying out experiments and observations in Meteorology, and that he had generously presented to the Society the sum of £100, to form the nucleus of a Research Fund. The Society lost by death during 1893, nine Fellows and two honorary members.

The President, Dr. C. Theodore Williams in his valedictory address, gave an account of the climate of Southern California,

which he made most interesting by exhibiting a number of lantern photographs. In the autumn of 1892, Dr. Williams visited this favoured region, chiefly with a view of investigating its present and future resources and its suitability for invalids. After describing the entrance into California from Utah and Nevada, the general geological features, and physiography, he pointed out that the mountain shelter is tolerably complete, and that the protected area consists of (1) valleys, chiefly running into the coast range from the sea, and rising to various elevations, such as the fertile San Fernando and San Gabriel valleys; or else (2) more or less extensive plains, as those of Santa Aña and San Jacinto. Southern California is subdivided into two portions—eastern and western, by the Sierra Nevada and its spurs, the San Gabriel and San Bernadino mountains. The climate of the eastern portion, which is an arid region, is very dry, very hot in summer, and moderate in winter. The climate of the western portion has three important factors, viz.: (1) its southern latitude; (2) the influence of the Pacific Ocean, and especially of the Kuro Siwo current, which exercises a similar warming and equalizing influence on the Pacific coast of North America as the Gulf Stream does on the western coasts of the British Isles and Norway; and (3) the influence of mountain ranges; these affording protection from northerly and easterly blasts, and also condensing the moisture from the vapour-laden winds blowing from the Pacific. Dr. Williams then gave particulars as to the temperature and rainfall at Los Angeles, San Diego, Santa Barbara, and Riverside. From these it appears that the climate of Southern California is warm and temperate, and on the whole, equable, with more moisture than that of Colorado; and that it is a climate which would allow of much out-door life all the year round. The President next described the effect of the climate on vegetation, and showed what results had been obtained by irrigation and gardening in this beautiful region. Wine and brandy are made in South California, but oranges and lemons are the leading crops, varied with guavas, pineapples, dates, almonds, figs, olives, apricots and plums. On higher land, apples, pears and cherries bear well, and our English summer small fruit is also grown; while strawberries ripen all the year round, and are plentiful except in July and August. Dr. Williams concluded by saying that many an invalid has regained vigour and health, as well as secured a competence, in the sunny atmosphere of Southern California.

At the close of his address, Dr. Williams introduced to the meeting the newly-elected President, Mr. R. Inwards, F.R.A.S. Mr. Henry Perigal, F.R.A.S., was re-elected Treasurer, Mr. F. C. Bayard, L.L.M., and Mr. G. J. Symons, F.R.S., Secretaries, and Mr. R. H. Scott, F.R.S., Foreign Secretary.

THE monthly meeting of this Society was held on Wednesday evening, February 21st, at the Institution of Civil Engineers, Westminster, Mr. R. Inwards, F.R.A.S., President, in the chair.

Mr. R. M. Barrington, M.A., LL.B., Mr. C. G. L. Cator, and Mr. H. Owen were elected Fellows of the Society. The following papers were read :—

(1). "Temperature, Rainfall, and Sunshine at Las Palmas, Grand Canary," by Dr. J. Cleasby Taylor. The author gave the results of his observations during the five years 1889-93. The island of Grand Canary occupies a position midway between the African continent and the most western of the Canary group. The mountain peaks rise to a little over 6,000 ft., and are about 20 miles from the coast. The chief town and port of the island, Las Palmas, is consequently free from the influence of the mountains. The diurnal range of temperature fluctuates considerably with the variations in wind and sunshine. With a southerly wind (which usually dies down at sunset) the range is increased, but the greater part of the increase is due to a higher day temperature. With northerly winds persisting after sunset, the range may be very slight, particularly if the day has been cloudy. The sea temperature is dependent on causes outside the limits of the archipelago ; local presence or absence of sunshine does not cause any difference. A boisterous northerly wind, with a high sea, may cause the temperature to fall more quickly than usual, or, if the temperature is rising, may check the rise ; but any sudden variation is very rare. The rainfall is not great, though it is spread over a large number of days, the average yearly amount being 8·90 in. The greater part of the rain falls during October to January, while the period from June to September is practically rainless.

(2). "Report on the Phenological Observations for 1893," by Mr. E. Mawley, F.R.Met.Soc. This is a discussion of the observations made on the flowering of plants, appearance of insects, and the song and nesting of birds. The year 1893 was in complete contrast to its predecessor, being very forward throughout the United Kingdom. The February and March plants were later than usual in blossoming, especially in the colder parts of our islands, but after this the dates were everywhere in advance of the average, and during the height of the flowering season the departures from the mean were often considerable.

(3). "Comparative Observations with two Thermometer Screens at Ilfracombe," by Mr. W. Marriott, F.R.Met.Soc. Some exception having been taken to the thermometer screen which has been in use at Ilfracombe for a number of years past, a Stevenson screen was placed at a distance of 60 feet from the old screen in October, 1892, since which date simultaneous observations in the two screens have been made daily at 9 a.m. The results of this comparison show that the temperatures deduced from the two sets of observations agree very closely, the old screen giving a mean only 0°·3 higher than the Stevenson.

RAINFALL IN NATAL, AND THE SOUTHERN ICEBERGS.

Natal—or at any rate, part of the colony—was visited by exceptional rains in September, October and November, 1893.

The Rev. A. H. Stocker, who formerly kept the record of the fall of rain at Ovington, Hampshire, went to Ennersdale, Natal, early in 1893, writes, January 25th, 1894:—"The summer here—the wet season (October to February)—has been so far awfully wet:—

September	5·66	(far above the average).	}	Total in less than 5 months, 37·25 in.
October	4·73			
November	12·05	(3 miles off it was over 16·00).		
December	6·10			
January 1-25	8·71			

and February still to come, which generally has the highest average monthly rainfall."

To this we add the following table, which shows that in 1893 the monthly fall at the two stations was very differently:—

*Rainfall at Mount Edgecombe from 1887 to 1893, compiled by
Mr. Marshall Campbell:—*

	1887.	1888.	1889.	1890.	1891.	1892.	1893.	MEAN.
	in.	in.	in.	in.	in.	in.	in.	in.
Jan.	3·17	4·38	9·06	1·86	4·15	2·03	6·76	4·49
Feb.	4·20	3·29	2·97	3·90	4·44	5·45	7·59	4·55
March	2·17	6·49	1·96	2·18	10·52	1·80	3·33	4·06
April	2·64	2·01	1·69	5·68	·60	·15	3·34	2·30
May	4·37	3·07	1·71	·73	2·74	2·79	3·89	2·76
June.	·34	·43	·20	·64	1·06	—	·12	·40
July	·49	1·37	·18	—	3·33	·18	·76	·90
August	1·94	1·10	1·32	·43	1·23	4·09	1·42	1·65
Sept.	1·00	4·20	1·00	·55	·79	4·45	11·87	3·41
Oct.	1·66	3·58	4·56	4·64	2·45	4·42	17·94	5·61
Nov.	1·93	1·58	1·98	3·99	4·11	5·38	7·00	3·71
Dec.	2·23	3·00	1·64	5·36	6·11	4·77	3·88	3·85
Total...	26·14	34·50	28·27	29·96	41·53	35·51	67·90	37·69

Natal Witness, January 12th, 1894.

The total for 1892 is printed as 35·31.—ED. M.M.

Finally we give Mr. Nevill's opinion upon the subject:—

"The Natal Government Astronomer, Mr. E. Nevill, gives it as his opinion that there is no just reason for ascribing wet seasons or droughts to the effect of spots in the sun, or other temporary disturbances in the normal equilibrium of that body. Attempts have been made by certain meteorologists to connect terrestrial weather disturbances with certain solar phenomena, but only with indifferent success. It is easy to find such coincidences between the times or periods of different classes of phenomena, but mere coincidences of this kind do not justify their being classed as cause and effect. He thinks that owing to a break-up in the southern ice-fields, and the liberation of great masses of ice which have come northwards, the great southern rain-belt has been thrown north, and thus brought very heavy rains on our coast.—*Cape Times*, December 27th, 1893."

REVIEW.

The Clyde Sea Area. By H. R. MILL, D.Sc., F.R.S.E. (Excerpt Trans. Roy. Soc. Edin.) 4to, 88 pages and 12 maps. R. Grant and Son, Edinburgh, 1892.

THIS is a full and very interesting account of the results obtained by Dr. Mill in what he has called the Clyde Sea Area, which may be defined as that portion of the sea on the West Coast of Scotland which is between the Peninsula of Kintyre and Ayrshire, in Lat. 55° N., and extends to the heads of Loch Fyne and Loch Long. This includes an area of nearly 1,200 square miles of water, while the area of the land draining towards it is about 3,300 square miles.

Dr. Mill seems to have spent a considerable portion of two years cruising about over this area in the steam yacht "Medusa," belonging to the Scottish Marine Station, and with apparatus either designed by himself or belonging to that establishment, taking thousands of measurements of temperature, specific gravity, and salinity, but apparently not paying much attention to either the direction or the force of the wind.

The paper before us deals chiefly with the specific gravity and salinity, its general object being to trace the rate of progress of the rain which falls on the land draining into the Clyde Sea Area, and on the water thereof, to its limit.

Dr. Mill spared no trouble; he took the Admiralty charts, and from them constructed a series of longitudinal and transverse sections of the various Lochs, so as to ascertain the cubic contents of each; he determined as nearly as practicable the fall of rain which had to be accounted for. (If anything, we think that his values are a little too high for the fall on the sea, but in the absence of actual knowledge, do not speak positively.) Then, by his determinations of specific gravity, and by chemical analysis, Dr. Mill gets out the proportion of fresh water to salt water in various parts of the district, and in different seasons. This problem is not an easy one. Dr. Mill himself finishes his paper with the following paragraph:—

"It is somewhat remarkable that so prolonged, widespread, and careful a set of analyses as those of Mr. Dickie do not show more direct relations with the remarkably contrasted physical conditions of the regions from which the samples worked upon were taken. I confess to much disappointment with the results; but, in the hope that others with greater skill or courage in the treatment of statistics than I possess may be induced to look into the matter, I am induced to publish my discussion of the work as far as it has gone."

Our impression is that Dr. Mill unduly depreciates his own abilities, and that the difficulties have nothing to do with statistics. We have heard of very similar discordances in attempts to estimate the amount of fresh and of salt water in the Thames. But even if this part of the paper be untrustworthy, there remains much that is interesting, instructive, and suggestive.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, SEPTEMBER, 1893.

STATIONS. <i>(Those in italics are South of the Equator.)</i>	Absolute.				Average.				Absolute.		Total Rain.		Aver. Cloud.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
England, London	81·6	6	35·3	24	67·9	49·1	47·8	71	123·4	30·9	1·07	10	4·6
Malta.....	98·8	25	66·5	6	87·8	72·3	67·5	68	147·9	60·0	·00	0	2·0
<i>Cape of Good Hope</i> ...	80·4	15	41·9	1	64·7	50·6	50·9	77	...	...	3·73	10	5·9
<i>Mauritius</i>	78·3	25	57·8	13	75·6	63·1	59·4	75	127·7	48·3	·91	16	5·7
Calcutta.....	89·6	6, 28	73·7	12	86·6	77·7	78·2	88	158·3	72·4	8·74	13	6·7
Bombay.....	86·7	12	73·9	23	84·5	76·1	74·4	83	139·0	71·0	7·54	24	7·3
Ceylon, Colombo	86·7	29	72·8	25	84·7	75·9	71·4	79	153·0	70·0	1·99	13	5·4
<i>Melbourne</i>	81·8	30	33·9	2	62·2	47·1	45·8	75	127·4	27·9	3·27	18	7·4
<i>Adelaide</i>	84·0	22	40·3	19	65·6	49·0	46·4	66	146·0	33·0	3·34	19	6·6
<i>Sydney</i>	84·0	23	43·4	2	67·3	51·5	47·9	68	137·3	33·7	1·60	15	3·0
<i>Wellington</i>	65·0	22 ^a	36·0	30	59·2	48·5	47·3	79	123·0	27·0	5·97	21	5·2
<i>Auckland</i>	67·0	27	44·0	21	61·9	50·7	49·2	77	140·0	40·0	3·57	20	6·0
Jamaica, Kingston.....	91·3	12	71·0	26	89·1	73·7	72·6	81	...	...	2·72	6	5·6
Trinidad	92·0	1, 2	67·0	1	89·3	70·3	75·1	86	171·0	67·0	11·73	14	...
Toronto.....	79·1	19	36·2	26	66·4	48·4	49·9	75	...	30·2	1·25	12	5·0
New Brunswick, Fredericton	76·9	14	30·0	27	61·8	42·4	45·5	74	...	...	5·27	18	5·5
Manitoba, Winnipeg...	86·6	12	21·7	26	67·1	42·4	...	...	...	...	·66	10	5·0
British Columbia, Esquimalt.....	70·6	6	40·2	12 ^b	62·0	46·3	49·9	89	...	...	1·21	13	5·4

^a And 26. ^b And 23, 30.

REMARKS.

MALTA.—The hottest month of the year, and hotter than any previous September in 10 years; also the only September in that period with total absence of rain. The high dew point made the weather very trying. J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·3 below, dew point 0°·3 below, and rainfall ·53 in. below, their respective averages. Mean hourly velocity of wind 11·4 miles, or 0·7 mile below average; extremes, 26·1 on 1st, and 1·8 on 6th; prevailing direction, E. C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—L only was seen on the 29th. D. G. MANTELL.

Melbourne.—Hoar frost on the 2nd; hail on the 7th; heavy squalls on the 17th and 21st; lightning on the 11th; distant thunder on the 23rd and 24th; thunderstorms on the 25th and 30th. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean temp. 0°·2 above the average of 36 years. A very wet and cloudy month, the rainfall being 1·56 in. above the average. C. TODD, F.R.S.

Sydney.—Temperature 0°·7 above, humidity 2 below, and R 1·56 in. below, the average. H. C. RUSSELL, F.R.S.

Wellington.—Showery, unpleasant weather almost throughout the month. Prevailing winds N.W., frequently strong; thunder on the 10th; hail on the 29th and snow on the hills. Mean temp. 2°·9 above, and rainfall 1·71 in. above, their averages. R. B. GORE.

Auckland.—A showery month, but with no violent storms or other exceptional features. Rainfall about a quarter of an inch above the average. Mean temp. 1°·5 above the average; barometrical pressure much below. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Fair, with afternoon showers and thunder. Mean hourly velocity of wind 3·5 miles. ROBT. JOHNSTONE.

TRINIDAD.—Rainfall 4·20 in. above the average of 30 years, and only exceeded in 1862, 1863, 1875, and 1876. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,
FEBRUARY, 1894.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			
II.	Dorking, Abinger Hall.	1.73	XI.	Rhayader, Nantgwillt..	7.00
„	Birchington, Thor	1.25	„	Lake Vyrnwy	11.08
„	Hailsham	2.51	„	Corwen, Rhug	4.25
„	Ryde, Thornbrough	2.69	„	Carnarvon, Cocksidia ...	3.41
„	Emsworth, Redlands ...	2.08	„	I. of Man, Douglas	5.66
„	Alton, Ashdell	2.50	XII.	Stoneykirk, Ardwell Ho.	2.81
III.	Oxford, Magdalen Col...	1.41	„	New Galloway, Glenlee	12.66
„	Banbury, Bloxham	1.90	„	Melrose, Abbey Gate ...	6.72
„	Northampton, Sedgbrook	1.99	XIII.	N. Esk Res. [Penicuick]	11.90
„	Alconbury	1.18	„	Edinburgh, Blacket Pl..	6.81
„	Wisbech, Bank House..	1.09	XIV.	Glasgow, Queen's Park.	8.96
IV.	Southend	1.26	„	Inverary, Newtown	14.83
„	Harlow, Sheering	1.47	XV.	Islay, Gruinart School..	5.57
„	Colchester, Lexden	1.23	XVI.	Dollar	8.63
„	Rendlesham Hall	1.34	„	Balquhider, Stronvar..	16.79
„	Diss	1.47	„	Ballinluig	6.54
„	Swaffham	1.19	„	Dalnaspidal H. R. S. ...	14.82
V.	Salisbury, Alderbury ...	1.94	XVII.	Keith H. R. S.	2.91
„	Bishop's Cannings	2.69	„	Forres H. R. S.	3.71
„	Blandford, Whatcombe .	3.47	XVIII.	Fearn, Lower Pitkerrie.	4.72
„	Ashburton, Holne Vic. ...	4.23	„	Loch Shiel, Glenaladale	17.76
„	Okehampton, Oaklands.	4.88	„	N. Uist. Loch Maddy ...	7.91
„	Hartland Abbey	3.35	„	Invergarry	15.79
„	Lynmouth, Glenthorne.	3.79	„	Aviemore H. R. S.	6.45
„	Probus, Lamellyn	2.38	„	Loch Ness, Drumnadrochit	7.48
„	Wellington, Sunnyside..	3.06	XIX.	Invershin	5.14
„	Wincanton, Stowell Rec.	2.96	„	Scourie	5.89
VI.	Clifton, Pembroke Road	3.99	„	Watten H. R. S.	2.43
„	Ross, The Graig	2.24	XX.	Dunmanway, Coolkelure	7.45
„	Wem, Clive Vicarage ...	2.25	„	Ferroy, Gas Works ...	2.14
„	Cheadle, The Heath Ho.	2.86	„	Killarney, Woodlawn ...	5.37
„	Worcester, Diglis Lock	2.21	„	Tipperary, Henry Street	2.10
„	Coventry, Coundon	2.66	„	Limerick, Kilcornan ...	2.43
VII.	Ketton Hall [Stamford]	1.94	„	Ennis	3.94
„	Grantham, Stainby	1.99	„	Miltown Malbay	4.60
„	Horncastle, Bucknall ...	...	XXI.	Gorey, Courtown House	1.82
„	Worksop, Hodsck Priory	2.48	„	Athlone, Twyford	3.85
VIII.	Neston, Hinderton	2.52	„	Mullingar, Belvedere ...	3.97
„	Lancaster, Rose Bank ...	5.24	„	Longford, Currygrane ...	3.88
„	Broughton-in-Furness..	8.41	XXII.	Galway, Queen's Coll...	5.55
„	Ripon, Mickley	5.19	„	Crossmolina, Enniscoe..	8.63
IX.	Scarborough, South Cliff	2.55	„	Collooney, Markree Obs.	5.67
„	EastLayton [Darlington]	4.52	„	Ballinamore, Lawderdale	4.80
„	Middleton, Mickleton..	6.77	XXIII.	Lough Sheelin, Arley ..	4.11
„	Haltwhistle, Unthank..	7.33	„	Warrenpoint	3.78
X.	Bamburgh	3.36	„	Seaforde	3.28
„	Newton Reigny .....	...	„	Belfast, Springfield	4.33
XI.	Llanfrecfha Grange	5.16	„	Bushmills, Dundarave...	5.20
„	Llandoverly	6.62	„	Stewartstown	3.92
„	Castle Malgwyn	2.94	„	Buncrana	5.36
„	Builth, Abergwessin Vic.	...	„	LoughSwilly, Carrablagh	7.20

FEBRUARY, 1894.

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 Night below 32°.	In shade. On grass.
		Total Fall.	Differ- ence from average 1830-9.	Greatest Fall in 24 hours			Max.		Min.			
				Dpth	Date		Deg.	Date	Deg.	Date.		
		inches.	inches.	in.								
I.	London (Camden Square) ...	1.75	— .13	.41	17	16	56.4	7	23.3	19	8	15
II.	Maidstone (Hunton Court)...	1.63	— .17	.26	17	13	...	...	...	...	...	...
III.	Strathfield Turgiss	2.06	+ .06	.67	17	18	57.1	2	20.1	21	8	21
IV.	Hitchin	1.73	— .02	.58	17	15	53.0	7, 26	19.0	18	9	...
V.	Winslow (Addington)	1.72	— .44	.68	17	16	55.0	27	20.0	19	11	15
VI.	Bury St. Edmunds (Westley)	1.73	+ .17	.39	25	12	55.0	8	22.0	23	...	...
VII.	Norwich (Brundall)	1.09	— .04	.23	25	14	57.0	7	22.6	23	...	11
VIII.	Weymouth(LangtonHerring)	2.56	— .04	1.11	17	17	52.0	11	25.0	19	6	5
IX.	Torquay (Cary Green)	1.72	— .00	.23	23	18	53.9	27	27.8	21	3	8
X.	Polapit Tamar [Launceston]..	2.34	— .93	.47	17	17	61.0	8	23.0	21	4	9
XI.	Stroud (Upfield)	2.44	— .12	1.00	17	18	54.0	27	24.0	20	8	...
XII.	ChurchStretton(Woolstaston)	3.01	+ .56	.57	17	18	54.0	7	22.0	19	8	17
XIII.	Tenbury (Orleton)	2.43	— .05	.81	17	16	56.0	7, 26	20.5	21	10	12
XIV.	Leicester (Barkby)	1.77	— .04	.47	17	15	59.0	7	15.0	19	17	21
XV.	Boston	1.14	— .54	.40	17	9	60.0	7	20.0	22	12	...
XVI.	Hesley Hall [Tickhill].....	2.72	+ 1.22	1.13	17	15	59.0	7	...	...	...	12
XVII.	Manchester(PlymouthGrove)	4.49	+ 2.44	.81	10	20	55.0	7	23.0	19	9	15
XVIII.	Wetherby (Ribston Hall) ...	3.66	+ 2.08	1.02	18	12	...	...	...	...	...	...
XIX.	Skipton (Arneliffe)	10.40	+ 5.71	1.28	10	24	...	...	...	...	...	...
XX.	Hull (PearsonPark)	2.68	+ .88	.63	16	16	59.0	7	24.0	20	13	18
XXI.	Newcastle (Town Moor)	2.88	+ 1.48	.97	16	15	...	...	...	...	...	...
XXII.	Borrowdale (Seathwaite)....	25.91	+13.27	3.64	6	23	...	...	...	...	...	...
XXIII.	Cardiff (Ely).....	4.06	+ .87	.74	17	21	...	...	...	...	...	...
XXIV.	Haverfordwest	3.33	— .79	.62	17	22	53.1	8	21.1	21	6	10
XXV.	Aberystwith, Gogerddan.....	4.16	+ .90	.80	25	18	52.0	16	17.0	20	9	...
XXVI.	Llandudno.....	3.13	+ 1.21	.57	16	19	...	...	...	...	...	...
XXVII.	Cargen [Dumfries]	9.73	+ 6.08	1.52	16	22	53.4	7	24.0	14	6	...
XXVIII.	Jedburgh (Sunnyside).....	4.20	+ 2.69	.77	16	18	56.0	25	23.0	14	11	...
XXIX.	Old Cumnock .....	...	...	...	...	...	...	...	...	...	...	...
XXX.	Lochgilthead (Kilmory).....	11.74	+ 6.55	1.55	6	26	...	...	19.0	13	8	...
XXXI.	Mull (Quinish)	7.53	+ 2.06	.81	28	27	...	...	...	...	...	...
XXXII.	Loch Leven Sluices.....	9.20	+ 6.45	1.60	12	16	...	...	...	...	...	...
XXXIII.	Dundee (Eastern Necropolis)	4.45	+ 2.35	.85	16	22	54.0	7	22.4	1	9	...
XXXIV.	Braemar	5.68	+ 2.32	.85	28	23	49.2	6, 7	3.8	15	15	26
XXXV.	Aberdeen (Cranford)	2.91	— .00	.81	16	16	53.0	6	23.0	13	9	...
XXXVI.	Strathconan [Beaully]	12.19	+7.48	1.40	7	17	...	...	...	...	...	...
XXXVII.	Glencarron Lodge.....	14.93	— .00	1.85	11	26	49.4	6	13.9	14	12	...
XXXVIII.	Cawdor [Nairn]	5.11	+ 2.88	.89	6	23	...	...	...	...	...	...
XXXIX.	Dunrobin	5.23	+ 3.14	.95	11	19	51.2	4	21.8	15	9	...
XL.	S. Ronaldsay (Roeberry).....	3.25	+ .61	.85	11	23	49.0	6	28.0	11	10	...
XLI.	Darrynane Abbey.....	2.51	— .00	.43	15	23	...	...	...	...	...	...
XLII.	Waterford (Brook Lodge) ...	2.43	— 1.65	.48	27	19	54.0	7	24.0	21	5	...
XLIII.	O'Brienbridge (Ross)	4.06	— .00	.48	24	20	...	...	...	...	...	...
XLIV.	Carlow (Browne's Hill)	2.72	— .36	.46	28	22	...	...	...	...	...	...
XLV.	Dublin (FitzWilliam Square)	1.90	— .45	.36	10	16	58.6	7	31.6	1	2	10
XLVI.	Ballinasloe	4.69	+ 1.91	1.00	10	23	53.0	6a	33.0	1d	...	...
XLVII.	Clifden (Kylemore)	10.76	— .00	1.03	9	25	...	...	...	...	...	...
XLVIII.	Waringstown	2.81	+ .36	.79	10	17	56.0	1, 7	27.0	12e	9	11
XLIX.	Londonderry (Creggan Res.)..	5.59	+ 2.56	1.02	10	26	...	...	...	...	...	...
L.	Omagh (Edenfel)	5.18	+ 2.49	1.12	10	22	52.0	26	28.0	17	7	16

a And 7, 26. b And 21, 22. c And 20. d And 11, 18. e And 13.
+Shows that the fall was above the average; —that it was below it.

METEOROLOGICAL NOTES ON FEBRUARY, 1894.

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

ENGLAND.

STRATHFIELD TURGIS.—A showery month, but with about the average rainfall, and mild, with the exception of one or two cold periods, especially about the 21st and 22nd. From the 6th to the 11th, and from 25th to the close, the weather was very rough and unsettled. Hazel in flower on 1st.

ADDINGTON.—The month was noted for heavy wind storms, often lasting for a long time, particularly that of the 10th, 11th, and 12th. The rainfall on the 17th (0·68 in.) caused the brook to overflow the meadows, the first time for many months. A sharp spell of frost set in on the 19th, lasting four days, the ther. on grass falling to 15° on the 19th. Aurora on the 28th.

BURY ST. EDMUNDS.—A cold spell occurred from the 18th to the 24th, the rest of the month being mild. Very windy, especially at night. Fine aurora on the evening of the 28th. S on 28th.

NORWICH, BRUNDALL.—The first fortnight was very mild and boisterous, with scarcely any frost. Severe gales on the 6th, 7th, 10th, 11th, and 12th, that on the 11th being exceptionally violent. Max. temp. above 50° daily (with one exception) from 1st to 11th. The third week bright, but colder, with frosty mornings. The close of the month again stormy and mild. The earlier spring flowers quite as forward as in 1893. S on 28th, and bright white aurora in evening.

LANGTON HERRING.—With the exception of a cold snap from the 18th to the 23rd, the month was uniformly mild, the variations of temp. being very slight, and the mean at 9 a.m. 1°·2 above the average of 23 years. Temp. fell to 25° on the 19th, 21st, and 22nd, to 26° on the 20th, and to 27° on the 23rd, but on no other days was there frost. Fogs on the 5th, 6th, 9th, and 26th. Very high wind on the 11th.

TORQUAY, CARY GREEN.—Duration of sunshine 89 hours, or 8 hours in excess of the average. Mean temp. 44°·7, or 2°·3 above the average. Rainfall 1·05 inches less than the average.

POLAPIT TAMAR.—Gales or high winds on 6th, 7th, 9th, 10th, and 12th, and heavy gale at night, with H, on the 11th.

STROUD, UFFIELD.—S.W. gales on the 6th, 7th, 10th, and 11th.

WOOLSTASTON.—A very stormy month. The gale on the 11th was most destructive, wrecking chimneys, roofs, and ricks in all directions, and throwing down a large portion of a very fine church spire. A brilliant display of aurora occurred on the 23th from about 7 to 9 p.m. Gales on the 6th, 7th, and 23rd. Mean temp. 40°·4. S fell on the 12th and 17th.

ORLETON, TENBURY.—With the exception of 7 days from 18th to 24th inclusive, a fine, warm month; the first fortnight unusually so. A great gale occurred at night on the 11th, doing much damage. Fog on 15th and 22nd. Mean temp. rather more than two degrees above the average of 33 years.

LEICESTER, BARKEY.—A month of fine open weather, except from 17th to 24th. Hurricane on 11th. Mean temp. 39°·4. Grass has grown almost all through the winter. Water is still deficient.

MANCHESTER.—Slight fall of S on the 1st, followed by a week of fine weather. On the 11th a great storm of wind. Slight H showers on the 12th and 13th. Dense fog up to noon on the 22nd. Mean temp. 40°·9.

HULL, PEARSON PARK.—Stormy on the 6th, 7th, 10th, 11th, 12th, and 23rd.

SEATHWAITE.—Falls of R exceeding an inch occurred on 12 days, exceeding two inches on two days, and exceeding three inches on one day. S 1½ inches deep on 13th.

WALES.

HAVERFORDWEST.—The general characteristic of February was mildness and continuous wet, although the amount of R was not excessive. There was also

a constant succession of gales, some of them of great strength and long duration. From the 19th to the 23rd keen frost prevailed, which interposed a salutary check on the exuberant and precocious advance of vegetation. On 28th a splendid meteor was seen to N. at 7.20 p.m., and bright aurora from 7 to 8.30 p.m. Prevailing winds S., S.W. and N.W.

GOGERDDAN.—Very stormy throughout the month, with gales from the W. and N.W. Very little sunshine.

SCOTLAND.

CARGEN.—Another very stormy and unsettled month, the fluctuations in pressure being on several occasions very marked, on one occasion upwards of an inch in 24 hours. A good deal of damage was done to trees, &c., in the district. The R was excessive, being the heaviest recorded in February in the 34 years since observations commenced. On three days the fall exceeded an inch. On only three occasions during the above period has the amount of R been exceeded in any month. Extensive flooding and much damage has occurred in many parts of the district. The mean temp. of the month is a little over 1°·5 above the average. Sunshine little more than half the average duration. Heavy gale on the 11th, S showers on the 12th and 24th.

JEDBURGH.—The weather was most unsettled, extreme changes often occurred several times during the day. On high ground much S fell, and the distant hills were all white, but on lower lying ground it melted the day it fell. Still out-door work went on unchecked. High wind on 6th, 7th and 11th.

MULL, QUINISH.—A month of almost incessant gales from all quarters. Violent S squalls with T and L on 9th, 10th, 24th and 27th.

BRAEMAR.—Aurora on the 21st and 28th. L on the 26th, 27th and 28th.

ROEBERRY.—A very coarse month throughout, almost one continued gale from S.W. to W. Mean temp. 38°·2.

IRELAND.

O'BRIENSBRIDGE, ROSS.—S.W. gales were frequent during the month. A week of bright cold bracing weather occurred from 14th to 21st, the remainder of the month was wet. T and L on 27th.

DUBLIN.—An open, windy, showery month. Until the 14th and after the 22nd deep depressions passed in rapid succession north eastwards, causing strong S.W. and W. gales, and frequent falls of R, H and sleet. Conditions were, for the most part, anticyclonic from the 14th to the 22nd, so that fog and frost were prevalent in that central period of the month. The mean temp. (44°·9) was 2°·1 above the average. S or sleet fell on two days, and H on four days. Fogs occurred on eight days. High winds were noted on 17 days, reaching the force of a gale on eight. L on the 11th. Aurora on the 23rd and 25th.

EDENFEL.—Every concomitant of bad weather prevailed with but little intermission during the entire month. Extremely unsteady pressure, equally unsteady temp., though but little frost; gales, squalls, sleet, H and heavy drenching rains and winter L in daily and nightly succession. The total rainfall of the month and also of January was double the average, amounting for both to 11·82 in., the heaviest for at least 30 years.

SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

CCCXXXIX.]

APRIL, 1894.

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THE CLIMATE OF ODESSA.*

PROF. KLOSSOVSKY has not been so considerate towards his western friends as usual. If we remember correctly he generally prints his papers in Russian, *and* French or German, or gives an epitome in one of those languages. The present important paper is wholly in Russian, with the exception of half the title page, the table of contents, and the list of numerical tables. As our knowledge of the Russian language is extremely slight, we cannot give a critical notice, but will briefly indicate the scope of the work. Section I. describes the position of the observatory, and gives a list of observations made in the town from 1839 to 1892 (there appear to have been some 1820-30, but we do not see the results in the present paper). Section II. deals exhaustively with the temperature, especially as regards the period (1866-92) during which the observatory has been fully equipped, and also compares the values for Odessa with those for other places. For an obvious reason we do not say more respecting this section than that it has evidently been worked out with great care; some of the principal features will be found indicated in the table at the end of this notice. In Section III. Professor Klossovsky deals very similarly with rain, snow and hail—comparing the mean at Odessa (16·98 in.) with that at other stations, of which we may quote a few:—Astrakhan, 7·19 in.; Baku, 9·93 in.; Sevastopol, 15·15 in.; Archangel, 15·61 in., and Moscow, 21·11 in. Then he takes out the extreme fall in each month at Odessa; the wettest month being June, 1886, with 6·58 in., and the driest, September, 1892, absolutely rainless. As regards the yearly totals, he gives—

			Depth. in.		Ratio.
Wettest.....	1875	.....	24·62	.....	145
Mean	1866-92	.....	16·98	.....	100
Driest	1872	.....	9·39	.....	55

The wettest year agrees absolutely with the value assigned by Mr. Binnie and Mr. Symons; the driest year is, relatively to the mean, decidedly low.

Section IV. deals with humidity, cloud, fog, and evaporation—the

* Le Climat d'Odessa d'après les observations de l'observatoire Météorologique de l'Université Impériale d'Odessa, par A. Klossovsky. Odessa, Franzow, 1893. 4to, 72 pages, 1 plate.

last (we believe) as recorded by Wild's vaporimeter. The yearly totals are:—

1886	.....	in. 20·10	|	1890	.....	in. 23·36
1887	.....	23·55	|	1891	.....	25·95
1888	.....	18·63	|	1892	.....	27·06
1889	.....	incomplete.	|			

the average being 22·43 in.

Sections V. to VIII. deal respectively with barometric pressure, prevalent winds, the physical features of the Black Sea, and with terrestrial magnetism.

Mean and extreme values for Odessa (1866-92.)

Lat. 46° 28' 36" N. Lon. 30° 45' 33" E. Altitude 180 ft.

	TEMPERATURE IN SHADE.				RAINFALL.		CLLOUD.	HUMIDITY.
	Mean.	Max.	Min.	Range.	Depth. in.	Days.	Mean. 0-10.	Mean.
Jan...	26·4	54·9	— 8·3	63·2	1·00	7	7·6	89
Feb...	27·5	58·5	— 18·8	77·3	·81	7	7·1	86
March	36·0	69·8	— 0·4	70·2	1·29	9	6·9	82
April..	48·2	74·5	24·6	49·9	1·09	7	5·5	73
May...	61·0	93·6	34·2	59·4	1·39	8	4·7	67
June..	69·3	92·5	50·2	42·3	2·31	8	4·5	64
July...	73·4	95·4	53·6	41·8	1·92	7	3·8	61
Aug. ..	71·6	93·6	48·7	44·9	1·27	5	3·2	61
Sept...	63·0	89·6	33·4	56·2	1·36	5	3·7	67
Oct. ...	52·3	85·6	21·6	64·0	1·38	6	5·4	78
Nov. ...	41·5	66·2	9·9	56·3	1·61	9	7·3	84
Dec....	31·6	60·1	— 6·9	67·0	1·55	9	7·2	87
YEAR.	50·2	95·4	— 18·8	114·2	16·98	87	5·7	75

[NOTE.—The max. and min. are not from self-registering thermometers, but the extreme at any observation hour; the full range would therefore be greater.]

Yearly total Rainfall at Odessa, 1841-92.

Years.	Depth. in.	Years.	Depth. in.	Years.	Depth. in.	Years.	Depth. in.	Years.	Depth. in.
1840...	—	1850...13·46	1860...19·14	1870... 22·03	1880...18·21				
1841...	—	1851...12·04	1861...15·04	1871...15·21	1881...22·11				
1842...10·43	1852...16·73	1862... —	1872... 9·39	1882...17·71					
1843...14·82	1853...17·72	1863... —	1873... 9·44	1883...11·27					
1844...11·83	1854...15·18	1864... —	1874...17·68	1884...19·11					
1845...16·85	1855... —	1865... —	1875...24·62	1885...15·80					
1846...10·99	1856...14·92	1866... —	1876...19·26	1886...19·07					
1847...13·50	1857...11·93	1867...10·57	1877...22·34	1887...18·88					
1848...11·59	1858...19·92	1868... 9·99	1878...22·74	1888...18·10					
1849...17·62	1859... —	1869...15·95	1879...22·97	1889...20·75					
	13·45	15·24	14·14	18·57	18·10				
		Years.		in.					
		1890	.....	16·28				
		1891	.....	12·65				
		1892	.....	14·26				
				14·40					

[NOTE.—It will be seen that the total is not given for 1866, there being no record for January. As the other eleven months of that year were mostly very

dry, the mean in the previous table for the 27 years, 1866-92 (16·98 in.), is slightly (0·19 in.) less than the mean of the 26 years, 1867-92, which is 17·17 in. The early observations gave generally about three inches less than the later ones (possibly the gauge was higher above the ground), and there are small values in winter, which may indicate that at that time snow was not carefully measured.]

We have doubtless not done justice to the paper, but we have said enough to indicate what a mass of information it contains.

IRIDESCENCE ON THE ENGLISH LAKES.

To the Editor of the Meteorological Magazine.

SIR,—I observed a phenomenon yesterday which was strange to me and which may interest your readers.

I was on Windermere about 11 a.m. when I noticed on the surface of the water about a mile north of where I was, a narrow streak of light, brilliantly coloured in rainbow tints. It lay across the lake apparently in a straight line, the blue end towards the east, the red to the west, nearly extending to the shore on each side, but neither actually reaching it. The red end terminated somewhat abruptly. The blue was more elongated, and became fainter towards the extremity.

The sky was practically cloudless, but the atmosphere was slightly hazy, not enough, however, to prevent the further shore of the lake, about five miles distant, from being distinctly seen over and beyond the line of light.

The phenomenon lasted about ten minutes and then gradually faded away. There was not a breath of wind at the time.

I am, yours faithfully,

GEO. CREWDSON.

St. Mary's Vicarage, Windermere, March 30th, 1894.

The above account is very interesting. Some time since we investigated the Floating Island,* and Professor Meldola† explained the production of the gases which floated it. We now have another phenomenon, or perhaps two considering the widely different explanations. The first we reprint verbatim from the *Edinburgh New Phil. Journal* for July, 1853.

Singular Iridescent Phenomenon seen on Windermere Lake, October 24th, 1851.

By J. F. MILLER, Esq.

On the 24th inst. (October) a very remarkable iridescent appearance was seen on Windermere Lake by a gentleman (J. C. Mounsey, Sunderland), from whose written description I have gathered the following particulars:—

“The morning was very misty, and the barometer high (30·35 Whitehaven); between 10 and 11 a.m. the mist cleared off, the sky became cloudless, and the

* “The Floating Island in Derwentwater; its History and Mystery,” by G. J. Symons, F.R.S. 4to, cloth. Stanford, Cockspur-street.

† *Met. Mag.*, Nov., 1889.

air calm, the lake being of a glassy smoothness. At 11 we went on the lake, and, in about half an hour I observed brilliant prismatic colours on the water, near the shore, say half a mile or more distant, but no appearance of a bow. I rowed towards the spot, and in doing so, the colours increased in extent and brilliancy.

There were two bows, which resembled ordinary rainbows inverted; both were exceedingly brilliant at the extremities, and became gradually fainter as they receded from the shore.

“The outer bow came completely down to the boat, which appeared to prevent our seeing the crown of the arch; its extremities also proceeded from the shore, and its centre was apparently under the feet of the spectator. In both bows, the red was on the outside and the violet on the inside, and, in both, the light and colours were most brilliant and distinct at the extremities or points of convergence at the water's edge. I am certain there was no rainbow in the sky at the time, neither was there any solar halo or any other phenomenon in the air that I observed, of which this could be the reflection. I observed that wherever the prismatic phenomenon shewed itself, there was a sort of scum on the water, as if there was some fine dust or bubbles on the surface. I put my finger into the water and found it so dirty as to leave a distinct mark behind, which leads me to think that what I at first took to be small bubbles must have been some sort of dust. Whatever it was, it appeared to me to be the cause of the iridescence, as wherever it was lost the bows disappeared.

“The bows were visible about an hour, and in looking at them the sun was of course directly behind the spectator.

“The boatmen say they have sometimes (though very rarely) seen a similar phenomenon after the disappearance of a mist from the surface of the water.” At Whitehaven, the sky was also cloudless, but in the evening the air was misty.

Dr. Davy considers that the carbonaceous deposit or soot-like film, occasionally observed on the lakes of Westmoreland, is really of the nature of soot, derived from the adjoining manufacturing districts, wafted thither by the wind, and falling with the mist or light rain. The film burns in the same manner as soot, sinks when wet in water, imparts a brownish hue to transmitted light, and under the microscope, appears to be composed of particles more or less irregular in form, varying in size from 1-4000th to 1-1000th of an inch. Dr. D. further thinks that the precipitation is an ordinary, rather than an uncommon, occurrence here, as is shewn by the discoloration of the sheep of the country, especially after exposure for many months on the higher fells. Seen on the mountain pastures, or when driven into the lower meadows in the early spring, their coats are of so dark a hue, as to resemble closely those of their fellows fed in the most smoky precincts of our great towns; and on examination, the colouring matter staining the fleece, is found to be similar to that of the black film of the lakes and tarns, and in brief, it is essentially soot.*

J. F. MILLER.

Observatory, Whitehaven, April, 1853.

On a calm sunny autumn morning about 20 years ago we were rowing, or perhaps it would be the actual fact to say floating, on Derwentwater, when we suddenly noticed about a quarter of a mile to the north, a long line of intense prismatic colours on the surface of the lake, and stretching from W. to E. We kept our boat nearly

* Edinburgh Philosophical Journal for January, 1852, p. 64, and private letter from Dr. Davy.

stationary, and enjoyed the lovely colouring until, in about ten minutes, it faded away. The line of colour was much more intense than that of any rainbow, halo, or corona. We are not competent to decide the cause, but our impression was that, being nearly level with the water (which assuredly had no smoke upon it) the distant ripples were so foreshortened that they acted like the diamond ruling on a diffraction grating and broke up the bright sunlight into a natural spectrum.

We shall be glad if some of our readers will tell us whether this explanation is in accordance with the laws of optics, or if not, what is the true explanation. It seems to us that the Rev. G. Grewdson saw the same phenomenon as we did, but that Dr. Miller's was scum iridescence. —*Ed.*

SUNSPOTS AND AIR TEMPERATURE.

To the Editor of the Meteorological Magazine.

SIR,—I am glad that "W. E." has taken up this question, and I trust his re-presentation of the facts will be carefully considered. I may be permitted to at least doubt whether he has yet "probed the matter as completely as possible."

It occurred to me that some fresh light might be had by going through all the months of what we may call the "summer half" (April to September) concerned in this inquiry (414 in all), and seeing how many were above and how many below average.

The result is curious:—

(1.) *Minimum Sunspot division.*

	April.	May.	June.	July.	Aug.	Sept.	
a. Above average ...	15	20	19	11	17	18 = 100	} = 216
b. Below average ...	20	16	17	22	19	18 = 112	
Average	1	...	...	3	..	... = 4	

(2.) *Maximum Sunspot division.*

a. Above average ...	13	14	14	16	16	12 = 85	} = 198
b. Below average ...	19	17	19	17	17	21 = 110	
Average	1	2	...	...	...	... = 3

Thus there is a majority of months below average in the minimum division as well as in the maximum. But a majority of months below average also appears if we take the whole 130 years. On the other hand, it may be said, that the number of months *above* average in (1) is a somewhat larger proportion of the total in (1) than the number in (2) is of the total in (2); and the number *below* average in (2) a larger proportion of the total in (2) than is the case in (1); also that in (2) *all* the months show a greater number of cases below average than above; whereas in (1) this happens in only three months. But I do not lay stress on these things.

In seeking proof of an influence of the sunspot cycle on air temperature, it seemed to me that we might be more likely to find it, or might find it more pronounced in the summer half than in the other. "W. E." sees no reason for excluding the winter half, and it is

assumed, I rather think, that the effect on the two halves must be similar in kind, so that if, *e.g.*, we find a warmer summer half with sunspot minimum, we should then find also a milder winter half. Is this warranted? The weather-problem is a very complex one. What if we found the two halves to vary with *opposite* phases, so that about minimum sunspots (from whatever cause) they got further apart, while about maximum they drew nearer again? The contrast between the two being intensified about the time of minima. I am inclined to think there *is* something of this nature, and would now, with your permission, give some figures which seem to point that way.

Consider the mean temperature of the summer half and that of the winter half (by which latter will here be meant the first quarter plus the last quarter of each year, not the months October to March in two years.) We may first take Dr. Buchan's entire table, then the data since 1841 alone (of which, I suppose, we may feel more sure). Put down in one column the values for the minimum sunspot years; in another, those for the *first* year after minimum; in another, those for the *second*; then those for the *third*. Do the same with the maximum sunspot years, and take averages. (Those years are selected because of possible lagging effect.) In this way I find as follows:—

I. Summer half.

1. ENTIRE SERIES FROM 1763.

Average Monthly Temperature.

	Min. or Max. year.		1		2		3
a. Min. group.....	58 ^o ·24	...	58 ^o ·17	...	58 ^o ·06	...	58 ^o ·43
b. Max. group ...	57·29	...	57·62	...	57·61	...	58·18
Relation of a to b	+·95		+·55		+·45		+·25

2. SERIES FROM 1841.

a. Min. group.....	58·06	...	58·44	...	57·78	...	58·96
b. Max. group ...	57·20	...	57·90	...	57·52	...	57·40
Relation of a to b	+·86		+·54		+·26		+1·56

II. Winter half (first quarter and last quarter).

1. ENTIRE SERIES FROM 1763.

a. Min. group.....	42·08	...	42·42	...	42·08	...	42·36
b. Max. group ...	42·11	...	42·50	...	42·55	...	42·44
Relation of a to b	—·03		—·08		—·47		—·08

2. SERIES FROM 1841.

a. Min. group.....	41·78	...	41·72	...	41·78	...	41·72
b. Max. group ...	41·82	...	42·95	...	43·05	...	42·75
Relation of a to b	—·04		—1·23		—1·27		—1·03

We thus find in each case an excess in the summer half with sunspot minima, and a defect in the winter half.

Another view of the matter is this: consider the difference in mean temperature between the two halves since 1841. Smooth the series by means of five year averages. The resulting curve corres-

ponds very fairly with the sunspot curve, showing maxima in 1844 (sunspot min. 1843), in 1857 (min. 1856), in 1869 (min. 1867), in 1879 (min. 1878), and 1888 (min. 1889.)

To some minds, possibly, such opposite behaviour of the summer and winter halves might appear to tell against the idea of sunspot influence. I do not see why it should. Possibly, again, by some method of analysis like that he has applied, "W. E." might find what he would consider fatal differences. Such must be weighed with the evidence of the undivided series, and the consensus above shown. I would here merely remark on the lessened evidential value of half a numerical series of the kind we deal with, as compared with the whole. And the more you divide, the more weight you give to those accidental variations which it is our object in taking as long a series as possible to neutralise. Perhaps, after all, twelve sunspot waves are too few to give satisfactory results.

As to differences between max. and min. years being small, I would ask, Are we entitled, by the nature of the case, to expect large differences ?

Hoping I have not transgressed in the length of this letter,
I am, yours faithfully, A. B. M.

NOTE.—In a list of years of sunspot maxima given recently (*Mct. Mag.*, vol. xxviii., p. 151) is the year 1788. I have here substituted 1787, thus conforming to Wolf throughout (whose figures for those two years are very near each other—viz., 130.9 and 132.0.)

A ROUGH WINTER ON BEN NEVIS.

To the Editor of the Meteorological Magazine.

SIR,—The past winter has been so exceptionally wet and sunless over the more northern portion of the British Isles, that a summary of the meteorological conditions experienced at the Ben Nevis Observatory (4,407 feet above the level of the sea) may be of interest as showing how bad British weather can really be. We have extracted from the official returns in possession of the Scottish Meteorological Society the following particulars relative to rainfall and bright sunshine for the four months, November 15th, 1893, to March 14th, 1894—119 days in all :—

Rainfall (including melted snow)	104.39 ins.
No. of days .01 in. or more fell	110
" " 1.00 " " 	38
Total bright sunshine	23.7 hrs.
Sunless days	107

From November 22nd, 1893, to February 13th, 1894, the bright sunshine recorded amounted to only four hours, December being sunless, except for one hour on the 1st. The only fine day during the four months was February 14th, when eight hours sunshine was registered. Needless to say, the mountain was rarely free from mist during the above long period.

I am, yours very truly, R. C. MOSSMAN.
10, Blacket-place, Edinburgh, April 3rd.

THE AURORA OF FEBRUARY 28TH.

To The Editor of the Meteorological Magazine.

SIR,—On p. 21 Mr. Ryves suggests the possibility of computing the altitude of the aurora of the 28th ult., but unfortunately has himself not adopted the suggestion made in your magazine to secure synchronous observations, that is, of observing at the exact half-hours, see vol. vi., pp. 223, 224, and vol. xxvii, p. 121. He, however, describes the movement of the arches as steady, and if he is correct in that, then the omission will be of less consequence. In looking at my notes I find the statement that at 6.46 p.m. south of the main arch, which was always north of the Zenith, there were two partial ones; this looks promising for ascertaining the height, as Mr. Ryves also describes two; but unfortunately within two minutes later I observed there were three partial arches, and later on there continued to be at least three. I have not mentioned in my notes more than that; but as they were so imperfect, it was difficult at any moment to say how many there were—it is possible there might be more.

It is not unreasonable to suppose that the most southern arch seen here was also the most southern one that Mr. Ryves saw from Stoke, in which case it might be possible to calculate the heights; if he incline to do this, I will send him a copy of my observations, unless he prefer to accept the suggestion in the *Meteorological Magazine*, vol. xxvii, p. 122, for me to send both his and my observations to Dr. Veeder for his calculation.

T. W. BACKHOUSE.

Sunderland, March 21st, 1894.

To the Editor of the Meteorological Magazine.

SIR,—In my account of the aurora of Feb. 28th, which appeared in your Magazine for March, I find that the values of the westerly and southerly movements of the luminous bands are erroneously given. Through an inadvertence in transcribing the fair copy from the rough notes, jotted down during the occurrence of the aurora, the values of the two movements were transposed, and instead of "60° in 35 minutes S., and 10° in 20 minutes W.," should have been "60° in 35 minutes W., and 10° in 20 minutes S." The figures did not strike me as having any particular significance at the time, but it is interesting to find that when the resultant of the two movements is worked out, it gives a combined movement in a direction about at right angles to the magnetic meridian.

Another fine aurora was well observed here on the evening of Friday, March 30th. There were no luminous bands on this occasion, but in other respects the spectacle presented (between 10 and 11 p.m.) was as fine as on the 28th, if not finer. At 10.30 p.m., brilliant coloured streamers, shooting up from the main arc in the north, and diverging in the usual fan-like form, filled the whole of the northern sky, and at 10.35 extended some distance beyond a line cutting the zenith and reaching the E. and W. horizons.

G. T. RYVES, F.R.Met.Soc.

Team Vicarage, Stoke-on-Trent, April 4th, 1894.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday, March the 21st, at the Institution of Civil Engineers, Westminster, Mr. R. Inwards, F.R.A.S., President, in the chair.

Mr. H. C. Kiddle and Mr. S. R. Loweock, Assoc.M.Inst.C.E., were elected Fellows of the Society.

Mr. W. H. Dines read a paper on the "Relation between the Mean Quarterly Temperature and the Death Rate." The Registrar-General's quarterly returns for the whole of England since 1862, were taken by the author, and the number of deaths in each quarter expressed as a departure per thousand from that particular quarter's average; the value so obtained being placed side by side with the corresponding departure of the temperature at Greenwich from its mean value.

The Registrar-General's returns relate to the civil quarter (January-March, &c.), but the temperature was taken for the seasonal quarter (December-February, &c.), as the cause must precede the effect. Had the civil instead of the seasonal quarter been taken, the results would have been substantially the same.

In the winter quarter the rule seems to be that a cold winter is unhealthy and a warm winter healthy. Like signs occur together, that is a + with a +, or a - with a -, twelve times, and unlike signs sixteen times, the remaining four being instances in which an exact average value occurs, which cannot be called either *plus* or *minus*. Thus out of 28 winters we have 12 exceptions to the rule. The exceptionally mild winters of 1866 and 1883 were unhealthy, and those of 1863 and 1872 had an average death rate. The exceptionally cold winters of 1881 and 1893 were exceptionally healthy, and those of 1880, 1887, 1888 and 1891 had a nearly average rate. With the exception of 1813, 1891 seems to have been the coldest winter of this century, and the fact that such a winter had an average death rate proves that prolonged cold is not necessarily prejudicial to health. This is the more remarkable, for 1891 was notorious for the number of its fogs.

In the summer quarter there is a marked relation between the temperature and the death rate. A hot summer is always unhealthy and a cold summer healthy. We have 22 like signs occurring together and 7 unlike.

The two summers notorious for cold, viz. : 1862 and 1879, are the two healthiest summers in the list. The hottest summer, 1868, is also the most unhealthy. Marked instances of the rule occur in 1863, 1867, 1868, 1878, 1879, 1884, 1888, 1891, 1892, and 1893, each of these being an exceptional summer accompanied by an exceptional death rate.

The excessive mortality in a hot summer is partly caused by the deaths of children under 5 years of age by diarrhoea, but even if all returns from this disease were excluded, the rule given above would hold.

It does not seem possible to deduce from the figures even the semblance of any relation between the two quantities for the spring and autumn quarters.

Absence of daylight means the increased use of artificial light, and in as far as the contamination of the air is concerned, one common gas burner is equivalent to four or five adults. The way in which overcrowding affects the death rate is well known; and there can be little doubt that, with the utter indifference to proper ventilation that prevails, most of our population live in the winter in air that is greatly overcharged with carbonic acid. This is a possible explanation of the higher winter death rate, although it may perhaps be due to the direct absence of sunlight. The question is very important, for if my conclusion be correct, the general introduction of good ventilation, or the use of the electric light in the place of gas or lamps, would greatly reduce the rate; whereas, if it be due to temperature or absence of sunlight, it is clear that no human agency can alter it.

The paper was followed by a prolonged discussion.

Dr. C. Theodore Williams suggested (in a letter) that the results would be materially affected if, in addition to heat and cold, other elements of climate were discussed, and also that epidemics would mask the effect of weather.

Dr. Robert Barnes referred to the effect of moisture and to the unfavourableness of the winter for outdoor exercise, and enlarged upon the enormous importance of sunshine.

Dr. Buchan thought that a weekly comparison would give better results, mentioning the immediate effect of hot summer weather and of sudden changes in winter, and pointing out that raw cold, with a temp. about 32° , is most detrimental, while colder and drier weather is favourable. He also questioned the advisability of comparing periods which were not synchronous, as most diseases do not take a month to kill.

Mr. Brodie objected to the use of Greenwich temperatures for comparison with England generally, and to the use of non-synchronous periods.

Dr. Marcet referred to the extreme unhealthiness of temp. just above 32° , illustrating it by the exodus from mountain sanatoria when the snow melts; he also mentioned the great strain endured in such polar expeditions as Dr. Nansen's, where exposure to extreme cold is prolonged for several years.

Mr. Symons quoted the late Dr. Rae as a standing example of the prolonged extreme cold that could be borne with apparent immunity, and thought that the retardation of one month adopted by Mr. Dines between the temp. and death rate, was not at all too great to allow for the disease to run its course and the death to be registered.

Mr. Dines, in reply, said that he began a weekly comparison, but could get no result; that he found the maximum death rate from diarrhoea occurred three weeks after the maximum temp., and that therefore he considered a month not too long to allow for diseases

in general; that he took the Greenwich temperature as simplest, and believed that it gave fair results for England generally.

Mr. Dines also read a paper on the "Duration and lateral extent of Gusts of Wind, and the measurement of their Intensity."

The Royal Commission appointed to enquire into the Tay Bridge disaster, recommended that allowance should be made for an extreme wind pressure of 56 pounds per square foot, but it is thought by some engineers, well qualified to form an opinion, that such high pressures do not occur in England, though much higher pressures have been recorded, and the question is: How much reliance can be placed on the instruments?

The paper gives an account of experiments and observations made to answer this, and opens with the statement that the attempt to obtain a record of the mean pressure and also the maximum pressure by the same instrument is hopeless. A pressure plate was so arranged as to act equally on two exactly similar springs, one spring being free and the other loaded with a two pound weight. The difference in the records given by the two springs, being a measure of the effect of the inertia (or momentum) of the weight. A sudden jerk, the force not being sustained even for an instant, caused the unloaded spring to give a higher value, but the force being sustained even for a second, caused the loaded spring to give the higher value. In a table the results of the loaded spring were expressed as percentages of the unloaded, the former giving the higher values in 27 cases out of 33, while its highest value is 171 per cent., and its lowest 73 per cent.

It appears from the table that the heavier a plate is, the more likely it will be to give too high a value.

It is very probable that jerking of the pen and pen carriage is the true explanation of the enormous pressures that have been recorded. Bidston Observatory is famous for high pressures, and, if the traces given in the Tay Bridge Report are exact copies, the scale at Bidston is the closest, and consequently, if the pencil is jerked an inch or so too high, it will have more effect on that record than on others with a more open scale.

The difficulty of measuring a rapidly-varying quantity is not confined to meteorology, but in other branches of science the instruments used for this purpose are designed so as to be adapted for the work they have to do. The indicator diagram of a steam engine, for example, would not be of much value if the diagram were drawn by an apparatus similar to the ordinary recording pressure plate; yet the variations of wind force seem to be almost as rapid as the variations of the steam pressure in the cylinder of an engine.

(To be continued.)

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, OCTOBER, 1893.

STATIONS. <i>(Those in italics are South of the Equator.)</i>	Absolute.				Average.				Absolute.		Total Rain.		Aver. Cloud.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
England, London	66·3	16	30·9	31	59·3	44·9	45·3	80	106·3	27·2	3·87	16	5·2
Malta.....	91·4	2	56·8	27	78·8	65·5	60·7	71	144·6	51·0	3·30	7	2·9
<i>Cape of Good Hope</i> ...	80·9	10	40·2	21	67·8	51·5	54·0	77	...	...	2·01	10	5·0
<i>Mauritius</i>	79·7	29	59·0	...	77·2	66·2	61·0	72	132·4	50·7	...	...	6·1
Calcutta.....	90·2	3	70·2	31	86·3	74·8	75·2	86	153·3	65·0	7·34	8	4·1
Bombay.....	90·1	31	71·4	20	87·2	74·9	72·6	76	139·7	60·8	4·5	5	1·6
Ceylon, Colombo	88·0	28	72·3	8	85·5	74·8	69·7	72	155·0	67·0	5·59	20	4·2
<i>Melbourne</i>	84·8	8	41·8	11	67·1	50·8	49·3	75	134·8	35·3	3·42	12	6·1
<i>Adelaide</i>	100·0	26	41·5	21	72·4	51·3	48·0	60	153·6	34·6	1·29	12	5·1
<i>Sydney</i>	80·4	16	50·7	12	70·6	57·8	52·0	69	141·8	43·5	3·69	15	4·9
<i>Wellington</i>	71·8	16	45·0	1,6	64·3	52·7	50·2	74	139·0	32·0	2·31	9	4·5
<i>Auckland</i>	71·0	10	46·0	1	65·5	54·1	55·5	87	137·0	42·0	1·07	10	6·1
Jamaica, Kingston.....	91·2	16	65·8	9	87·4	72·2	72·6	86	...	...	9·54	15	5·0
Trinidad	92·0	1	68·0	1	89·7	70·5	73·8	84	170·0	67·0	5·47	11	...
Toronto	68·4	9	26·9	31	56·6	40·6	43·6	79	...	21·2	3·61	10	5·1
New Brunswick, Fredericton	73·0	13	21·2	31	57·3	38·5	42·8	79	...	...	3·18	10	4·7
Manitoba, Winnipeg British Columbia, Esquimalt.....	61·0	6	12·0	28	48·0	28·1	...	...	...	...	1·35	8	6·5
	58·6	26	29·7	23	53·4	41·5	45·2	91	...	...	4·61	20	7·0

REMARKS.

MALTA.—Adopted mean temp. 70°·6; mean hourly velocity of wind 8·0 miles. Thunderstorms on 5 days and lightning on 4 other days. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·6 below, of dew point 0°·7 below, and rainfall 71 in. below, their respective averages. Mean hourly velocity of wind 11·8 miles, or 0·4 mile above average; extremes, 26·4 on 12th and 17th and 1·7 on 4th; prevailing direction, E. C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—Lightning was seen on the 4th and 6th. Thunderstorms occurred on 5 days. D. G. MANTELL.

Melbourne.—Lightning on 6 days; thunder and lightning on 14th; Aurora on 10th. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean temp. 0°·1 below average. Absolute max. unusually high, only once exceeded (100°·5 in 1859) since the record began. Rainfall 59 in. below average. C. TODD, F.R.S.

Sydney.—Temperature 0°·9 above, and rainfall 74 in. above, the average. H. C. RUSSELL, F.R.S.

Wellington.—Fine weather up to the 12th, with pleasant variable winds. Very heavy rain on 12th; the remainder of the month generally showery, with intervals of fine weather. Prevailing winds N.W., strong during the middle of the month. Thunderstorm, with vivid lightning, on 21st. Mean temp. 4°·9 above, and rainfall 2·52 in. below, their averages. R. B. GORE.

Auckland.—An unusually fine and dry month, the total rainfall being less than one-third of the average. Barometrical pressure and mean temperature both considerably above the average. T. F. CHEESEMAN.

JAMAICA.—“Seasons” latter part of month—two inches over the average. Average velocity of wind 2·2 miles per hour. One great cyclone passed far N. of the Island on 9th. R. JOHNSTONE.

TRINIDAD.—Rainfall 1·20 in. below the 30 years' average. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,
MARCH, 1894.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			
II.	Dorking, Abinger Hall.	1·92	XI.	Rhayader, Nantgwilt..	6·51
„	Birchington, Thor	·74	„	Lake Vyrnwy	6·60
„	Hailsham	1·89	„	Corwen, Rhug	1·10
„	Ryde, Thornbrough	1·80	„	Carnarvon, Cocksidia ...	2·49
„	Emsworth, Redlands ...	1·57	„	I. of Man, Douglas	2·61
„	Alton, Ashdell.....	2·16	XII.	Stoneykirk, ArdwellHo.	·44
III.	Oxford, Magdalen Col...	1·52	„	New Galloway, Glenlee	3·95
„	Banbury, Bloxham	1·45	„	Melrose, Abbey Gate ..	1·75
„	Northampton, Sedgebrook	1·05	XIII.	N. Esk Res. [Penicuick]	3·70
„	Alconbury.....	·66	„	Ediuburgh, Blacket Pl..	1·71
„	Wisbech, Bank House..	·81	XIV.	Glasgow, Queen's Park.	3·37
IV.	Southend	·62	XV.	Inverary, Newtown	6·32
„	Harlow, Sheering	·43	„	Islay, Gruinart School..	2·09
„	Colchester, Lexden.....	·65	XVI.	Dollar.....	2·69
„	Rendlesham Hall	·85	„	Balquhidder, Stronvar..	7·55
„	Diss	1·02	„	Ballinluig	2·18
„	Swaffham	·93	„	Dalnaspidal H.R.S. ...	6·21
V.	Salisbury, Alderbury ...	1·59	XVII.	Kelso H.R.S.	·71
„	Bishop's Cannings	2·03	„	Forres H.R.S.	1·23
„	Blandford, Whatcombe.	2·11	XVIII.	Fearn, Lower Pitkerrie.	1·56
„	Ashburton, Holne Vic....	4·22	„	Loch Shiel, Glenaladale	9·46
„	Okehampton, Oaklands.	3·59	„	N. Uist, Loch Maddy ...	8·17
„	Hartland Abbey	2·77	„	Invergarry	8·33
„	Lynmouth, Glenthorne.	4·42	„	Aviemore H.R.S.	2·60
„	Probus, Lamellyn	1·91	„	Loch Ness, Drumnadrochit	4·34
„	W-llington, Sunnyside..	2·24	XIX.	Invershin	2·54
„	Wincanton,StowellRec.	1·74	„	Scourie	3·79
VI.	Clifton, Pembroke Road	2·73	„	Watten H.R.S.	1·33
„	Ross, The Graig	1·34	XX.	Dunmanway,Coolkelure	4·28
„	Wem, Clive Vicarage	1·29	„	Fermyon, Gas Works ...	1·78
„	Cheadle, The Heath Ho.	1·83	„	Killarney, Woodlawn ...	3·80
„	Worcester, Diglis Lock	·96	„	Tipperary, Henry Street	2·14
„	Coventry, Coundon	·98	„	Limerick, Kilcornan ...	1·89
VII.	Ketton Hall [Stamford]	·68	„	Ennis .....	...
„	Grantham, Stainby	·50	„	Miltown Malbay.....	2·60
„	Horncastle, Bucknall ...	·55	XXI.	Gorey, Courtown House	1·31
„	Worksop,Hodsck Priory	·54	„	Athlone, Twyford	2·13
VIII.	Neston, Hinderton	1·49	„	Mullingar, Belvedere ...	2·26
„	Lancaster, Rose Bank...	2·33	„	Longford, Currygrane...	2·41
„	Broughton-in-Furness..	2·94	XXII.	Galway, Queen's Coll...	3·99
IX.	Ripon, Mickley	2·17	„	Crossmolina, Enniscooe..	4·08
„	Scarborough,South Cliff	·96	„	Collooney, Markree Obs.	2·90
„	EastLayton[Darlington]	1·39	„	Ballinamore, Lawderdale	2·32
„	Middleton, Mickleton..	2·78	XXIII.	Lough Sheelin, Arley ..	1·94
X.	Haltwhistle, Unthank..	2·27	„	Warrenpoint	1·85
„	Bamburgh	·39	„	Seaforde	1·14
„	Keswick, The Beeches...	4·76	„	Belfast, Springfield	2·96
XI.	Llanfrechfa Grange	3·99	„	Bushmills, Dundarave...	2·15
„	Llandovery	4·61	„	Stewartstown	1·98
„	Castle Malgwyn	2·41	„	Buncrana	2·34
„	Builth, Abergwessin Vic.	8·29	„	LoughSwilly,Carrablagh	2·83

MARCH, 1894.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					TEMPERATURE.				No. of Night below 32°.	
		Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours		Days on which .01 or more fell.	Max.		Min.		In shade.	On grass.
				Dpth	Date		Deg.	Date	Deg.	Date		
I.	London (Camden Square) ...	1.19	-.42	.40	14	9	65.8	31	28.6	3	6	23
II.	Maidstone (Hunton Court)...	1.02	-.48	.22	14	10	...	...	...	...	...	...
III.	Strathfield Turgiss	1.32	-.27	.34	12	14	64.2	27	28.0	28	...	...
III.	Hitchin	1.07	-.27	.36	12	10	65.0	27	28.0	25 _g	14	...
IV.	Winslow (Addington)	1.58	-.14	.51	12	11	64.0	26 _a	28.0	5 _h	11	18
IV.	Bury St. Edmunds (Westley) ..	.80	-.75	.19	14	8	60.0	30	30.0	17	...	...
V.	Norwich (Brundall) .....	.81	...	.20	8	12	65.0	31	26.2	18	7	19
V.	Weymouth (Langton Herring) ..	1.13	-.77	.40	12	10	58.0	20	31.0	17	2	...
V.	Torquay (Cary Green)	1.62	...	.68	12	14	56.5	27	34.0	5	0	8
VI.	Polapit Tamar [Launceston]..	2.35	-.18	.82	12	13	68.0	27	33.5	18	0	17
VI.	Stroud (Upfield)	1.86	-.33	.89	12	12	63.0	30 _b	30.0	2, 4	6	...
VI.	Church Stretton (Woolstaston) ..	1.98	-.15	.60	12	15	63.0	26 _c	31.0	17	6	21
VI.	Tenbury (Orleton)	1.47	-.61	.46	12	12	66.7	26	26.0	18	15	19
VII.	Leicester (Barkby) .....	.89	-.32	.18	12	13	63.5	30	22.0	16	18	27
VII.	Boston .....	.45	-1.09	.15	11	7	73.0	27	25.0	17	11	...
VIII.	Hesley Hall [Tickhill] .....	.50	-1.40	.22	12	7	69.0	30	24.0	17	15	...
VIII.	Manchester (Plymouth Grove) ..	2.76	+.54	.61	12	13	69.0	27	25.0	16 _j	8	17
IX.	Wetherby (Ribston Hall) ..	1.60	-.46	.87	12	7	...	...	...	...	...	...
IX.	Skipton (Arncliffe)	7.45	+2.35	1.23	5	17	...	...	...	...	...	...
X.	Hull (Pearson Park) .....	.90	-1.15	.22	8, 12	11	61.0	31	25.0	17	11	21
X.	Newcastle (Town Moor) .....	.75	-1.88	.63	12	5	...	...	...	...	...	...
X.	Borrowdale (Seathwaite)	11.24	+.74	4.22	5	14	...	...	...	...	...	...
XI.	Cardiff (Ely)	4.31	+1.33	1.12	12	16	...	...	...	...	...	...
XI.	Haverfordwest	2.83	-.41	.67	13	14	59.2	31	26.0	17	10	18
XI.	Aberystwith, Gogerddan	3.27	+.29	.70	12	13	65.0	26	20.0	16	15	...
XI.	Llandudno	1.71	-.37	.42	12	14	67.5	27	32.0	17	1	...
XII.	Cargen [Dumfries]	2.01	-1.29	.56	5	11	65.6	27	26.0	17	10	...
XII.	Jedburgh (Sunnyside) .....	.92	-1.04	.30	12	6	...	...	25.0	16 _j	14	...
XIV.	Old Cunnock .....	...	...	...	...	...	...	...	...	...	...	...
XV.	Lochgilhead (Kilmory)	5.46	+1.00	1.08	7	15	...	...	25.0	15	8	...
XV.	Mull (Quinish)	5.14	+1.30	.92	5	18	...	...	...	...	...	...
XVI.	Loch Leven Sluices	3.40	+.43	.70	2	12	...	...	...	...	...	...
XVI.	Dundee (Easter Necropolis) ..	1.00	-1.40	.25	11	12	63.2	30	27.7	17	8	...
XVII.	Braemar	2.79	+.15	.55	5	13	60.0	23	20.3	17	19	27
XVII.	Aberdeen (Cranford) .....	.68	...	.32	7	7	57.0	22	28.0	16	11	...
XVII.	Strathconan [Beaully] .....	...	...	...	...	...	...	...	...	...	...	...
XVII.	Glencarron Lodge	9.39	...	1.62	5	18	63.5	26	26.6	16	...	...
XVII.	Cawdor [Nairn]	1.87	-.17	.43	1	14	...	...	...	...	...	...
XIX.	Dunrobin	1.97	-.28	.50	7	9	56.0	21	30.0	15	10	...
XIX.	S. Ronaldsay (Roeberry)	1.39	-1.15	.40	10	15	58.0	24	31.0	7 _k	5	...
XX.	Darrynane Abbey	2.97	...	.84	13	15	...	...	...	...	...	...
XX.	Waterford (Brook Lodge) ..	1.69	-1.21	.57	12	12	58.5	28	27.0	17	3	...
XX.	O'Briensbridge (Ross)	2.73	...	.41	5	13	...	...	...	...	...	...
XXI.	Carlow (Browne's Hill)	1.61	-.76	.31	12	13	...	...	...	...	...	...
XXI.	Dublin (Fitz William Square) ..	1.29	-.72	...	...	14	63.6	29	31.8	17	2	12
XXII.	Ballinasloe	2.51	-.12	.43	8	16	62.0	28 _d	33.0	23	0	...
XXII.	Clifden (Kylemore)	5.08	...	.96	7	18	...	...	...	...	...	...
XXIII.	Waringstown .....	.99	-1.36	.40	7	10	66.0	27 _e	29.0	16	15	20
XXIII.	Londonderry (Creggan Res.) ..	2.45	-.28	.37	10	16	...	...	...	...	...	...
XXIII.	Omagh (Edenfel)	3.08	+.57	.61	5	15	64.0	27 _f	29.0	16	7	24

a And 30, 31. b And 31. c And 27, 30. d And 29. e And 28, 29, 30. f And 28, 29. g And 26, 27. h And 18, 27. i And 26. j And 17. k And 11, 13, 14.

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

METEOROLOGICAL NOTES ON MARCH, 1894.

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

ENGLAND.

STRATHFIELD TURGISS.—A fine March, with frequent showers during the first half of the month, and very dry during the latter part, with frosts up to the end. Honey bee seen on 12th, thrushes' nest with 4 eggs on 16th. Nettle tortoiseshell butterfly flying on the 18th. Chiffchaff heard on 25th. Black-thorn in flower on 28th.

ADDINGTON.—The first half of the month was unsettled and showery, and a heavy R on the 12th caused the brook to overflow the meadows to a large extent for a short time. From the 15th until the end beautiful weather prevailed; the mornings were frequently foggy early, but afterwards very clear, with occasional slight frosts at night, not enough to injure the blossom on fruit trees, which is in a very advanced state. Fogs on 4th, 17th, 22nd, 23rd, 24th and 29th.

BURY ST. EDMUNDS.—A fine, dry, mild month, favourable for agriculture. Several misty mornings in the latter part of the month. Let us hope the old saying, "So many mists in March, so many frosts in May," will not come true this year. Fine aurora on the evening of the 30th.

NORWICH, BRUNDALL.—Another fine March, much resembling 1893. From March 17th to April 2nd absolutely rainless. Mean temp, $0^{\circ}5$ lower than March, 1893, and about 4° above the average. R for the first three months 1.75 in. deficient. Gales on 1st, 11th and 13th; H and T on the 4th, at 4 p.m.

LANGTON HERRING.—The unsettled weather of the last week of February continued until the 14th of March, after which, to the end of the month, followed a period of bright, sunny days, many of them cloudless. The absolute drought lasted 20 days, from March 14th to April 3rd. The mean temp. at 9 a.m. ($43^{\circ}8$) is $2^{\circ}4$ above the average of 23 years. On the 4th there was a H storm. A solar halo was observed on the 11th, followed by high wind on the 12th. It was very dark from 3 to 4 p.m. on the 20th. Fog on the morning of the 29th.

TORQUAY, CARY GREEN.—R during March 1.07 in. less than the average. Mean temp. $3^{\circ}2$ above the average. Amount of sunshine at Chapel Hill, 182 hours, or 20 hours above the average.

POLAPIT TAMAR.—The first fortnight was more than ordinarily wet; in fact, very wet; the last fortnight was very dry, with an unusual amount of sunshine, and much colder at night. Remarkable absence during the month of bleak east winds. Heavy gale from S. on 12th; fogs on 16th and 17th.

STROUD, UFFIELD.—S.W. gales on 1st, 11th and 12th.

WOOLSTASTON.—A fine month, but the nights were very cold; the last half was very dry. Mean temp. $43^{\circ}8$.

TENBURY, ORLETON.—A fine, dry month, with no R after the 15th, and mean temp. 3° above the average. Everything very forward; in fact, only about 4 days later than last year. Stone fruit and pears coming into blossom fast at the end of the month. Chiffchaff heard on 26th. Loud clap of T on 30th, and fine display of aurora the same evening. Fog on 3rd, 22nd and 29th.

LEICESTER, BARKBY.—The weather was very similar to that of last year: constant night frosts, days cloudless and hot, small rainfall; only if it continues it will be more disastrous, since it began with less R.

MANCHESTER.—The weather was cold and windy on the 2nd, 4th, 6th, 11th and 13th; from 17th to 22nd, bright and sunny; from 23rd to 26th and 28th, magnificent spring weather. Mean temp. $44^{\circ}5$. Slight H shower on 13th; thick fog till 10 a.m. on 27th, and foggy morning on 29th.

HULL, PEARSON PARK.—Showers of sleet on 13th and 14th; fogs on 21st, 24th, 26th, 28th, 29th and 30th.

SEATHWAITE.—S on the 13th; T and L on 31st, about 1 p.m.; heavy R on the 5th, 4.22 in.

WALES.

HAVERFORDWEST.—The first fifteen days of March were stormy and wet, like the preceding months, but on 16th a sudden change of wind to the eastward took place, and the weather became fine, with sharp night frosts, the lowest grass reading being 21° on 17th. The days were fine and the sky cloudless, with bright warm sunshine. Vegetation unusually forward; sycamore in leaf on the 23rd; chesnut ready to burst into leaf on the 26th; blackthorn in full blossom on the 25th. The hedges quite green, cherry and pear trees blossoming; everything earlier even than last year.

GOGERDDAN.—Bright sunshine during the last fortnight, with N.E. wind.

SCOTLAND.

CARGEN.—The first fourteen days were very stormy, and a severe gale was experienced on the night of 11th–12th. The remainder of the month was rainless and very fine, with light airs, principally from the N. and E. The mean temp. of the month was 3° above the average. The sudden changes in the temp. during the last half of the month were very marked. On several occasions the daily range was 30°, and on the 27th as much as 34°. On the 27th the max. temp. reached 65°·6; on only two occasions during the last 34 years has this temp. been somewhat exceeded in March. The mean max. temp. of the last 10 days of the month was 62°·1, the mean min. 32°·3, a difference of almost 30°. Vegetation far advanced. Primroses and other spring flowers 10 days to a fortnight earlier than usual. L on the 9th. H on 11th, 12th, and 14th.

JEDBURGH.—The weather during the month was marked by low temperature during the night, and much clear sunshine during the day. The latter half was singularly dry, and the sowing of cereals was done with great ease and comfort. Old farmers remark that for many years there has not been such a fine seed time. The low night temperature checked the growth of grass.

BRAEMAR.—The old adage holds good for this month, "In like a lion and out like a lamb." Ground in fine order for sowing. Amount of sunshine recorded, 199 hours. L on 1st.

ROEBERRY.—The first half of the month was coarse and unsettled, the latter half very fine. Mean temp. 42°·4.

IRELAND.

DARRYNANE ABBEY.—Constant R during the first half of the month, but the second half very fine, dry, and warm, with S.E. wind. Aurora on 30th between 9 and 10 p.m.

WATERFORD, BROOK LODGE.—Some S on the Comeraghs on the 13th and 17th. E. or S.E. winds during the whole of the latter half of the month. H on the 11th. Thick fog at night on 20th; dense fog on morning of 30th.

O'BRIENSBRIDGE, ROSS.—From the 14th to the end perfect weather, with full sunshine on all but one day; slight fog on some mornings. The first two weeks were very wild and wintry. Aurora of very wide extent in north-west at night on 30th. Very little frost.

DUBLIN.—Until the 15th the weather was unsettled, stormy, and showery; after that date absolute drought occurred, lasting until the close of the month. Solar halos were seen on the 12th and 16th. S or sleet fell on 11th, 12th, and 15th; H on 5 days; more or less fog on 10 days.

CLIFDEN, KYLEMORE.—Stormy on 3rd, 7th, and 9th; strong gale from S on 10th. Sleet on 11th, 12th, and 13th. The second half of the month fine and almost rainless.

LONDONDERRY, CREGGAN RESERVOIR.—S on 11th, 13th, and 14th.

EDENFEL.—The first 15 days of the month were a continuance of the persistently wet and inclement weather that had prevailed since the opening of the year, the R for that short period considerably exceeding the average for the month. Thence to the end there followed 16 days of "absolute drought," with cloudless skies and warm sun by day and very light night frosts, enabling the leeway in farm work to be made up under the most favourable conditions. Brilliant aurora on night of 30th.

SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

CCCXL.]

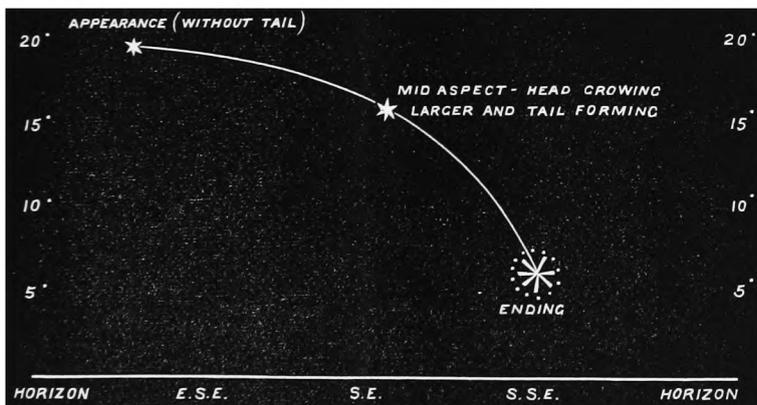
MAY, 1894.

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

A SPLENDID FIREBALL.

To the Editor of the Meteorological Magazine.

SIR,—Whilst walking home last evening at 7.37 p.m., with my son and nephew, we observed a grand meteor, or fireball. It was almost light at the time, and the phenomenon appeared to last at least five seconds. It commenced with the aspect of a large planet about E.S.E., and some 20 degrees above the horizon. The head then plunged downwards, and vanished about five degrees from the horizon. The tail formed a splendid curve about 15 degrees in length, and the head increased in size during its flight, until it was vastly larger than Venus and Jupiter together, and in fact even rivalled the full moon. But after attaining its maximum it disappeared suddenly. Had it been dark, as it was an hour later, the



scene would have been magnificent indeed. What struck us chiefly about the fireball was its rapid development and apparent proximity. It seemed to stand out from the sky, and did not appear to be more than a few miles distant. I shall be curious to know if this grand display was equally favourably observed by others, and especially those who are most interested in the matter. Our position at the time was three-quarters of a mile west of Chiddingfold village, and on high ground.—Yours faithfully,

A. F. PARBURY.

Chiddingfold, Surrey, 23rd April, 1894.

VOL. XXIX.

E

The following are other notes of the same meteor :—

LONDON.—On April 22nd, 7.35 p.m., during twilight, I observed a large meteorite, or fireball about 70° above the horizon, and travelling downwards towards the eastern horizon near to where the sun rises. It was in view for about five seconds, was pear-shaped and of a pale green colour, followed by a train of sparks. No stars were visible in the vicinity. If the sky had been dark and cloudless it would probably have been a conspicuous object in the heavens.—C. PHILLIPS, 125, Ossulton-street, Euston-road.—*English Mechanic*.

REDHILL, SURREY.—This evening, when my wife and I were out walking near Redhill, we saw a remarkable meteor. Appearing near the meridian, it descended vertically towards the south-western horizon. At first of a brilliant white, it gradually changed to a pale green colour, and finally, when near the earth—apparently, it dispersed into several fragments, each of a bright red. The duration of the phenomenon was about four seconds, and the time 7.35 p.m.—D. W. B., April 22nd.—*Standard*.

GUILDFORD, SURREY.—A brilliant sight was observed here to-day. In bright daylight at 7.35, I saw a very large meteor fall in the east of the heavens in direct line to the earth, leaving behind a magnificent train of blue. After travelling to within apparently a very short distance of the earth, it broke into three pieces, something like the bursting of a sky-rocket, the lower portion being about the size of a breakfast cup. The sight was the more remarkable there being no other star visible in the clear light of the day.—ARTHUR ALLEN.—*Surrey Times*.

HASLEMERE, SURREY.—Yesterday evening, Sunday, April 22nd, a very fine meteor was seen to traverse the sky from near the zenith to near the horizon, in an easterly or south-easterly direction. It is reported to me as having appeared about 7.25 p.m., when twilight was strong, and before any stars had come out. It threw off sparks like a rocket, and was followed by a bright train. No noise was heard after the explosion.—ROLLO RUSSELL.—*Nature*.

RAMSGATE, KENT.—A very brilliant meteor was seen here about 7.20 p.m., April 22nd. It was of considerable size, much larger than Venus at her brightest, having the appearance of a very large rocket. Its colour was of a brilliant white at first, afterwards changing to blue and violet. It left a slight trail, which did not last. Time about three seconds. There was not the slightest noise. It appeared to come from the North-West.—DEIMOS.—*English Mechanic*.

WARMINSTER, WILTSHIRE.—I was fortunate enough to witness the splendid meteor of Sunday, about which your correspondents at Southampton and Guildford have written. I was driving back to Warminster from a neighbouring village church, when in full daylight, in a sky of the clearest blue, the meteor appeared, like an immense rocket. The direction seemed to be north-west to south-east, and the large star-shaped body, brilliant as the electric light,

slowly descended and disappeared without a sound. It must have been a powerful celestial phenomenon to be seen under the conditions prevailing. The time was 7.34 p.m.—J. F. WELSH, April 24th.

We have received letters from correspondents at Hampstead, Lee, Southend, Gravesend and Horsham, which describe the brilliant meteor on Sunday night. In all these places it was seen at the same time (7.35), and with the same effects.—*Daily News*.

[We have not yet seen any calculation of the path of this meteor, but apparently it was passing from N. to S., over the southern portion of the North Sea, or perhaps over Belgium.—ED. M.M.]

ROYAL METEOROLOGICAL SOCIETY.

(Continued from page 43.)

The momentum of the plate itself, probably often adds 30 to 50 per cent. to the real pressure, and the sudden jerk transmitted through the chain or wire, often brings the pen or pencil another 50 per cent. above its proper place. Mr. Ellis has told us how substituting a flexible chain for a wire reduced the Greenwich pressure, and it is not unreasonable to suppose that if the chain also had been done away with, and the clock and drum placed close behind the plate, a still greater reduction might have been produced.

The pressure plate is a useful anemometer and gives very interesting results, including a perfectly accurate mean pressure. If it were provided with a rack and catch, so that it could not oscillate, and once driven back by the wind could not return until set by the observer, the record of the mean would be lost, but the record of the maximum would be reliable.

For obtaining information as to the duration of gusts the tube anemometer was used.

Two similar glass tubes were obtained and bent to exactly the same curve. They were partly filled with coloured paraffin oil and fixed on a frame side by side touching each other, with a velocity scale underneath. The ends of the tubes being connected with the head of the anemometer, the two columns of oil moved up and down together, registering exactly the same maximum velocity for each gust of wind. A piece of tube of $\frac{1}{32}$ in. bore and about 3 inches long was then inserted between one tube and the head, the other being left as before. The maximum velocities recorded for the same gust by these two tubes were given in a table.

The average difference is 4 miles per hour, the greatest 10 miles at a velocity of 43 miles per hour, and the least difference 0 mile, the higher velocity of course being recorded by the free tube.

It was found by experiment that the sudden application of a pressure corresponding to 40 miles per hour, the tubes then indicating zero velocity, produced the following effects:—

The liquid in the open tube rose to 43—44, owing chiefly to its momentum, but partly because some little of it remained sticking to

the glass, there not being time for it to settle to its true level. The liquid in the contracted tube rose steadily, it never exceeded the 40 miles per hour, but took from 5 to 6 seconds to reach that value.

We do not know how the gusts rise, so we cannot immitate them artificially, but during a gale in which the maximum velocity, as registered by the open tube, is about 60, the minimum will not as a rule fall below 20.

It appears that the extreme force of the wind is hardly ever maintained steadily for five seconds. If it were the two tubes would give maxima much nearer together. Also, since the contracted tube never falls so low as the other, it has not so far to rise, and would not take nearly five seconds to reach its maximum; hence it appears that a gust seldom maintains its full force for more than one or two seconds.

The same two glass indicating tubes were used to determine as far as possible the lateral extent of gusts. Neither of them was contracted, and they were connected with two separate but exactly similar anemometers, placed at the same height, viz. 18 ft. above the top of the house, but 11 ft. apart.

Even at so short a distance the extreme force is sometimes very different, and during a storm the liquid in one tube may be seen rising while that in the other is falling. One anemometer is S.E. of the other, and with a S.E. wind the two columns of liquid often move together as though rigidly connected. From this it appears that the extreme velocity mostly occurs in lines roughly parallel to the direction of the wind.

Mr. Airy, C.E., agreed that it is hopeless to get the maximum and mean by the same instrument, and that the Osler anemometer gives too high a maximum, though the mean may be correct, but to engineers the maximum is the more important value. A pressure plate kept face to the wind by a vane, when struck by a gust swings away and oscillates so that it never faces the wind.

At the Forth bridge in addition to an ordinary free pressure plate a second plate was fixed facing the direction of the frequent S.W. gales, and this gave a higher maximum than the free plate, owing to the oscillation referred to. A large plate 20 ft. by 15 ft. was also erected and gave results one third lower than the small plate. He considered that the duration of the extreme velocity in gusts was less than one second. In reply to Mr. Munro he said that the weight per square foot was much greater in the large plate than in the small one but he could not give the values.

Mr. R. H. Curtis remarked that the smaller pressure on a large plate was born out by experiments which he had made and communicated to the society some years since. He thought that the results as to the extension of squalls were affected by the inland position, and by the proximity of the house and of trees. The duration of squalls also was at times greater than that given in the paper as he had records of the extreme velocity lasting four seconds.

Mr. Dines, in reply, said that a plate which oscillates would never give the true maximum, but he had shown in a paper read before the Royal Society that the pressure on a plate might be greater when it was not at right angles to the wind. The experiments bore out his statement that gusts do not as a rule last one second, but that they did sometimes last as much as 4 seconds as mentioned by Mr. Curtis.

Mr. R. H. Scott, F.R.S., exhibited a diagram showing some remarkably sudden changes of the barometer in the Hebrides on February 23rd, 1894. At 8 a.m. the reading at Stornoway was 29.39 ins., being a fall of 0.73 in. since the previous day, and at 6 p.m. the reading was 28.58 ins. From the trace of the self-recording aneroid it appears that the minimum, 28.50 ins. occurred about 5.30 p.m., and that the fall during the half-hour preceding the minimum was nearly 0.20 in., the rise after the minimum being nearly as rapid.

The other paper read was "On the Calculation of Photographic Cloud Measurements," by Dr. K. G. Olsson.

At the meeting of this Society held on Wednesday evening, April 18th, at the Institution of Civil Engineers, Great George Street, Westminster, Mr. Richard Inwards, F.R.A.S., the President, delivered an address on some phenomena of the upper air. He said that there are three principal ways in which the higher atmosphere may be studied. First, by living in it on some of the great mountain chains which pierce many miles into the air in various parts of the globe; second, by ascending into it by means of balloons; and third, by the study of the upper currents as shown to our sight by the movements of the clouds.

After describing the effects of rarefied air on animal life and natural phenomena, Mr. Inwards proceeded to give an account of various balloon ascents which had been undertaken with the object of making meteorological observations. In 1850 Messrs. Barral and Bixio, when they had ascended to 20,000 feet, found the temperature had sunk to 15° Fahr., but this was in a cloud, and on emerging from this, 3,000 feet higher, the temperature fell as low as —38°, or 70° below freezing point. In 1862 Mr. Glaisher and Mr. Coxwell made their famous ascent, when they reached an altitude of about seven miles from the earth. A short time ago a balloon without an aeronaut, but having a set of self-recording instruments attached, was sent up in France, and from the records obtained it is shown that a height of about ten miles was attained and that the temperature fell to —104° Fahr. (136° below freezing point).

Clouds are simply a form of water made visible by the cooling of the air, which previously held the water in the form of invisible vapour. Cumulus clouds may be regarded as the tops of invisible warm columns or currents thrusting their way into a colder body of air.

After referring to the various classifications and nomenclatures of clouds, of which that proposed by Luke Howard in 1803 is still in general use. Mr. Inwards said that whatever system of naming and classifying clouds be adopted, it should depend on the heights of the various clouds in the air, and he gave a few rough rules by which the comparative altitudes of the clouds may be judged when there is no time or opportunity to make exact measurements. Among the indications by which a cloud's height may be gathered are its form and outline, its shade or shadow, its apparent size and movement, its perspective effect, and the length of time it remains directly illuminated after sunset. By the last method some clouds have been estimated to have been at least ten miles above the surface of the earth. The cloud velocities at high altitudes have been carefully noted at the Blue Hill Observatory, Mass., U.S.A., and show practically that at about five miles height the movement is three times as fast in the summer and six times in the winter as compared with the currents on the earth's surface.

After showing a number of lantern slides illustrating the various types and forms of clouds, the Aurora Borealis, and rainbow, Mr. Inwards concluded his address by urging the desirability of establishing a good cloud observatory somewhere in the British Isles.

At the close of the meeting the Fellows and their friends inspected the exhibition of instruments, photographs, and drawings relating to the representation and measurement of clouds, which had been arranged in the rooms of the Institution. A lantern display of slides showing cloud effects and other meteorological phenomena was also given.

The number of entries in the catalogue was 135, but as many of the entries included groups of objects, the total number of photographs and pieces of apparatus must have exceeded 500. We can, therefore, mention only a small proportion of the exhibits.

Among the apparatus were various patterns of cloud mirrors, nephoscopes, theodolites, and cameras, for ascertaining the direction in which clouds move, their velocity, and their altitude.

The photographs of clouds were indisputably finer and more numerous than had ever before been gathered under one roof, as will be readily proved by the following list of exhibitors:—

Acres, B.	Gaster, F.	Saunders, Col.
Angot, A.	Hall, A. D.	Singer, K.
Clayden, A. W.	Maclear, Adm.	Smart, F. G.
Cohen, L.	Manucci, Sig.	Sprung, A.
Davis, H. E.	Raymond, G.	Stroh, A.
Drewitt, F.	Riggenbach, A.	White, T. C.
Garnier, P.	Russell, H. C.	Wilson-Barker, Capt.

The exhibit which excited the greatest interest was a portrait of Luke Howard, taken about 1843, when the Father of English Meteorology was slightly over 70, and two original sketches of

clouds drawn by him, all lent by Mr. W. Dillworth Howard. There were copies of all the editions of Howard's "Essay on Clouds," including (very appropriately) Prof. Hellmann's reprint of the rare first edition, which was published only a few days before the exhibition; and there was a large (but not perfect) collection of engravings of clouds in various publications dating from 1722 to the present year.

The "Miscellaneous" and "New Instruments" exhibits included barometers, thermometers, anemometers, and sketches and photographs of Mr. Rotch's Pole Star recorder, of lightning, solar halos, hoar frost and auroræ, of damage by hail and by waterspouts.

On the whole, the Society is to be congratulated on an excellent exhibition, and on the good catalogue, which was ready on the opening day and distributed gratuitously to every visitor.

A BOLIDE OVER CENTRAL ENGLAND.

To the Editor of the Meteorological Magazine.

SIR,—With reference to the correspondence on the above subject, which appeared in the *Met. Mag.*, vol. xxii., pp. 161, 177, it may interest your readers to know of a paper by Prof. Tomlinson, F.R.S., on "Aerolites and Bolides," and of discussion thereon, in *Notes and Queries*, October 22nd, November 26th, December 24th, 1892, pp. 321, 438, 512. —Yours truly,

FRED. COVENTRY.

The Holmes, Ketton, Stamford, April 21st, 1894.

[We wrote the head-line of the above letter as it now stands; the printer sent the proof headed "A BOLIS;" we reverted to Bolide, never having seen or heard of a Bolis. The printer referred us to the Dictionary, and there we are astonished to find:—

"BOLIS. A fireball darting through the air, followed by a train of light or sparks."

"BOLIDES. Plural of Bolis."

There is no doubt that the printer and the dictionary are right, because on turning to the origin, it is the Greek *Βολις*, a missile weapon, and in the plural *Βολιδες*, used occasionally to express *flashes of lightning*. Can any one quote even one passage containing the words "A Bolis?" We could quote many with a "A Bolide."—
ED. M.M.]

RAINFALL IN NATAL.

IN recent numbers we have been able to give some information as to the rainfall of the colony of Natal; and we have just received a number of the *Natal Farmer*, which contains a rainfall table for January, 1894, so good, that we reprint it as an indication of the organization now existing in the Colony, and in the hope that we may obtain full particulars both for the past and the future. It is curious that the table bears no signature.

Weather Reports.—January.

	Rainfall in inches.	No. of days Rain fell.	Heaviest Rainfall in one day.	Temperature.	
				Max.	Min.
Underberg	7·79	11	Jan. 5 ... 2·01	°	°
Ladysmith	5·86	15	...	...	...
Dundee	7·38	12	„ 2, 3 ...	91	60
Estcourt	7·81	14	„ 18 ... 2·18	87	56
Little Tugela .....	...	...	...	...	...
Mooi River	8·08	12	„ 2 ... 1·64	84	52
Gourton	9·98	13	„ 10 ... 2·05	95	63
Karkloof	10·08	14	„ 31 ... 1·70	90	56
Balgowan	7·11	16	„ 31 ... 1·35	80	50
Howick (Everdon)	5·73	18	„ 2 ... 1·46	88	52
Adamshurst	6·72	17	„ 3, 31 ... 1·32	90	55
Hilton	5·78	15	„ 2 ... 1·6	88	51
Newcastle	5·09	6	„ 21, 25 ... 2·50	...	...
Botanic Gardens, Pietermaritzburg	8·87	12	„ 25 ... 1·86	91	55
Town Bush Valley	8·70	16	„ 2 ... 1·79	...	...
Boston	13·14	17	„ 2 ... 8·02	83	42
Byrne	6·21	17	„ 21 ... 1·38	98	50
Richmond Village	4·16	18	„ 24 ... 1·42	90	51
Richmond	3·10	10	„ 2 ... 62	91	53
Umzinto	2·86	9	„ 25 ... 1·96	95	61
Ifafa .....	...	...	...	...	...
Lower Umcomas	1·82	5	„ 24 ... 1·23	...	...
Bellair	1·76	...	...	...	...
Malvern	2·34	12	„ 25 ... 90	...	...
Umbilo Water Works	2·45	9	„ 20 ... 55	92	64
Durban Observatory	1·72	11	...	...	...
Verulam, Redcliffe	3·75	7	„ 25 ... 1·43	97	64
Verulam Village	1·64	7	„ 25 ... 67	97	61
Tongaat Mouth	2·39	7	„ 25 ... 75	92	66
Nonoti (Sea)	2·36	7	„ 24, 25 ... 1·06	...	...
„ (Clifton) .....	...	...	...	...	...
Ottawa	1·41	7	„ 3 ... 39	...	...
Stanger	2·03	4	„ 25 ... 1·27	106	58
Port Shepstone	3·17	9	„ 23 ... 2·35	87	61
Ixopo	3·90	10	„ 24 ... 1·12	88	52
Greytown	7·03	...	„ 19 ... 1·07	86	56
Umzinto	3·21	9	„ 25 ... 2·03	...	...
Clairmont	1·73	8	„ 27 ... 60	...	...
Equeefa	3·43	9	„ 24 ... 2·26	...	...
Mount Edgecombe	1·80	8	„ 24 ... 45	91	63
Vaal River	2·51	9	...	...	...
Polela	12·68	17	„ 2 ... 2·63	90	45

It will be noticed that Umzinto appears twice in the above table, as the 20th and as the 37th station. The differences and yet general accord induces the belief that there are two stations in the town, but if so, we do not understand why the entries are so far apart.

THE OAK AND THE ASH.

In the *Meteorological Magazine* for August and September, 1889, there were two long notes upon the old proverbs indicating the character of the season as shown by the priority of leafing of the oak and of the ash. The subject seems to have been again discussed in some of the daily newspapers, and the following note which we reprint from the *Journal of Horticulture*, may, perhaps, be accepted as a last word. The letter might have been more tersely expressed, but evidently the writer (like several of those in our previous numbers) lays great stress on the fact that inferences must not be based upon the leafage or non-leafage of single trees:—

OAK v. ASH SINCE THE BATTLE OF WATERLOO.—Mr. J. Roger Dutton, Reading, writes as follows in reference to the controversy regarding the Oak v. Ash which has been going on in the daily press:—"Now that the Oak and Ash are both out (although it will be fully ten days before an Ash attains that stage) we have the record of another spring to add to bygone years, and I think that I am in a position to answer the various points mooted during the past few weeks with reference to 'Oak and Ash.' I have before me a record as to both of these trees (applicable to several counties) for seventy-nine years—*i.e.*, since the Battle of Waterloo—the first fifty-six obtained from one who 'faithfully annotated' during the time, the last twenty-three carefully entered each year by myself. From this it appears that since the Battle of Waterloo the Ash has been out before the Oak only twelve times, and that 1859, or thirty-five years ago, was the last occasion. As I can confidently assert that the Oak has had priority ever since I kept a record, I am almost rash enough to question even the twelve years referred to, and for this reason. Some days ago I saw my first Ash in leaf. In the same hedgerow were two Oaks not yet out, and a casual observer of these would confidently assert that 'in 1894 the Ash was out before the Oak,' whereas the fact is that the Oak was out ten days previously, as on April 14th I wore in my hat a sprig with leaves fully expanded, taken by myself from a full grown Oak. This is the earliest year for the Oak, and the earliest but one for the Ash, in my record. We forget that there are early and late Oaks and Ashes, as there are early and late potatoes; and though it is possible occasionally, but very seldom, to find an early Ash out before a late Oak, I contend that in the same year there has been an early Oak out before the earliest Ash. If, however, in our forefathers' time it was not uncommon to see the Ash out before the Oak (and the old adage seems to assure us of this), may not the extensive drainage and culture of the last sixty years have had some effect in retarding the Ash or in advancing the Oak? As the Oak has undoubtedly been out first for at least thirty-five years, and we have had seasons of 'soak,' as well as of 'splash' only, I contend that the old adage is now valueless."—*Journal of Horticulture*, May 3rd, 1894.

REVIEWS.

Neudrucke von Schriften und Karten ueber Meteorologie und Erdmagnetismus herausgegeben von PROF. DR. HELLMANN.

No. 3. LUKE HOWARD.—*On the Modifications of Clouds.* London, 1803. Berlin [and London], A. Asher & Co., 1894, 4to., ix.—32 pages, three plates.

In our number for June, 1893, we reported under the heading, "New Issue of Old Meteorological Books," the publication of Nos. 1 and 2 of Dr. Hellmann's reprints. We have now the pleasure of announcing the receipt of No. 3, which in all respects maintains the excellencies of its precursors; in type, in plates, in paper, and in printing nothing could be better.

This leaves only two points open to consideration (1) the desirability of the reproduction, (2) the scientific and bibliographical value of the introductory notes.

Howard's system of cloud classification was first placed before the world in the *Philosophical Magazine* for July, September and October, 1803, and in a few copies of the three papers which Luke Howard had separately printed for private distribution. These separate copies form the first edition of his essay, "On the Modifications of Clouds," and are excessively scarce. We know of only two. Howard's system is the only one universally known to meteorologists, and even if a new classification ever be agreed to, we feel sure that Nimbus and Cumulus will survive, and will not improbably last as long as there are any clouds to be seen, or human beings to see them.

As regards Dr. Hellmann's notes, they are worthy of him, which is saying enough, for it proves that they are clear, to the point, and accurate. Those who can read German will find all attainable information respecting the work, and all who can read English can have for a few shillings that which pounds would not otherwise procure, a verbatim and facsimile reproduction of the first edition of Howard's clouds.

Elementary Meteorology, by WILLIAM MORRIS DAVIS, Professor of Physical Geography in Harvard College, Boston (U.S.A.) Ginn and Co, 1894; large 8vo., xii.—355 pages, 108 engravings and 6 charts.

IT is impossible to give in a limited space full notice of this important work. If asked to define by a single word its leading characteristic, we should say "solidity"; it bears on almost every page indication of its having been written with great care by a physicist and a teacher, and *per contra* there are several statements and omissions which lead us to think that Prof. Davis is not in the habit of personally making or reducing meteorological observations.

We are not sure of the appropriateness of the word "elementary"; of course it is merely a matter of opinion, and by calling it "elementary," it may be lifted beyond criticism, and all who cannot understand every sentence, must consider themselves unable to learn even the rudiments of meteorology. The book is intended for use in "the later years of a high-school course, or in the earlier years of college study," and we at once admit the soundness of the lessons it contains, but it seems to us written in a needlessly formal manner. Here for example are the opening sentences of

"197. *Decreased rate of adiabatic change of temperature in cloudy air.*—We must return now to examine the effect of the liberation of latent heat in ascending currents of air when cloud-making has begun, and of the reverse process in descending cloudy currents.

"The retardation of nocturnal cooling when latent heat is liberated in the formation of dew or frost has been explained in section 182. In that case the liberated energy passed away as terrestrial radiation into space, without doing any work on the earth. In the problem now before us, the liberated latent heat of an ascending, expanding current is applied to aiding in the work of pushing away the surrounding air; the heat of the ascending current is therefore drawn upon more slowly to do its share in this work, and hence the fall of temperature in the ascending air is retarded. This process is of wide application, and must be carefully considered."

It is characteristic of this work—strong in theory, weak as to instruments, that the above reference to terrestrial radiation induced us to search for the description of a "grass minimum" or of its precursor the "min. in focus of a parabolic reflector," and we can find neither. So again with solar radiation, we have the description of the "black bulb" in vacuo, but no reference to its companion "bright bulb" in vacuo.

We mention the point with reluctance, because we know that Professor Davis has the advancement of meteorology at heart, and because it is evident that both he and his publishers have taken great pains to produce a first-class text book—and we do not say that they have not succeeded—the work indisputably contains a vast amount of information given in clear and unmistakable language. It has an accurate and copious index (probably more than 1,000 entries), and while we demur to its being an elementary book, we think that (except as to instruments) there is no one book in the English language which would be more useful for reference in case of any dispute as to the accepted causes and rationale of meteorological phenomena.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, NOVEMBER, 1893.

STATIONS. <i>(Those in italics are South of the Equator.)</i>	Absolute.				Average.				Absolute.		Total Rain.		Aver. Cloud.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
England, London	59·8	3	27·8	1	47·9	36·0	37·5	85	83·0	24·4	2·17	15	7·3
Malta.....	80·0	1	53·0	26	71·5	61·0	56·1	74	127·2	48·1	3·37	9	6·5
<i>Cape of Good Hope</i> ...	89·2	25	45·2	1	74·1	55·9	58·2	82	...	...	·23	2	3·6
<i>Mauritius</i>	80·5	4, 30	63·2	11	78·7	66·9	61·2	70	137·6	52·8	1·78	17	5·6
Calcutta	84·0	1	58·7	30	80·5	65·6	65·4	79	143·4	50·6	·03	1	2·9
Bombay	90·8	2	69·9	23	86·9	74·3	71·0	74	139·3	62·3	1·63	5	2·3
Ceylon, Colombo ...	87·7	17	71·6	26	84·8	73·2	71·0	81	153·0	68·0	18·10	27	7·5
<i>Melbourne</i>	88·4	16	44·8	22	68·6	52·1	51·3	74	139·7	38·8	2·38	11	6·6
<i>Adelaide</i>	90·5	17	47·0	28	75·7	55·0	49·4	56	153·3	40·5	1·48	6	5·0
<i>Sydney</i>	86·8	4	55·6	29	73·9	60·6	58·5	70	151·8	43·6	4·05	21	5·8
<i>Wellington</i> .....	...	...	...	...	...	...	...	...	...	...	1·28	13	...
<i>Auckland</i>	81·0	24	51·0	18	72·0	58·4	57·0	80	146·0	49·0	7·17	17	5·2
Jamaica, Kingston.....	90·8	26	61·9	18	86·1	70·8	71·2	86	...	...	3·57	12	5·6
Trinidad	91·0	3, 4	67·0	23	88·0	69·5	72·6	82	169·0	65·0	7·84	15	...
Toronto	58·1	2	21·4	25	43·3	31·3	31·6	77	...	16·0	2·99	20	6·9
New Brunswick, Fredericton	62·7	3	9·2	27	41·1	23·1	27·8	77	...	...	1·86	10	5·2
Manitoba, Winnipeg ...	49·9	9	—30·3	29	23·9	5·5	...	...	...	...	2·34	12	7·2
British Columbia, Esquimalt	50·5	7	27·2	1	44·5	35·5	38·6	93	...	...	10·43	19	7·4

REMARKS.

MALTA.—Adopted mean temp. 64°·8 ; hourly velocity of wind 10·2 miles. Thunderstorms on 3 days ; lightning on 8 days. J. F. DOBSON.

Mauritius.—Mean temp. of air 2°·2 below, dew point 2°·9 below, and rainfall 0·15 in. below, their respective averages. Mean hourly velocity of wind 10·6 miles, or 0·3 mile below average ; extremes, 28·7 on 20th, and 0·0 on 3rd ; prevailing direction, S.E. to E. C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—Thunderstorms occurred on 8 days, and lightning was seen on 3 other days. D. G. MANTELL.

Melbourne.—Lightning on 3 days ; thunder and lightning on 12th ; dust storm and smart squalls at 2.35 p.m. on 3rd. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean temp. 1°·5 below the average of 36 years. Rainfall 47 in. above the average. C. TODD, F.R.S.

Sydney.—Temperature 0°·8 above, and rainfall 80 in. above, their respective averages. H. C. RUSSELL, F.R.S.

Auckland.—An exceptionally wet and warm month, the rain being accompanied by much thunder, but little wind. Total rainfall the greatest yet recorded for the month, and two and a-half times more than the average. Mean temperature 5° above the average. T. F. CHEESEMAN.

JAMAICA.—Rain in the first half of the month, with light thunderstorms ; fair afterwards. Mean hourly velocity of wind 2·3 miles. The Kingston rainfall was half as much again as the average, while the Island rainfall was double the average. R. JOHNSTONE.

TRINIDAD.—Rainfall 98 in. above the 30 years' average. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,
APRIL, 1894.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			
II.	Dorking, Abinger Hall.	2:76	XI.	Rhayader, Nantgwilt..	2:50
„	Birchington, Thor	2:14	„	Lake Vyrnwy	2:49
„	Hailsham	2:41	„	Corwen, Rhug	1:76
„	Ryde, Thornbrough	2:07	„	Carnarvon, Cocksida ...	1:85
„	Emsworth, Redlands ...	2:35	„	I. of Man, Douglas	2:32
„	Alton, Ashdell	2:21	XII.	Stoneykirk, Ardwell Ho.	1:98
III.	Oxford, Magdalen Col...	1:76	„	New Galloway, Glenlee	2:72
„	Banbury, Bloxham	1:83	„	Melrose, Abbey Gate...	1:05
„	Northampton, Sedebrook	1:74	XIII.	N. Esk Res. [Penicuick]	1:70
„	Alconbury	1:04	„	Edinburgh, Blacket Pl.	1:75
„	Wisbech, Bank House..	1:33	XIV.	Glasgow, Queen's Park.	1:91
IV.	Southend	1:91	XV.	Inverary, Newtown	1:94
„	Harlow, Sheering	1:40	„	Islay, Gruinart School..	44
„	Colchester, Lexden.....	1:64	XVI.	Dollar	91
„	Rendlesham Hall	2:28	„	Balquhider, Stronvar..	2:27
„	Diss	2:15	„	Ballinluig	1:77
„	Swaffham	1:98	„	Dalnaspidal H.R.S. ...	2:36
V.	Salisbury, Alderbury ...	2:51	XVII.	Keith H.R.S.	1:03
„	Bishop's Cannings .....	...	„	Forres H.R.S.	53
„	Blandford, Whatcombe .	2:39	XVIII.	Fearn, Lower Pitkerrie.	71
„	Ashburton, Holne Vic....	4:40	„	Loch Shiel, Glenaladale	...
„	Okehampton, Oaklands.	2:79	„	N. Uist. Loch Maddy ...	1:06
„	Hartland Abbey	2:10	„	Invergarry	1:18
„	Lynmouth, Glenthorne.	1:79	„	Aviemore H.R.S.	78
„	Probus, Lamellyn	4:13	„	Loch Ness, Drumnadrochit	41
„	Wellington, Sunnyside..	2:50	XIX.	Invershin	07
„	Wincanton, Stowell Rec.	2:37	„	Scourie	70
VI.	Clifton, Pembroke Road	2:73	„	Watten H.R.S.	51
„	Ross, The Graig	2:16	XX.	Dunmanway, Coolkelure	7:41
„	Wem, Clive Vicarage ...	1:79	„	Fermoy, Gas Works ...	5:86
„	Cheadle, The Heath Ho.	1:64	„	Killarney, Woodlawn ...	7:12
„	Worcester, Diglis Lock	1:23	„	Tipperary, Henry Street	6:36
„	Coventry, Coundon	1:91	„	Limerick, Kilcornan ...	2:98
VII.	Ketton Hall [Stamford]	1:21	„	Ennis	3:67
„	Grantham, Stainby	1:65	„	Miltown Malbay	3:93
„	Horncastle, Bucknall ...	2:08	XXI.	Gorey, Courtown House	3:75
„	Worksop, Hodsck Priory	2:45	„	Athlone, Twyford	4:49
VIII.	Neston, Hinderton	2:26	„	Mullingar, Belvedere ...	4:29
„	Lancaster, Rose Bank...	1:57	„	Longford, Currygrane...	4:15
„	Broughton-in-Furness..	1:41	XXII.	Galway, Queen's Coll...	3:76
IX.	Ripon, Mickley	3:17	„	Crossmolina, Enniscooe..	3:84
„	Scarborough, South Cliff	1:41	„	Collooney, Markree Obs.	4:12
„	East Layton [Darlington]	2:03	„	Ballinamore, Lawderdale	5:45
„	Middleton, Mickleton..	1:79	XXIII.	Lough Sheelin, Arley ..	4:05
X.	Haltwhistle, Unthank..	1:16	„	Warrenpoint	3:06
„	Bamburgh	1:00	„	Seaforde	2:27
„	Keswick, The Beeches...	2:39	„	Belfast, Springfield	1:96
XI.	Llanfrechfa Grange	2:13	„	Bushmills, Dundarave...	1:60
„	Llandoverly	2:12	„	Stewartstown	2:76
„	Castle Malgwyn	2:71	„	Buncrana	2:36
„	Builth, Abergwessin Vic.	2:54	„	Lough Swilly, Carrablagh	2:49

APRIL, 1894.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.				Days on which "0" or more fell.	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) ...	1.74	-.00	.59	24	14	73.3	8	34.5	22	0	8
II.	Maidstone (Hunton Court) ...	1.81	+ .16	.56	24	15	...	...	...	...	...	...
III.	Strathfield Turgiss	2.09	+ .49	.48	16	16	70.4	10	31.1	22	1	10
IV.	Hitchin	1.49	- .30	.32	18	14	72.0	8, 11	32.0	21 ^a	2	...
V.	Winslow (Addington)	1.59	- .33	.39	11	13	72.0	11	31.0	22 ^b	2	10
VI.	Bury St. Edmunds (Westley) ..	1.27	- .39	.35	24	16	69.0	8	34.0	22	0	...
VII.	Norwich (Brundall)	2.08	...	.49	24	15	70.8	8	32.8	23	0	9
VIII.	Weymouth (Langton Herring) ...	2.50	+ .62	.35	10	18	64.0	7	38.0	13 ^c	0	...
IX.	Torquay (Cary Green)	2.39	...	.44	22	17	61.3	29	38.0	13	0	0
X.	Polapit Tamar [Launceston]..	2.01	- .21	.32	25	16	67.0	1, 3	37.5	1	0	6
XI.	Stroud (Upfield)	2.44	+ .29	.75	25	16	69.0	11	39.0	17 ^f	0	...
XII.	Church Stretton (Woolstaston) ..	2.32	- .02	.47	24	17	72.0	11	36.0	20 ^f	0	7
XIII.	Tenbury (Orleton)	1.25	- .83	.18	23	15	71.2	11	30.2	20	4	10
XIV.	Leicester (Barkby)	1.67	- .43	.46	25	16	76.0	11	24.0	20	7	13
XV.	Boston .....	.89	- .82	.30	12	11	74.0	10	30.0	21	1	...
XVI.	Hesley Hall [Tickhill].....	2.86	+ 1.15	.75	18	15	74.0	11	29.0	21	2	...
XVII.	Manchester (Plymouth Grove) ..	1.55	- .16	.34	16	16	74.0	11	34.0	19 ^g	0	3
XVIII.	Wetherby (Ribston Hall) ..	1.94	+ .09	.62	13	14	...	...	...	...	...	...
XIX.	Skipton (Arncliffe)	2.55	- .88	.47	16	17	...	...	...	...	...	...
XX.	Hull (Pearson Park)	1.16	- .76	.23	13	11	67.0	10	27.0	21	2	9
XXI.	Newcastle (Town Moor)	4.19	- .65	.39	26	13	...	...	...	...	...	...
XXII.	Borrowdale (Seathwaite).....	1.28	- 2.85	.80	27	21	...	...	...	...	...	...
XXIII.	Cardiff (Ely)	2.22	- .19	.45	23	17	...	...	...	...	...	...
XXIV.	Haverfordwest	2.46	- .17	.57	24	16	64.9	12	31.9	1	2	11
XXV.	Aberystwith, Gogerddan	1.69	- .87	.27	11	11	71.0	2	28.0	21 ^h	8	...
XXVI.	Llandudno	1.59	- .22	.27	11	16	...	...	...	...	...	...
XXVII.	Cargen [Dumfries]	1.90	- .33	.49	12	11	68.0	11	31.6	1	2	...
XXVIII.	Jedburgh (Sunnyside).....	1.38	- .32	.32	7	12	71.0	11	31.0	14 ^g	6	...
XXIX.	Colmonell	1.70	...	.52	11	12	68.0	2	33.0	1, 20	0	...
XXX.	Lochgilthead (Kilmory).....	2.43	- .38	.59	10	19	...	...	32.0	19	1	...
XXXI.	Mull (Quinish)	1.75	- 1.23	.25	10 ^a	18	...	...	...	...	...	...
XXXII.	Loch Leven Sluices .....	.70	- 1.52	.20	8 ^h	5	...	...	...	...	...	...
XXXIII.	Dundee (Eastern Necropolis) ..	1.45	- .60	.25	17 ^b	16	65.9	29	34.6	1	0	...
XXXIV.	Braemar	1.63	- .79	.45	17	17	60.2	28	26.2	2	8	17
XXXV.	Aberdeen (Cranford)	1.15	...	.42	16	16	60.0	11	32.0	1	1	...
XXXVI.	Strathconan [Beaully] .....	.63	- 2.18	.18	17 ^c	7	...	...	...	...	...	...
XXXVII.	Glencarron Lodge	1.20	...	.36	17	13	66.5	11	31.9	29	1	...
XXXVIII.	Cawdor [Nairn]	1.08	- .44	.44	16	8	...	...	...	...	...	...
XXXIX.	Dunrobin .....	...	...	...	...	...	...	...	...	...	...	...
XL.	S. Ronaldsay (Roeberry).....	.49	- 1.12	.12	23	10	59.0	28	38.0	1	0	...
XLI.	Darrynane Abbey	4.55	...	.80	13	22	...	...	...	...	...	...
XLII.	Waterford (Brook Lodge) ...	4.32	+ 1.85	.86	15	20	63.0	4, 28	33.0	17	0	...
XLIII.	O'Briensbridge (Ross)	2.86	...	.57	11	21	...	...	...	...	...	...
XLIV.	Carlow (Browne's Hill)	4.09	+ 1.81	.62	15	21	...	...	...	...	...	...
XLV.	Dublin (FitzWilliam Square) ..	3.12	+ 1.00	.56	13	20	62.7	8	38.0	1	0	1
XLVI.	Ballinasloe	4.19	+ 1.85	.70	11	22	63.0	4	39.0	19	0	...
XLVII.	Clifden (Kylemore)	8.98	...	1.34	14	20	...	...	...	...	...	...
XLVIII.	Waringstown	2.04	- .38	.31	16	21	67.0	11	33.0	25	0	2
XLIX.	Londonderry (Creggan Res.) ..	2.47	+ .23	.70	11	18	...	...	...	...	...	...
L.	Omagh (Edenfel)	2.83	+ .60	.49	11	19	60.0	2, 20	34.0	18	0	3

^a And 14. ^b And 29. ^c And 18. ^d And 22. ^e And 20, 22. ^f And 21. ^g And 20. ^h And 30.

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

METEOROLOGICAL NOTES ON APRIL, 1894.

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

ENGLAND.

STRATHFIELD TURGINS.—A fine month for all vegetable and agricultural growth; fine at the commencement, showery and mild in the middle and at the end; vegetation very forward. Honey bee seen on 12th. Horse chestnut in leaf on 14th. Young rooks seen on 21st.

HITCHIN.—A very early season. Chestnut in bloom on 14th, hawthorn on 16th. A wasp's nest found on 30th.

ADDINGTON.—A fine open month; vegetation of all kinds in a very advanced state, and some hawthorn bushes well in flower in the last week. The cuckoo and swallow were with us on the 9th. A sharp TS occurred on the 11th at 2 p.m., and another on the 26th, on which day a very heavy H storm swept along, a mile to the N. of us, doing much damage to growing crops, and breaking a quantity of glass at Adstock, but no H fell here.

BURY ST. EDMUNDS.—R fell in small quantities on 16 days. Between Bury St. Edmunds and Cambridge much less R fell than in the surrounding districts. Vegetation very forward. Asparagus cut on the 4th. Foreign birds not much earlier than usual. Cuckoo on the 8th, nightingale on the 11th, swallow on the 24th.

LANGTON HERRING.—Rain has fallen on no less than 71 days in the four months January to April, 16 more than the average, and the greatest number in any year from 1879 to 1893. The mean temp. at 9 a.m. ($50^{\circ}\cdot7$) is $3^{\circ}\cdot5$ above the average, but $1^{\circ}\cdot5$ below that of April, 1893. Hawthorn in blossom on the 18th, on the same day of the month as in 1893. Grass crop very promising. Lunar halo on the 14th. Solar halos on 17th, 25th, and 26th. TSS on the 18th and 28th.

TORQUAY, CARY GREEN.—Rainfall $\cdot42$ in. less than, and rainy days one more than, the average. Mean temp. $4^{\circ}\cdot3$ above the average. Amount of sunshine at Chapel Hill, 166 hours 30 mins., being 28 hours below the average.

POLAPIT TAMAR.—A very seasonable month altogether, the rainfall being slightly less than the average of 13 years. TS on 19th; distant T on 28th; thick fog on 20th.

STROUD, UPFIELD.—L on 2nd; T and L at night on 10th; TSS on the 11th, 18th, and 25th; on the latter day, very heavy H fell at Chalford, near Stroud.

WOOLSTAFON.—A pleasant and very growing month, though the nights were cold. There was a violent storm of T and L on the 11th, after an intensely close afternoon. T and L on the 2nd and 8th. The cuckoo was first heard on the 12th, and the swallow seen on the same day. Mean temp. $50^{\circ}\cdot4$.

LEICESTER, BARKBY.—The country was lovely with the abundance of plum, pear and apple blossom. First cuckoo on the 10th; first swallow on the 11th; first nightingale on the 27th. T and L on 8 days; H on 2 days. Mean temp. $49^{\circ}\cdot7$. A fine, but occasionally very cold, month.

WALES.

HAVERFORDWEST.—The drought, which set in on March 15th, was absolute up to April 6th; fine bright days, with sharp night frosts, continuing up to that date, the lowest grass reading being $26^{\circ}\cdot5$ on 2nd. Broken weather then prevailed to the 18th, although many of the days were fine, R falling at night. From the 19th to the 23rd fine bright days with night frost occurred, and the temp. was cooler as the month advanced. Oak and ash both in leaf on the 25th, white thorn on the 28th; lilac in bloom in the 3rd week; rhododendrons in full bloom on the 25th. Grass abundant, with every indication of a good hay crop; everything as early as last year, but the max. temp. in shade $11^{\circ}\cdot1$ lower. Prevailing winds, S.W. and N.N.W.

GOGERDDAN.—Beautiful growing weather throughout the month. Such good weather throughout April not remembered for more than 20 years.

SCOTLAND.

CARGEN.—A fine month generally speaking. The mean temp. was $2^{\circ}7$ above the average, and there were unusually few frosty nights. The R was a little below the average. E. winds prevailed for 19 days. Vegetation progressed rapidly during the month, and is much more advanced than usual at this time of the year. Many trees are in full leaf, and hawthorn, lilacs, and laburnums are in flower; pasture lands unusually luxuriant. TSS on the 2nd, 3rd, 24th, and 27th.

JEDBURGH.—For the period of the year the weather was unusually fine, and the cereal and potato crops were got in in fine condition. Vegetation generally was in an advanced stage, and the hedges had been in full bloom for ten days at the close. The bush and tree fruit crop had the appearance of being a very heavy crop, if not checked by bad weather.

COLMONELL.—The mean temp. of the month ($49^{\circ}3$) was $5^{\circ}1$ above the average of 18 years, and the highest in any of them except 1893, which was 2° higher. The max. temp. in 1886, 1892, and 1893 were all higher than this year, 71° , 75° , and 78° respectively. The min. temp. this year is the highest in April for 19 years. The average number of days with frost in April is 11, and till this year none has had less than three. T and L on 11th. Strong winds on 14th, 24th, 25th, and 26th, approaching to a gale only on 24th.

BRAEMAR.—Vegetation unusually forward. Sunshine 139 hours 40 minutes. T and L on the 25th, and T on 27th and 29th.

ROEBERRY.—A very dry month, the driest recorded since 1878. Mean temp. $45^{\circ}2$.

IRELAND.

DARRYNANE ABBEY.—The first few days were fine and warm; the rest of the month was wet, cold, and stormy, with a few warm days. Very strong gale at night on 22nd and all day on 23rd. Heavy T from midnight to 2 a.m. on the 14th.

WATERFORD, BROOK LODGE.—T from 2 to 3 p.m. on the 4th. Heavy H on 24th. Cuckoo heard on 17th. Swallows seen on 25th.

O'BRIENSBRIDGE, ROSS.—Plenty of R. T on 2nd. Strong S.E. gale, with H showers and T, on 15th. Foliage of trees earlier even than last year. Beech, lime, sycamore, and horse-chestnut in full leaf on 19th. Oak also very forward, but leaf not so fully developed. Fine bloom on fruit trees.

CARLOW, BROWNE'S HILL.—More rain fell this April than has fallen in any corresponding month since 1877.

DUBLIN.—Like April, 1893, this was a mild month, and led to a forward spring. Unlike that month, however, the amount of cloud was large, particularly in the mornings, and R fell frequently and heavily. The prevalent winds were from S.E. and S. Under these several circumstances vegetation made rapid progress, and by the end of the month most of the forest trees were in full foliage, and the hawthorn, lilac, and laburnum were fast coming into blossom. The mean temp. was $49^{\circ}6$, or $2^{\circ}2$ above the average. Lunar halos on the 15th and 17th. Fog on 8 days. High winds on 5 days, reaching the force of a gale on 22nd and 24th. H fell on 13th and 24th. Aurora borealis on the evening of the 5th.

EDENFEL.—A moderate month, without any extremes; the B and temp., however, were both somewhat above the average, and unqualified by any appreciable frost. Vegetation of all kinds is early and luxuriant. The bursting into leaf of the oak simultaneously with the beech, instead of with the ash (which gives no sign), is very unusual. Swallows 10 days earlier than the average time; other migrants about the average.

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CCCXLI.]

JUNE, 1894.

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THE MAY FROST OF 1894.

MAY frosts are usual, but the later they are, the more serious are their effects, and still more so if the spring has been mild and vegetation is forward. It is, we think to this, rather than to the intensity of the frost, that the great damage at the end of last month is due.

When travelling in the East Riding of Yorkshire we heard farmers talk of reploughing the fields, which a few days before had promised excellent crops of potatoes; shortly afterwards we received the box of ruined vegetation referred to on a subsequent page by Mr. C. L. Brook, and then the newspapers and especially the agricultural ones, began to describe the frost as unprecedented. We thereupon began to collect the facts, and although we are by no means sure of their meteorological importance, they are certainly of interest in connection with the agricultural disaster. We give (1) Typical letters from some of our regular correspondents; (2) reports as to damage extracted from the *Journal of Horticulture*. [Our readers must remember that many gardeners put their thermometers in positions by no means conformable to the rules of the Royal Meteorological Society, and that we reprint their figures without in any way adopting them]; (4) the lowest temperature in the air in the early morning of the three days May 20th, 21st, and 22nd; (5) the lowest on grass on the same days—(4) and (5) are chiefly from stations of unquestionable excellence, with proper stands and verified instruments—(6) a brief epitome.

To the Editor of the Meteorological Magazine.

SIR,—The frost of Sunday night, May 21st, or Monday morning (22nd), did great havoc to vegetation. Potatoes were blackened, yews, laurels and holly shoots “burnt off” by it, and an acacia tree was turned yellow and shed part of its foliage, as in October. Two-thirds of a magnificent prospect of roses were destroyed; the buds were in very forward and vigorous condition. The blossom (very luxuriant) of outdoor azaleas and rhododendrons blackened and utterly destroyed in that one terrible frost.

Slough.

GEORGE BENTLEY.

SIR,—Last May was the coldest May for at least 13 years, as the following table shows :—

MEAN TEMP. OF MONTH.			
Thermometer in Stevenson Screen.			
1882	51°4	1888	51°3
1883	51·9	1889	54·2
1884	54·1	1890	52·6
1885	48·0	1891	48·7
1886	51·1	1892	51·6
1887	49·0	1893	54·5
Mean of 12 years		51·5	
Mean of May, 1894.....		46·9	

Deficiency on average of previous 12 years 4·6

The cold spell was more prolonged than I have ever registered, the minimum temperatures being :—

DATE. 1894.	Shade Temp. 4 ft. from Ground.	On Grass.	
May 20	30	28	Snowed a little.
" 21	29	24	
" 22	30	26	" "
" 23	32	24	
" 24	35	28	
" 25	30	24	
" 28	34	27	{
" 30	34	30		Snow on Long Mountain in early morning.
" 31	33	29	
June 1	33	29	

so that it froze on each night but three from the 20th May to June 1st. Potatoes terribly cut down. Ash leaves cut, and I fancy in many cases the budding leaves destroyed, as the trees look as though more than half their branches were dead. Sycamore leaves and fern fronds also suffered, while the gooseberries and currants are dropping off the trees, killed by the frost, which I fancy has also destroyed our apple crop, though some of Miss Ormerod's friends may have something to say to this last.

The rainfall for May was 3·55 in., with a maximum fall (on 15th) of 1·24 in., the heaviest rain since November 8th, 1890, when the same amount (1·24 in.) fell in the 24 hours.—Yours faithfully,

R. J. ROBERTS.

Pool Quay Vicarage, Welshpool, June 6th, 1894.

SIR,—Some details of the disastrous May frosts may be acceptable. The cool showery weather of May 1st—18th gave place on Saturday, May 19th, to a spell of severe cold, with strongish and

very piercing N.N.E. winds. On Sunday, May 20th, some hail fell, with rain in the afternoon, and when in the evening the sky cleared and the wind dropped, it was evident that mischief was impending. I covered up delicate plants with flower pots, matting both thick and thin, and newspapers, which last often give quite sufficient protection from a summer frost; put out a soup-plate full of water on the lawn, then set an alarum for 3.15 a.m., so that I was in my garden at 3.20 on Monday morning, just when the cold was at its worst. The air was wonderfully bright, keen, and still; the lawn as white as in any winter frost; hoar frost was on tops of gates close to my house; and the plate of water was solid ice. I saw the thermometer on the grass at 22° , and that in the shed at 25° . I tried watering some of the rows of potatoes, but the frost held till so long after sunrise that this could do no good. The frost had gone unchecked through the newspaper, and even through the matting so far that upper leaves were blackened; and a few days later, looking at a potato bed opposite my thermometer shed, I could not see where the rows had been!

The following night the minima were 26° in shed and $21\frac{1}{2}^{\circ}$ on grass, and the cold continued, with much wind and frequent hail, and on 21st and 26th unmistakable snow, heavy, wet snow, so that till the end of the month gardens had a bad time of it.

It is worthy of remark that my maxima for the last 13 days of May averaged $8^{\circ}\cdot6$ lower than those of the first 12 days of April and for the whole of May $2^{\circ}\cdot3$ lower than for the whole of April!

Not to speak of garden plants, the severity of the frost was shown by its blackening, to entire destruction, all the foliage of the ash in low-lying places to 20 ft. from the ground, and even some of the lower branches of oaks. Young shoots of ivy and of male fern were also cut off. Winter beans were in many cases unable to lift themselves again after the frost. The flourishing potato crop, so unusually forward, was cut back to the very ground, and the damage to fruit will only be known in the autumn.

As I do not read of the frost being worse elsewhere, I venture to trouble you with these minute details.

H. A. BOYS.

Easton Mauduit Vicarage, Northampton, June 4th, 1894.

P.S.—The cold seems to have had no effect on the wasps, which have been about in abnormal numbers till now, but may possibly be affected by to-day's heavy rain.

SIR,—I enclose a few specimens of the results of the recent frosts; the effects of it are simply disastrous, exceeding those of May 18th, 1891, owing to the fact that though the actual minimum has not been so low, the season of 1894 is some three weeks in advance of that year. Referring to the specimens, I cannot find a single strawberry blossom without a black centre; about three-fourths of the gooseberries are in the condition of the enclosed sample; a great

number of young beech leaves are shrivelled up, and at least half the oaks have *every leaf* in the condition of those I send, and hardly a single oak has entirely escaped; besides these every rhododendron flower that was open is absolutely destroyed, and every potato cut down to the ground; even common ferns have suffered to a large extent.

The readings were:—

	Stevenson Screen.	Old stand.	Grass.
1894.			
May 21	26° 3	26° 2	22° 0
„ 22	27° 3	27° 3	22° 3
„ 23	30° 7	30° 8	25° 9
„ 24	no frost	no frost	31° 9
„ 25	28° 7	28° 8	24° 5
1891.			
May 18	—	23° 8*	19° 8

Yours very truly, CHARLES L. BROOK.

Harewood Lodge, Meltham.

“As no report appears to have reached you from the Vale of Evesham, regarding the recent severe weather, a few remarks may be of interest to some of your readers in market gardening and fruit-growing districts. No previous spring frosts ever wrought such destruction as those of May the 20th and 21st. Runner beans and potatoes were cut down, marrows were killed under hand-lights, and almost everything in a growing state was more or less damaged. The worst blow was to the fruit. On all the flat land the plums and currants were killed, and the gooseberries, of which there was promise of an abundant crop, were quite three parts taken, but those under trees did not suffer so severely as those in the open. In a few very high parts of the district no damage was done. I noticed on the same piece of land the variety Keepsake are almost all killed, while Whinham's Industry is carrying a heavy crop, thus proving the hardiness of the latter variety. Strawberries are also seriously injured, some crops ruined. Early peas are crippled, and the main crop, Telegraph and Leicester Defiance, will be found very light at picking time. Apples and pears are not grown much in the market gardens, but I have noticed some dwarf trees of Lord Suffield, Lord Grosvenor, and Stirling Castle, and the apples appear stunted, so I am afraid that they will fall.

“I do not know whether the trees in other localities are damaged like they are here. The leaves (especially of the Pershore Plum) are all singed as if a fire had been lighted under them, and it also seems to have penetrated to the pith. Those branches carrying the most fruit appear to have suffered worst. Growers are at a loss to know what to do for the best with the trees.”
—MARKET GROWER.

As some of your readers may like to compare notes of the results of the frost on Sunday night, the 20th ult., and Monday morning, I send a few particulars. In south-east Somerset I find the temp. fell to from 22° to 25°,

* This is not from a Stevenson stand, but is from a verified thermometer in the old stand, and I find by comparison of the last six months between my old stand and the Stevenson that the difference is very small, probably not exceeding 2 or 3-tenths.

but it was accompanied with a cutting north-east wind. I have known several severe frosts in May and June during the last 30 years in this neighbourhood, but have not known one so disastrous, and attended with such serious results, as the one last week. The most mysterious thing is that these early and late severe frosts generally come on a Saturday or Sunday night.

The following is a summary of the result of the frost:—Walnut trees cut fearfully, also planes, oak and ash, from seedlings up to 12 and 15 feet. Beech (copper), and some other hardy trees are injured more or less. Of hardy shrubs, the following have the new growth entirely destroyed:—*Abies Nordmanniana*; yews, both English and golden; *aucuba japonica*; *osmanthus*; laurels, common, Caucasian, and *rotundifolia*, also the Portugal. Fruit appears very much injured, especially gooseberries. I fear apples and pears will also suffer very much. Of course potatoes, French beans and marrow, where above ground, are in many places quite destroyed.—B. R. D., *Yeovil*.

Since Monday, the 21st, we have had frosts more or less, varying from 2° to 8°, i.e., down to 24°, with very cold winds and dull weather. Words almost fail to describe the havoc caused by the frost. Acres of potatoes are laid level with the ground, one farmer a short distance from here having lost a crop which he valued at £1,000. Shrubs which had been pruned in and have made two or three inches of growth, are quite blackened. In some places currants and gooseberries look as if they had been boiled, the ground underneath the trees being literally strewn with such fruit. All the early strawberry blooms are quite destroyed, as are also dwarf and runner beans. The oldest inhabitants in this neighbourhood say that they cannot remember a more destructive May frost.—R. P. R., *Liverpool*.

“With our thermometer hanging on the open espalier nearly 4 feet from the ground and about 100 yards from the river Wear, the frost on Monday, 21st ult., was 20°; 22nd, 20°; 23rd, 19½°; 24th, 25°; 25th, 21½°; thus making a mean of 21° for the consecutive five nights, and as even the grass is seriously damaged—in fact, I never saw anything like it—one may judge what are our fruit prospects hereabouts. The week previous was cold—bitterly cold—and what we may have left I think will be largely attributable to this cold, as all vegetation was thoroughly hardened, which perhaps reduced the damage to what might have been expected from a third less frost with softer conditions. I may say that I notice quite a scourge of green fly, and strange to say the insects do not seem to have been much affected.—JOSEPH WITHERSPOON, *Red Rose Vineries, Chester-le-Street, Durham*.

“Few persons perhaps remember so destructive and disastrous a May frost as that which occurred on the 21st of May in this year. Following upon a week of abnormally cold weather, we had a slight frost on Saturday night and Sunday morning, but it was left to the night of the latter day, and yesterday, to complete the work of destruction. A frost of any sort in May is always dangerous, and often destructive; but when it comes to 10° of frost—or 22° Fahrenheit—then, indeed, is the disaster complete, and the hopes of the year are absolutely and entirely destroyed.

“The morning of the 21st broke bright and sunny after the overnight frost, and disclosed a sorrowful sight. Ice a quarter of an inch in thickness was plentiful, and on the north side of walls and buildings the ground remained frost-bound far into the forenoon. In most gardens, and in many fields, potatoes were well above the ground; by noon there was nothing but the

blackened remains of the haulms above the ground level, so effectually are they killed. Seeding turnips, instead of being green, are turned to a sickly purple hue. According to Mr. W. Thompson, the thermometer at the Deanery Gardens registered 22° or 10° of frost."

The above cutting from the *Newcastle Daily Chronicle* will give you an idea of what the weather has been in the north. We registered 5° of frost here this morning, but our garden is sheltered.—W. A. JENKINS, *Aldine Grange Gardens, Durham.*

Minima in Shade in May, 1894.

COUNTY.	STATION.	DATE.		
		20th.	21st.	22nd.
<i>Surrey</i>	Farnham (Great Down, Seale) ...	...	30·0	...
"	Reigate (Woodhatch Lodge) .....	...	...	31·0
"	Merstham	S *	30·5	30·9
"	Addington Hills	S *	31·7	*
"	Wallington	S ...	29·3	...
<i>Kent</i>	Keston Tower .....	...	27·0	...
<i>Sussex</i>	Ditchling	S ...	30·5	...
<i>Hants</i>	Strathfield Turgiss	S *	29·4	29·9
<i>Berks</i>	Reading	S *	31·0	*
"	Yattendon .....	...	30·0	30·0
<i>Herts</i>	Broxbourne	28·0	...	...
"	Berkhamstead (Rose Bank)	S ...	30·1	...
"	Hitchin (Wratten) .....	...	29·0	29·0
<i>Bucks</i>	Winslow (Addington)	S ...	29·0	...
<i>Oxford</i>	Henley-on-Thames .....	...	29·0	...
"	Oxford (Radcliffe Observatory) ...	S *	31·0	*
"	" (St. Giles's) .....	...	30·0	...
<i>Northampton</i>	Easton Mauduit .....	...	25·0	26·0
"	Castle Ashby .....	...	30·0	...
"	Pitsford (Sedgbrook) .....	...	...	28·6
<i>Cambridge</i>	Cambridge Observatory	S *	29·0	30·0
<i>Essex</i>	Chelmsford	S *	29·2	*
"	Harlow (Sheering) .....	...	30·0	...
"	Halstead	S *	29·4	31·8
"	Saffron Walden (Newport)	24·0	...	...
<i>Suffolk</i>	Rendlesham Hall .....	...	27·0	...
"	Haverhill (Great Thurlow)	S *	28·3	30·5
"	Bury St. Edmunds (Orchard St.)	28·0	...	...
"	" " (Westley) ...	...	31·0	...
<i>Norfolk</i>	Diss	29·0	...	...
"	Hillington	S *	31·9	31·9
<i>Wilts</i>	Salisbury (Alderbury)	30·0	30·0	...
"	Marlborough (Mildenhall)	S ...	26·0	...
<i>Dorset</i>	Blandford (Whatcombe)	29·0	29·0	...
<i>Devon</i>	Buckfastleigh	S *	31·0	31·5
"	Bramford Speke	S *	31·6	*
"	Castle Hill	S *	31·8	31·9
<i>Gloucester</i>	Cheltenham (Southam Villa)	S *	29·2	...
<i>Hereford</i>	Burghill	S *	31·8	*
<i>Shropshire</i>	Church Stretton (Woolstaston) ...	31·0	...	...
"	Wem (Clive Vicarage)	30·0	...	...
<i>Stafford</i>	Burton (Hoar Cross)	25·0	...	...
"	Cheadle (Heath House)	S *	31·9	*
"	" (Teau Vicarage)	S ...	26·2	...
<i>Warwick</i>	Kenilworth	S *	30·2	31·6
"	Sutton Coldfield	S *	30·1	*

Minima in Shade in May, 1894—(continued).

COUNTY.	STATION.	DATE.		
		20th.	21st.	22nd.
<i>Leicester</i>	Barkby .....	...	24·0	...
„	Loughboro' (Forest Road)	§ *	28·0	26·0
„	Belvoir Castle	„ ..	29·0	...
<i>Rutland</i>	Ketton Hall [Stamford]	§ *	31·0	31·0
<i>Lincoln</i>	Boston	„ ..	30·0	30·0
„	Horncastle (Bucknall)	„ ..	29·0	...
„	„ (Hemingby)	„ ..	30·0	...
<i>Notts</i>	Hesley Hall [Tickhill]	„ ..	27·0	...
<i>Derby</i>	Buxton	§ 29·8	24·5	25·7
<i>Lancashire</i>	Manchester (Plymouth Grove) ..	30·0	30·0	...
„	Bolton	§ *	30·4	*
„	Hawkshead (Esthwaite Lodge) ...	„ ..	...	28·2
<i>York</i>	<i>W.R.</i> Meltham (Harewood Lodge)	§ ..	26·3	27·3
„	Wakefield Prison	„ ..	31·0	...
„	Halifax (Bermerside Observatory) § ..	25·5	25·7	...
„	York	§ *	29·0	30·0
„	<i>E.R.</i> Hull (Pearson Park)	§ ..	29·0	...
„	Driffield (York Road)	§ *	28·6	31·8
„	<i>N.R.</i> East Layton [Darlington]	„ ..	28·0	...
<i>Durham</i>	Barnard Castle (Whorlton) .....	„ ..	...	29·0
„	Durham (Ushaw)	§ 29·7	30·6	30·7
<i>Northumberland</i> ..	Haltwhistle	„ ..	27·0	...
„	Rothbury	§ 30·0	28·0	26·0
<i>Cumberland</i>	Seathwaite	§ *	31·5	29·3
„	Keswick .....	§ ..	...	27·0
<i>Westmoreland</i> ..	Windermere	§ *	28·8	28·0
„	Appleby	§ 31·0	30·0	28·8
<i>Monmouth</i>	Monmouth (The Hendre)	„ ..	30·0	...
„	Llanvihangel Court	„ ..	30·0	30·0
<i>Carmarthen</i>	Llandoverly	„ ..	27·0	...
<i>Pembroke</i>	Haverfordwest .....	„ ..	...	29·4
„	Castle Malgwyn [Llechryd]	„ ..	24·0	...
<i>Montgomery</i>	Churchstoke (Mellington Hall) ...	§ 30·1	29·0	30·4
„	Welsh Pool (Pool Quay)	§ 30·0	29·0	30·0

Minima on Grass. (Below 25°).

<i>Hampshire</i>	Strathfield Turgiss	„ ..	24·9	...
<i>Northampton</i>	Easton Mauduit	„ ..	22·0	21·5
<i>Gloucester</i>	Cheltenham	„ ..	24·5	...
<i>Stafford</i>	Cheadle (Teau Vicarage)	„ ..	19·0	...
<i>Leicester</i>	Loughboro' (Forest Road)	„ ..	24·0	23·0
„	Belvoir Castle	„ ..	23·0	23·0
<i>Rutland</i>	Ketton Hall [Stamford] .....	„ ..	...	23·0
<i>Nottingham</i>	Hodsock Priory	„ ..	18·0	...
<i>Lancashire</i>	Southport (Hesketh Park)	„ ..	24·3	...
„	Bolton	„ ..	21·2	22·0
<i>York</i>	<i>W.R.</i> Meltham (Harewood Lodge)	„ ..	22·0	22·3
„	<i>E.R.</i> Driffield	„ ..	22·0	...
<i>Montgomery</i>	Welshpool (Pool Quay)	„ ..	24·0	...

§ = Stevenson's Stand. * = Not below 32°. ... = No information.

We need not occupy much space with comment upon the foregoing, for incidentally nearly all the leading features have been touched upon:—

(1). It does not seem to us that the temperature can be described

as excessively low for May, but of course it makes a great difference whether a low reading occurs on the 1st or 31st, or as in this case on the 21st—23rd.

(2). No one has referred to the "Icy Saints" of May 11th to 13th, to the French proverb quoted by Mr. Inwards: "In the middle of May comes the tail of the winter," or to the well known fact of a cold period being usual in the middle or latter part of May.

(3). As usual, the frost was most severe in low lands, near streams, and none was recorded at any station on the English coast.

(4). Several remarks show that it was not the lowness of the temperature of the air which did the mischief, but the radiation of the heat into space, which was facilitated by a clear sky, and is proved by the grass temperatures.

(5). Judging from what we have heard, it seems by no means improbable that some large weed fires would have saved many an acre of potatoes by creating a smoke cloud adequate to lessen radiation.

(9). We wish that our readers would refer to the *Meteor. Mag.* for June 1891, and to the beautiful engraving of the snow storm of May 18th of that year, it will tend to show them that in rather minimizing the intensity of the recent frost, we had substantial ground for our argument; and if they will compare the minima in the general table for May 1891 with those on page 78 of this number, they will find that at the majority of English and Welsh stations, the frost of 1891 was more severe by about 1°.

(7). The facts in (1) and (2) being admitted, they have to be reconciled with widespread disaster—and nothing is more easy; a mild damp spring made vegetation forward and fuller of sap than usual, deficient sun had neither dried up the moisture nor hardened the vegetation, the plants were full of water, by the rapid cooling on a clear night the sap froze, the cells were broken by the expansion of the freezing sap, and the plant life was gone.

FIREBALL OF 1894—APRIL 22ND.

To the Editor of the Meteorological Magazine.

I have compared the interesting accounts of the brilliant fireball seen in the strong twilight of Sunday evening, April 22nd at 7.36. The descriptions though pretty numerous, are rather conflicting and in some instances too vague and incomplete to be serviceable in computing its real path in the atmosphere. There are several reports from Surrey, such as Haslemere, Kenley, Guildford, Redhill, &c., where the object appears to have descended in a vertical path towards the S.E. horizon, though the diagram in the *Meteorological Magazine* (May 1894) p. 49, represents the direction of flight to have been very different at Chiddingfold, Surrey. Any attempt to harmonize the various reports would be futile; the only course possible is to derive an approximate result that will satisfy in a general way, the majority of the observations. I have received one good determination of the end point from Mr. I. Evershed, of Ken-

ley, Surrey, who measured it as in azimuth $44^{\circ} 30'$ E. of S. and altitude $5^{\circ} 45'$. Mr. A. F. Parbury, at Chiddingfold, gives the altitude as 5° in S.S.E. Mr. R. W. Christy, of Chelmsford, describes the path as from near α Leonis (Regulus), to a little short of Corvus, while the Rev. F. T. Wardale, of Knebworth, Herts, says that the direction was from between α and β Leonis to between Orater and Corvus. At Bristol the meteor offered a fine spectacle, and was described to me as being a well defined ball of fire, of bluish colour, falling in the S.E. or E.S.E., and with a slight inclination from the vertical.

The meteor seems to have descended from a height of about 80 miles above the region of Hastings to a height of 17 miles over Amiens in France. It therefore passed above the Strait of Dover, and probably had a real path of more than 120 miles, traversed in about 4 seconds (average of 6 estimates) so that the velocity would be about 30 miles per second, but this is probably in excess of the actual speed. The direction of the meteor's flight was from N.W. to S.E., but the precise position of the radiant point cannot be given, though it is indicated in the neighbourhood of α Persei.

It is to be regretted that the results are open to question from the indefiniteness and contradictory character of the materials employed. This is, however, commonly the case in regard to casual observations of large fireballs. They are seen by all sorts of persons, few of whom are aware of the really necessary points to be noted, and of course the suddenness and unexpected nature of the spectacle is often so bewildering, that it becomes impossible for inexperienced eyes to retain a correct impression as to the most salient points. Even when scientific observers supply descriptions of this kind, it is not always they are found to be accordant and there is sometimes a pretty wide margin of error.

Large fireballs of similar type to that which appeared on April 22nd last, contain, apart from the attractions afforded by their striking aspect, some significant features likely to contribute to our knowledge of this branch of astronomy. But it is a most regrettable circumstance that they are nearly all allowed to escape that exact observation which alone can enable us to gain the instruction offered by their apparitions. It is to be hoped that future observers will recognise the utility of recording these bodies with greater precision. In all such cases the most important features are : the positions of the beginning and end point amongst the stars and the duration of flight. Other details, such as the brilliant effects of a meteor, its bursting, its train of sparks or phospheric streak, its coruscations, peculiarities of shape, &c., are of far less consequence, though deserving record after the position and duration have been carefully noted. When observers generally endeavour to supply accurate data concerning apparitions of fireballs not a year will pass but will add its quota of useful knowledge in regard to a very important and often beautiful class of phenomena.

W. F. DENNING.

Bristol, 1894, May 21st.

BOLIS, BOLIDE OR BOLID ?

To the Editor of the Meteorological Magazine.

SIR,—On page 55 you have raised the question whether “Bolis” or “Bolide” is the correct form. May I suggest that neither is correct, and that we ought to use the term “Bolid” ?

The rule is that in adopting words from the Greek which end in “ς” in the nominative and form the genitive in —*ados*. —*idos* or —*odos*, the stem letter “δ” is made the terminal of the English form. It is enough to cite *Æneid*, *Iliad*, *mænad*, *nomad*, *tetrad*, *tetrapod* and *Troad*. In every case the vowel of the final syllable is short, while the addition of a final “e” would necessarily make it long.

Dr. Murray (*New English Dict.*, 1888) does not recognise “Bolis” at all. He gives “Bolide,” citing as authorities Ross (1852), Proctor (1870) and Jefferies (1884). If the word cannot claim a longer prescription here, it is not, I hope, too late to adopt the more regular form. He marks the “i” long, which is no doubt the accepted, though inaccurate, pronunciation.

Webster, I observe, gives both “Bolis” and “Bolide,” but cites no authority for the former, while he marks the quantity of the “i” as uncertain.

I agree that as against this rule we have “ephemeris” and “tripos,” both naturalized in a less critical age—and for the latter we find “tripode” in Holland’s *Plutarch* (1603). These do not seem to be sufficient authorities to induce us to depart from the rule.

May I now ask a little space to reply to Mr. Denning’s letter on page 18 in answer to my communication on “Meteors” on page 8. I had not done so before, as I expected further discussion would have followed. I hope Mr. Coventry’s letter is a proof that the subject is attracting attention.

The object of my remarks was not to formulate a theory—as I have said before, in the same connexion, it is much too early to do that—nor did I suggest a necessary coincidence of phenomena, but rather a possible connexion between different phenomena not coincident. That Mr. Denning has observed many meteors without *simultaneous* evidences of electrical action, is therefore not to the purpose. On the other hand, I have known many instances of electrical action clearly evidenced in the path of meteors within a few hours. These may very well be accidents. All I say is, let us observe and note. It is surely unscientific to shut the door to enquiry because it is not “promising,” or to suggest that it is going back to theories of our forefathers. I should be obliged by a reference to any work where the co-relation of these phenomena has been proposed.

Mr. Denning has, in his last paragraph, quite misunderstood me. I did not suggest the slightest doubt of the accuracy of his computation. The point of my remark, which I hoped was sufficiently obvious, was to emphasize the statement in the beginning of my paper, that there was not one meteor, but that there were several.

Yours truly, JAMES G. WOOD, M.A.

115, Sutherland Avenue, W., June 4th, 1894.

To the Editor of the Meteorological Magazine.

SIR,—Referring to your inquiry on page 55 of the *Met. Mag.*, concerning the above, the following definition, accompanied by a quotation from Musschenbroek, appears in the Encyclopædic Dictionary (Cassell and Company, Limited) page 615, where it is classed amongst *obsolete* words:—

Bolis (pl. bolides). [Lat. *bolis*, from Gr. Βολίς (*bolis*)—anything thrown, a missile, a javelin . . . a flash of lightning.]

Meteorology: A fire-ball dashing through the air, followed by a train of light.

“*Bolis* is a great fiery ball, swiftly hurried through the air, and generally drawing a tail after it. Aristotle calls it *capru*. There have often been immense balls of this kind.”
—*Musschenbroek*.

I am, yours faithfully,

GEORGE REDPATH.

16, *Primrose-street, Leith, June 1st, 1894.*

ROYAL METEOROLOGICAL SOCIETY.

The monthly meeting of this society was held on Wednesday evening, the 16th instant, at the Institution of Civil Engineers, Westminster; Mr. R. Inwards, F.R.A.S., President, in the chair.

Mr. W. Ellis, F.R.S., read a paper “On the relative frequency of different velocities of Wind,” in which he discussed the anemometer records of the Greenwich Observatory for the five years 1888—1892, with the view of ascertaining the number of hours during which the wind blew with each of the different hourly velocities experienced during the period. The results of this discussion show that the wind blew for the greatest number of hours with the hourly velocities of 10 and 11 miles.

Mr. W. Marriott, F.R.Met.Soc., gave an account of a series of observations on the “Audibility of ‘Big Ben’ at West Norwood,” which he had carried on for a period of five years. The Clock Tower at Westminster is $5\frac{1}{2}$ miles distant from the point of observation, in a north-by-west direction. The large bell “Big Ben” was designed by Lord Grimthorpe, and cast in 1858; its weight is about 14 tons; it is 9 ft. $5\frac{1}{2}$ in. in diameter, and $9\frac{3}{8}$ in. in thickness; its tone being E. The observations were 976 in number, and were made at the hours of 9 a.m. and 9 p.m. The bell could be heard more frequently in the evening than in the morning, and on Sundays it was more frequently audible than on week-days. The direction of the wind most favourable for hearing “Big Ben,” was between West and North. The observations were also discussed in relation to temperature, moisture, cloud and barometric pressure.

A paper by Mr. A. W. Moore was also read on “Earth Temperatures at Cronkbourne, Isle of Man, 1880—1889.”

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, DECEMBER, 1893.

STATIONS. <i>(Those in italics are South of the Equator.)</i>	Absolute.				Average.				Absolute.		Total Rain.		Aver. Cloud.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
England, London	57·8	13	20·1	3	45·8	34·4	36·9	86	68·9	20·5	2·23	14	5·3
Malta.....	69·9	1	41·1	30	61·0	52·8	48·1	76	126·2	37·5	7·37	22	7·1
<i>Cape of Good Hope</i> ...	91·6	12	48·5	6	77·2	59·0	56·4	66	...	...	·04	2	2·4
<i>Mauritius</i>	85·6	30	69·0	1a	83·2	71·4	66·7	73	138·5	62·2	1·40	16	5·4
Calcutta.....	78·0	27	51·5	13	75·9	55·8	57·0	76	135·5	43·8	·00	0	5·9
Bombay.....	87·6	1	67·9	22	85·0	70·7	64·8	66	135·7	50·0	·00	0	2·2
Ceylon, Colombo	89·2	...	70·8	...	86·9	72·0	69·3	75	148·0	60·0	6·13	8	3·0
<i>Melbourne</i>	99·8	10	43·8	3	74·7	54·7	52·9	68	147·5	37·2	2·55	9	5·7
<i>Adelaide</i>	107·8	10	47·4	19	84·1	58·8	50·0	46	165·3	43·2	·63	4	3·8
<i>Sydney</i>	93·6	6	54·2	4	76·6	62·8	58·5	66	148·1	44·9	1·47	...	5·0
<i>Wellington</i>	77·5	31	45·0	7	65·5	53·9	50·9	75	147·0	30·0	2·90	18	4·8
<i>Auckland</i>	76·0	23	52·0	16	70·7	57·7	56·6	76	146·0	50·0	4·65	17	5·5
Jamaica, Kingston.....	90·3	1	63·8	7	84·5	68·4	68·2	84	...	...	3·29	8	4·4
Trinidad	89·0	3, 4	65·0	23	86·7	69·0	70·0	79	168·0	65·0	7·23	23	...
Toronto	51·5	25	— 4·6	13	22·1	15·1	23·2	84	...	— 9·0	4·60	24	7·4
New Brunswick, Fredericton	39·9	1	—26·0	15	24·0	2·7	13·3	84	...	...	6·09	20	6·2
Manitoba, Winnipeg ...	34·0	22	—39·1	10	5·6	—18·6	...	...	...	...	·62	12	4·6
British Columbia, Esquimalt	52·6	3, 15	29·2	27	46·4	38·5	41·6	95	...	...	9·75	28	8·6

a And 12, 22.

REMARKS.

MALTA.—Adopted mean temp. 56°·3; mean hourly velocity of wind 9·3 miles. Thunderstorms on 6 days, and lightning on 6 other days; hail on 3 days. Rainfall double the average. The month was unusually cloudy, with less than the average amount of wind. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·5 below, of dew point 1°·2 below, and rainfall 3·67 in. below, their respective averages. Mean hourly velocity of wind 8·8 miles, or 2·0 below average; extremes, 21·4 on 14th, and 0·0 on 27th and 30th; prevailing direction, E.S.E. to E. by N. Thunder on 22nd, and lightning on 24th. C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—Lightning was seen on the 1st and 24th; thunderstorms occurred on 6 days. D. G. MANTELL.

Melbourne.—Hail on the 15th; lightning on the 5th and 11th; thunderstorms on the 25th. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean temp. 0°·4 above the average of 36 years. Rainfall ·21 in. below the average. C. TODD, F.R.S.

Sydney.—Temperature the same as the average of 35 years; humidity 3°·8 less than the average; rainfall 1·14 in. less than the average. H. C. RUSSELL, F.R.S.

Wellington.—Rather showery weather during the month, though the total rainfall was 1°·04 in. below the average. Prevailing winds S.E. and N.W., generally moderate. Mean temp. 1°·1 below average. Slight earthquake on 9th. R. B. GORE.

Auckland.—A warm, moist month, the rainfall being nearly twice the average; otherwise there were no exceptional features to record. T. F. CHEESEMAN.

JAMAICA.—Mean hourly velocity of wind 2·4 miles; prevailing direction S.S.E.; greatest number of miles per day, 119; least, 21. Rainfall considerably above the average both in Kingston and the Island generally. R. JOHNSTONE.

TRINIDAD.—Rainfall 2·42 in. above the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,
MAY, 1894.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			
II.	Dorking, Abinger Hall.	2.21	XI.	Rhayader, Nantgwilt..	4.73
„	Birchington, Thor	3.17	„	Lake Vyrnwy	3.86
„	Hailsham	1.61	„	Corwen, Rhug .....	...
„	Ryde, Thornbrough	1.18	„	Carnarvon, Cocksidia ...	3.55
„	Emsworth, Redlands ...	1.05	„	I. of Man, Douglas	4.19
„	Alton, Ashdell	2.21	XII.	Stoneykirk, Ardwell Ho.	2.90
III.	Oxford, Magdalen Col...	1.35	„	New Galloway, Glenlee	3.26
„	Banbury, Bloxham	1.48	„	Melrose, Abbey Gate ...	4.63
„	Northampton, Sedgbrook	1.40	XIII.	N. Esk Res. [Penicuik]	4.35
„	Alconbury	1.27	„	Edinburgh, Blacket Pl..	3.20
„	Wisbech, Bank House..	1.66	XIV.	Glasgow, Queen's Park.	2.28
IV.	Southend	1.53	XV.	Inverary, Newtown	3.65
„	Harlow, Sheering	1.74	„	Islay, Gruinart School..	.84
„	Colchester, Lexden.....	1.74	XVI.	Dollar.....	2.37
„	Rendlesham Hall	2.11	„	Balquhider, Stronvar..	3.08
„	Diss	2.86	„	Ballinluig	2.07
„	Swaffham	2.41	„	Dalnaspidal H.R.S.	3.81
V.	Salisbury, Alderbury ...	1.67	XVII.	Keith H.R.S.	6.63
„	Bishop's Cannings	1.60	„	Forres H.R.S.	3.22
„	Blandford, Whatcombe.	2.82	XVIII.	Fearn, Lower Pitkerrie.	3.52
„	Ashburton, Holne Vic....	2.96	„	Loch Shiel, Glenaladale	6.33
„	Okehampton, Oaklands.	3.85	„	N. Uist. Loch Maddy ...	2.44
„	Hartland Abbey	3.03	„	Invergarry	2.54
„	Lynmouth, Glenthorne.	2.29	„	Aviemore H.R.S.	3.03
„	Probus, Lamelny	2.46	„	Loch Ness, Drumnadrochit	3.65
„	Wellington, Sunnyside..	2.04	XIX.	Invershin	2.11
„	Wincanton, Stowell Rec.	2.13	„	Scourie	3.95
VI.	Clifton, Pembroke Road	1.94	„	Watten H.R.S.	4.16
„	Ross, The Graig	2.96	XX.	Dunmanway, Coolkelure	2.66
„	Wem, Clive Vicarage ...	2.66	„	Fermoy, Gas Works ...	1.36
„	Cheadle, The Heath Ho.	2.89	„	Killarney, Woodlawn ...	2.77
„	Worcester, Diglis Lock	2.89	„	Tipperary, Henry Street	2.31
„	Coventry, Coundon	2.31	„	Limerick, Kilcornan ...	2.06
VII.	Ketton Hall [Stamford]	1.27	„	Ennis	3.90
„	Grantham, Stainby	1.69	„	Miltown Malbay.....	3.80
„	Horncastle, Bucknall ...	1.32	XXI.	Gorey, Courtown House	3.05
„	Worksop, Hodsck Priory	1.34	„	Athlone, Twyford	3.51
VIII.	Neston, Hinderton	1.99	„	Mullingar, Belvedere ...	3.35
„	Lancaster, Rose Bank...	2.85	„	Longford, Currygrane...	2.78
„	Broughton-in-Furness..	3.94	XXII.	Galway, Queen's Coll...	3.90
IX.	Ripon, Mickley	1.87	„	Crossmolina, Enniscoe..	4.46
„	Scarborough, South Cliff	1.73	„	Collooney, Markree Obs.	2.81
„	EastLayton [Darlington]	2.39	„	Ballinamore, Lawderdale	...
„	Middleton, Mickleton..	2.24	XXIII.	Lough Sheelin, Arley ..	2.46
X.	Haltwhistle, Unthank..	3.29	„	Warrenpoint	2.76
„	Bamburgh.....	2.04	„	Seaford	2.91
„	Keswick, The Beeches...	4.73	„	Belfast, Springfield	3.30
XI.	Llanfrechfa Grange	2.71	„	Bushmills, Dundarave...	2.05
„	Llandoverly	3.26	„	Stewartstown	2.45
„	Castle Malgwyn	3.67	„	Buncrana	2.95
„	Builth, Abergwessin Vic.	4.81	„	LoughSwilly, Carrablagh	2.37

MAY, 1894.

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.		In shade.	On grass.
				Dpth	Date		Deg.	Date	Deg.	Date.		
I.	London (Camden Square) ...	1.85	— .05	.41	10	16	71.5	15	33.0	21	0	6
II.	Maidstone (Hunton Court)...	1.71	+ .33	.44	26	14	...	...	...	...	...	...
III.	Strathfield Turgiss	1.66	— .21	.25	29	17	68.2	25	29.4	21	2	11
IV.	Hitchin	2.09	+ .14	.65	31	15	66.0	15a	29.0	20c	2	...
V.	Winslow (Addington)	1.55	— .55	.50	11	16	64.0	15b	29.0	21	3	9
VI.	Bury St. Edmunds (Westley)	2.68	+ .93	.90	26	15	72.0	16	31.0	21	...	...
VII.	Norwich (Brundall)	2.73	...	.72	26	22	70.0	16	34.0	21	0	8
VIII.	Weymouth (Langton Herring)	1.45	— .16	.27	16	15	66.0	18	35.0	21d	0	...
IX.	Torquay (Cary Green) ...	2.43	...	.64	17	15	66.6	25	35.5	21	0	1
X.	Polapit Tamar [Launceston]..	2.69	+ .86	.56	8	19	67.0	18	37.0	22	0	3
XI.	Stroud (Upfield)	2.01	— .03	.56	15	20	67.0	24	36.0	20	0	...
XII.	Church Stretton (Woolstaston)	3.68	+ .81	.73	11	21	61.5	25	31.0	20	2	10
XIII.	Tenbury (Orleton)	3.13	+ .58	.52	11	19	69.0	25	30.0	28	2	9
XIV.	Leicester (Barkby)	1.99	+ .02	.61	30	13	69.0	25	24.0	21	6	11
XV.	Boston	2.15	+ .43	.35	31	17	72.0	25	30.0	21d	2	...
XVI.	Hesley Hall (Tickhill).....	1.09	— .95	.26	9	17	64.0	13	27.0	21	4	...
XVII.	Manchester (Plymouth Grove)	2.61	+ .26	.52	30	19	67.0	24a	30.0	20c	2	7
XVIII.	Wetherby (Ribston Hall) ...	1.88	— .07	.42	10	14	...	...	...	...	...	...
XIX.	Skipton (Arncliffe)	2.91	+ .81	.47	13	20	...	...	...	...	...	...
XX.	Hull (Pearson Park)	1.99	+ .11	.34	25	18	63.0	14	29.0	21	2	9
XXI.	Newcastle (Town Moor)	2.36	+ .61	.43	2	21	...	...	...	...	...	...
XXII.	Borrowdale (Seathwaite).....	8.17	— .44	1.73	13	21	...	...	...	...	...	...
XXIII.	Cardiff (Ely)	2.45	— .40	.50	15	15	...	...	...	...	...	...
XXIV.	Haverfordwest	4.23	+ 1.87	1.20	15	18	71.2	19	29.4	22	3	7
XXV.	Aberystwith, Gogerddan	4.37	...	.91	8	14	72.0	18	22.0	20	10	...
XXVI.	Llandudno	2.42	+ .49	.60	14	19	60.4	15	34.2	22	0	...
XXVII.	Cargen [Dumfries]	4.29	+ 1.77	1.14	14	21	65.4	24	29.0	21d	4	...
XXVIII.	Jedburgh (Sunnyside).....	3.10	+ 1.20	.76	14	19	65.0	24	27.0	22b	5	...
XXIX.	Colmonell	2.61	...	.47	13	14	71.0	18	27.0	21	6	...
XXX.	Lochgilthead (Kilmory).....	3.48	+ .13	.56	7	13	...	...	26.0	19	6	...
XXXI.	Mull (Quinish)	4.20	+ 1.25	1.11	8	18	...	...	...	...	...	...
XXXII.	Loch Leven Sluices	2.50	— .06	.50	15	13	...	...	...	...	...	...
XXXIII.	Dundee (Eastern Necropolis)	3.20	+ 1.54	1.00	14	21	65.8	25	29.5	20	4	...
XXXIV.	Braemar	3.90	+ 1.49	.59	25	25	62.0	24	24.2	22	7	18
XXXV.	Aberdeen (Cranford) ...	4.03	...	.73	27	22	59.0	11	31.0	21	2	...
XXXVI.	Strathconan [Beauly]	4.74	+ 1.65	.95	16	14	...	...	...	...	...	...
XXXVII.	Glencarron Lodge.....	6.20	...	.74	6	24	61.7	23	28.5	21d	...	...
XXXVIII.	Cawdor [Nairn]	4.20	+ 2.45	1.07	15	22	...	...	...	...	...	...
XXXIX.	Dunrobin	3.55	+ 1.45	.73	28	18	63.0	24	32.0	13	1	...
XL.	S. Ronaldsay (Roeberry).....	2.22	+ .50	.34	14	18	59.0	24	30.0	19	2	...
XLI.	Darrynane Abbey.....	3.02	...	.56	12	22	...	...	...	...	...	...
XLII.	Waterford (Brook Lodge) ...	1.98	— .25	.45	29	14	68.5	25	33.0	21d	0	...
XLIII.	O'Briensbridge (Ross)	3.16	...	.58	15	12	...	...	...	...	...	...
XLIV.	Carlow (Browne's Hill)	4.65	+ 2.31	.76	30	20	...	...	...	...	...	...
XLV.	Dublin (Fitz William Square)	3.56	+ 1.63	1.33	15	17	64.5	25	33.0	21	0	4
XLVI.	Ballinasloe	3.21	+ .52	.42	13	18	62.0	25	32.0	21	1	...
XLVII.	Clifden (Kylemore)	6.05	...	.99	7	19	...	...	...	...	...	...
XLVIII.	Waringstown	2.08	— .36	.67	30	14	69.0	31	28.0	21	3	5
XLIX.	Londonderry (Creggan Res.)..	2.91	+ .39	.61	8	21	...	...	...	...	...	...
L.	Omagh (Edenfel)	2.94	+ .47	.49	13	20	68.0	24	29.0	21	3	9

a And 25. b And 24. c And 21. d And 22.

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

METEOROLOGICAL NOTES ON MAY, 1894.

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

ENGLAND.

STRATHFIELD TURGISS.—The month of May retained its fickle character, with a temp. rather below the average. The severe paroxysm of cold on the 21st and 22nd was most disastrous to vegetation, cutting down everything to the ground, and killing all the young shoots of ash and laurel; the potatoes also suffered greatly. T on 15th, 28th and 29th; L and T on 30th.

ADDINGTON.—A rather cold month, with a moderate R. Up to the 20th there was the prospect of abundant crops of fruit of all kinds, but a sharp frost on the morning of the 21st changed the appearance of things. Currants and gooseberries (the latter quite large) were much injured. All the first blossom on strawberries was destroyed, and young shoots on many trees were cut quite back. Plums, pears and apricots escaped. Distant T on the last three days of the month.

BURY ST. EDMUNDS.—The month was chiefly remarkable for the sharp frosts of 21st and 22nd; the exposed thermometer here fell to 28°, but it was much colder in the valleys. Vegetation was greatly damaged; potatoes, beans and ash trees quite black; barley turning yellow from the frost and cold. Vegetation much retarded, and at the close about as forward as usual. T on 10th, 26th, 28th, 29th, 30th and 31st; H and S on 26th.

LANGTON HERRING.—A cold month, and the weather very unsettled. Mean temp. at 9 a.m. (51°·6) 2°·4 below the average, the mean min. and mean max. being very nearly the same as those of the preceding month. From the 19th to the 23rd inclusive it was very cold, frost slightly damaging vegetation, and the weather being quite wintry. Solar halo on the 25th; T on the 26th.

TORQUAY, CARY GREEN.—Rainfall ·14 in. greater than, and rainy days exactly, the average. Mean temp. 0°·9 below the average. Amount of sunshine, 203 hours 50 mins., being 3 hours 30 mins. below the average.

STROUD, UFFIELD.—Frost on the 20th—potatoe tops touched, fruit destroyed, and much damage done in the valleys. T heard, and H storm in afternoon, on 29th.

WOOLSTASTON.—The earlier part of the month was genial and growing, but on the 20th it became very cold, with sharp frosts on the grass, doing great injury to the crops and the early vegetation. Violent H, with T, on the 26th, and again on the 28th, 29th and 30th. Mean temp. 47°·4.

TENBURY, ORLETON.—A very cold, unseasonable month, with a mean temp. 3° below the average, though not so cold as in 1885 and 1887. Severe frosts at the end of the month—particularly on 20th, 21st and 28th—did much damage to potatoes, fruit, &c. T on 26th, 28th, 29th, 30th and 31st.; H on 26th and 28th, and L on 26th.

LEICESTER, BARKBY.—A cold month, with heavy T during the last week. Mean temp. (49·5) lower than that of April. The frosts of 21st and 22nd were very destructive, ·02 in. of R. which had fallen just before, being turned into a coating of ice.

BOSTON.—Sharp frosts on the 21st and 22nd, which did a great deal of harm to the early potatoes, strawberries and fruit trees.

MANCHESTER, PLYMOUTH GROVE.—The coldest May experienced since observation commenced 27 years ago, with the one exception of May, 1885, when the mean temp. was 49°·0. The temp. on grass fell to 25° on the 20th and 21st, and to 28° on the 24th, and considerable damage was done to fruit and vegetation. T and L on the 29th; TS and H shower on the 30th. Mean temp. 49°·1.

WALES.

HAVERFORDWEST.—May commenced fine, but with a much reduced temperature from the preceding month. The wind blew with great force on the night

of the 3rd and on the 4th. It was generally dry, cool and fine up till the 9th, when an exceedingly wet period set in, and between that date and the 15th more R fell than in the months of April, May and June, 1893. This stimulated vegetation amazingly in conjunction with fine sunlight and warm temp., but a severe check set in on the 20th, after a day of unusual warmth, and N.E. winds, with clear sky, and low night temperatures prevailed to the 27th. The last four days were wet.

GOGERDDAN.—Very cold throughout the month, with S and H storms and sharp frosts, doing much damage to all vegetation.

SCOTLAND.

CARGEN.—The mean temp. of the month ($46^{\circ}\cdot9$) is $3^{\circ}\cdot9$ below the average for May. Rather severe frosts occurred on the 21st, 22nd, 23rd, and 24th, and great damage was done to vegetation. All early potatoes were frosted down, and much damage done to grass lands, young shoots of trees, flowering shrubs, &c. With the exception of 1885, when the mean temp. was 46° , this is the coldest May since observations commenced 34 years since. The total R for the first five months of the year is $8\cdot07$ in. above the average. N. and E. winds prevailed for 23 days. TSS occurred on 17th, 21st, 29th, 30th, and 31st. S and H fell on the 20th, 21st, and 27th. In every respect it was the worst May for many years. Slight earthquake shock on 16th. Very brilliant meteor at 8.15 p.m. on 18th, travelling from N.W. to S.; it separated into two parts, leaving a long train of light distinctly seen, though it was bright daylight.

JEDBURGH.—The weather was most ungenial. The wind after the 8th, with one exception, was either N., N.E., S.E., or E. The frost that began on the 20th injured potatoes, bush and tree fruit, and beech, sycamore, spruce, and pine shoots. Vegetation made little progress during the month.

MULL, QUINISH.—Frost on night of 19th blackened potatoes and young growth of trees, &c. T, L, and H on 30th.

BRAEMAR.—A very cold month, and night frosts very damaging. Sunshine 135 hours 40 minutes. On the 22nd the temp. on grass fell to 17° , and icicles were seen nearly five inches long.

ROEBERRY.—A very cold and unsettled month throughout. Mean temp. $45^{\circ}\cdot3$.

IRELAND.

DARRYNANE ABBEY.—A very cold, ungenial month, with a few warm days at the beginning. Vegetation very backward.

WATERFORD, BROOK LODGE.—Frost on the 21st, 22nd, and 23rd, which blackened potatoes, mangolds, heliotropes, beans, &c. The whitethorn blossomed in the most wonderful manner this year. The ash trees were very late coming into leaf. T, L, and heavy H on 29th.

O'BRIENSBRIDGE, ROSS.—Generally, a cold and ungenial month. Hail showers frequent. Sharp frosts on 20th, 21st, and 22nd.

DUBLIN.—This was a cold, changeable month, more like an ordinary March than May. The mean temp. ($49^{\circ}\cdot2$) was actually lower than that of April by nearly one degree, and was $7^{\circ}\cdot5$ below that of May, 1893, being fourth in order of coldness in the past 30 years. A solar halo was seen on the 6th. High winds were noted on as many as 11 days, attaining the force of a gale on the 16th. T was heard on the 15th, 29th, and 30th. H fell on the 7th, 20th, and 28th. S and sleet on the 20th. Foggy on the 16th, 17th, and 23rd.

EDENFEL.—A harsh, unnatural, unsatisfactory month, with rainfall above, and temp. below, the average, destroying much of the bright promise of April. There was frost of more or less severity on nine nights in the latter half of the month, that of the night of the 21st having been more destructive in its effects than any frost in May for over 30 years. An unusually luxuriant and prolific vegetation of leaves and flowers was caught at its tenderest period, and plants of all kinds, including young hardy trees and even grass, received a check from which some will never recover, and the rest not during this year.

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CCCXLII.]

JULY, 1894.

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or 5s. per ann. post free.]

THE MAY FROST OF 1894.

WE revert to this subject not only because of its importance, and because we wish to insert two paragraphs which were crowded out last month, but because Mr. Harold Smith quite rightly criticises our statement in Section (4), p. 72. We say "quite rightly," because he quotes facts in support of his views; and it is only by criticism that truth can be elicited. We may have been wrong in assuming that the cause was identical throughout the country, but we think that the data in our last prove that Mr. Harold Smith's explanation will not do generally. He speaks of a "very strong, cold, and very dry N.E. wind," but the Rev. H. A. Boys, who got up at 3.20 a.m. on purpose to see what was going on, says, on page 67, "the air was wonderfully bright, keen and still." We think that Mr. Smith will be interested in Mr. Slade's report from Beckford; and for the present leave the subject, with the suggestion that it is probably not too late even now to ascertain for the vicinity of Kenley the relative damage at various heights above sea level, and at places exposed to, and sheltered from, N.E. winds. If Mr. Smith, or the "Croydon Microscopical and Natural History Club," will undertake this, we shall be happy to place a page or two at their disposal to report the result.

To the Editor of the Meteorological Magazine.

SIR,—In your "Comment No. 4" you attribute the damage done by the May Frosts to the radiation of the heat into space, which was facilitated by a clear sky and is proved by the grass temperatures. Here the values were:—

	Minimum Stevenson stand.	Grass.
May 21st, 1894	30°	27°
„ 17th, 1891	30°	26°
„ 12th, 1888	31°	24°

In 1894, with a difference of 3° between the stand thermometer and grass, an unprecedented damage was done; in the two other years only slight damage. 1888 and 1891, had, however, both been preceded by cold Aprils, and the differences were 4° and 7°.

On May 1st, 1892, min. on stand 31°, on grass 24°
 „ „ 7th, „ „ „ „ 26°, „ „ 18°

April, 1892, was warm—the differences in May, 1892, 7° and 8°

and still no extraordinary damage—but the earliness of the dates may partly account for that.

I think that the damage at Kenley is proved by the above not to have been due to radiation alone; a difference of only 3° does not point to so clear a sky with us, and yet our hardy English trees (Yews, Ashes, Maples and even Oaks) have suffered in a manner I never saw before.

There was one feature in the 1894 frost you do not mention in your comments, which is the prevalence at the time, of a very strong, cold and very dry North-East wind. I am of opinion that that wind was the criminal who robbed us of our garden stuff and spoiled the beauty of our trees. On all the other occasions I have quoted above, the air was comparatively calm.

Probably, first, radiation causes on the foliage a deposit of hoar frost. Second, the sun rises early and melts the hoar frost. Third, the wind blows strongly into the damp foliage, and causes a very rapid evaporation and consequent lowering of temperature in the foliage and young shoots, and to this third cause in my opinion the damage is due.

As an instance of what a cold N.E. wind can do, I relate the following:—In our garden at Hull, we had a small fountain; one winter's morning looking out, I saw large icicles hanging from the upper basin. I, of course, thought there had been a sharp frost, but on consulting the thermometer there had been no frost either on the stand or on the grass. At the time this occurred a strong dry N.E. wind was blowing, and the only cause I could assign for the formation of the icicles was the rapid evaporation caused by the cold, dry wind and consequent abstraction of heat from the trickling water. If the wind could do that, I think it could also cause the damage to vegetation that occurred last month. Please also note air temperatures are mild comparatively to some recorded and yet the damage occurred.

Yours sincerely,

Ingleside, Kenley, Surrey, 19th May, 1894.

HAROLD SMITH.

To the Editor of the Meteorological Magazine.

SIR,—Your statements as to the relative severity of the May frosts of 1891 and of this year are borne out by the state of the foliage as seen in travelling between Northallerton and Newcastle. At most spots on that line there is a good deal of brown, yet at least some green tinge is on almost, if not quite every tree; whereas in 1891, many beeches were perfectly brown, the nipping being much more severe in that year. In Cleveland, too, the nipping is very slight; while in 1891 it was severe. Yet the damage to the fruit crop is much greater than in 1891.

In the Swindon district the foliage is almost as much nipped as on the North-Eastern Railway, but I was not in that part in 1891, so cannot compare the two years there.

T. W. BACKHOUSE.

Sunderland, July 7th, 1894.

BECKFORD, GLOUCESTER.—The frost has done immense damage ; early potatoes and kidney beans are practically destroyed ; plums, strawberries and early peas that were either in blossom or pod have suffered severely, and what on May 20th promised a very good crop, may now be expected to yield less than half an average. The spring-planted beans in the fields, which were half a yard high, bent their heads to nearly touch the ground, and some of the stalks were cracked. This cannot fail to have a bad influence on the crop at harvest. Cherries and apples are also damaged ; in short, all kinds of fruit and vegetables have suffered more or less from the severe frosts of May 20th—22nd.

The frost was confined entirely to the valleys and low-lying districts near the rivulets and watercourses. Beckford is 120 ft. above the level of the sea. At Grafton, which is 200 ft. above sea level, scarcely any damage was done ; in one or two patches of potatoes only just the tops of the haulm was nipped, and at 30 ft. higher, at the upper end of the village, there was no trace of a frost having occurred. At Cobbler's Quarry, an elevation of 520 ft., the potato haulm and kidney beans exposed to the full blast of the cold north-easterly winds were not even touched by frost. At the Overbury allotments, 330 ft. above sea level, no damage was done ; but at the lower end of the village, which is the same elevation as Grafton, just the tops of a few patches of potatoes were scorched.

A line drawn at 230 ft. above sea level—or, what is more to the purpose, 100 ft. above the level of the brook in the valley—would represent the limit of the frost. Above that line no damage was sustained ; below that line everything in the shape of fruit and vegetables is more or less affected, the destruction increasing in intensity the nearer the watercourses, where it is indeed lamentable.—*Report for week ending May 24th, by Mr. F. Slade.*

EFFECTS OF THE FROST.—Reports from many counties in England and Scotland testify to serious damage having been done to tender crops by the frosts which occurred at the beginning of last week. The tops of potatoes were blackened in fields and gardens, and in many cases were killed quite down to the ground. French beans were destroyed, and early peas nearly or quite fit for picking were badly injured, while other crops in market gardens were more or less damaged. Early swedes and other turnips, just up, are reported by the *North British Agriculturist* to have been destroyed in Scotland. Some kinds of fruit, too, suffered a good deal in exposed situations from frost, while hailstorms were still more destructive in some parts of the country, cutting the fruit off the trees, and almost stripping them in the worst cases. Where strawberries were forward in the berry stage, as in Kent and other parts of the South, they were spoilt, and hop vines in exposed plantations were injured. Even such forage crops as clover, sainfoin, and vetches were affected in many places. Some of the injured crops will recover, while others, such as French beans and turnips, have been quite destroyed. Potatoes will grow fresh tops, but will be put back a good deal by the necessity of making a fresh start, and will yield badly in the end, or, at any rate, much less than they would have produced if no damage had been done to them. The misfortune is exceptionally partial in its coincidence. The frost was mainly a wind frost, and, therefore, it was most felt in exposed situations ; but it was a white frost in some parts of the country, and there its results are as serious in low-lying damp places as where the wind swept over the land without check. On the other hand, many a sheltered garden escaped injury entirely, and a smaller propor-

tion of fields and fruit and hop plantations. Apart from the frosts, the weather during the month now nearly ended has been cold and altogether unpropitious to vegetation, so that the farm outlook has deteriorated in a marked degree. Most of the white-straw crops have now assumed a sickly colour, and peas and beans have suffered quite as much as a rule. Even the hay crop, of which high hopes were raised a month ago, will be much smaller, as well as less satisfactory in quality, than it was expected to prove. Only the hardy varieties of herbage have been able to make much headway during this very unseasonable month of May. Warm weather immediately would do a great deal to restore the hopeful prospects of the early period of spring, but even another week of such low temperature as has been lately experienced would go far towards destroying the hope of a good harvest.—*Standard* (reprinted in *Hereford Times* of June 2nd).

STRAWBERRIES IN 1894.—The season of 1894 has in this locality but one word to describe it—disaster. The greater number of varieties were in full bloom when we experienced a frost, which not only registered 10° at 3 feet from the grass, but which lasted for at least six hours. The consequence was that not only the expanded blooms, but also the majority of the unopened buds, were destroyed, and the few blooms which survived this ordeal have been prevented bringing their fruit to perfection by the extraordinary hot weather and parching winds which have prevailed during the past three weeks.—A. H. PEARSON, Chilwell, Notts, in *Journal of Horticulture*.

ROYAL METEOROLOGICAL SOCIETY.

The closing meeting for the session of this society was held on Wednesday, June the 20th, at the Institution of Civil Engineers, Great George-street, Westminster, Mr. R. Inwards, F.R.A.S., President, in the chair.

Mr. R. H. Scott, F.R.S., read a paper on "Fogs reported with Strong Winds during the 15 years 1876-90 in the British Isles."

In a paper read before the society in June, 1893, the author drew attention to the instances of fog occurring with forces of wind of 6 and upwards on Beaufort's scale, and the present paper gives the results of an investigation of the conditions under which these fogs occurred.

Firstly, the distributions of pressure under which these fogs were reported were examined, in order to learn whether they were cyclonic or anticyclonic.

Secondly, the actual weather reported on each occasion was noted, whether simply "f," or qualified by any other letter, such as "o" "u" "d" "f"—overcast, ugly, drizzle, and fog.

Thirdly, the temperatures were extracted not only for the hour at which the fog was reported to have been present, but also the maximum temperature for the 24 hours to which the observation belonged.

Fourthly, the rain was extracted for the preceding and the succeeding days, except in the case of the 6 p.m. fogs, where only the rain reported at 8 a.m. next morning was tabulated.

It should be remarked that these fogs do not occur with typical anticyclonic conditions inasmuch as a wind force of 6 (Beaufort scale) implies steep gradients, and these are incompatible with an anticyclone. The fogs can occur only on the outskirts of the anticyclone, and as usually cyclones press rather closely upon anticyclones, it was often difficult to decide to which system the reported fog properly belonged. An attempt was, however, made to form a judgment on each case, and the accompanying table shows the number of the fogs attributed to each category and referred to winds from different quadrants.

The total number of strong wind fogs dealt with was 135 :—

Winds from	Cyclonic.	Anticyclonic or doubtful.	Total.
N. to E.N.E.	7	0	7
E. to S.S.E.	13	5	18
S. to W.S.W.	81	14	95
W. to N.N.W.	7	8	15
	Total 108	27	135

It need scarcely be said that in general no precipitation occurs with ordinary fogs. In the case of the strong wind fogs, this is far from being a correct statement, although it is the predominant condition of those classed under anticyclones. Of the 27 cases of the latter class of fog, 21 were dry, or at least unaccompanied by as much as 0.1 in. of rain. Of the 108 cases classed as cyclonic fogs, only 30 were dry to the same extent, and 78 were either accompanied with, or followed immediately by, rain (sometimes heavy) and in 18 cases exceeding half-an-inch. It is therefore evident that the majority of these fogs are essentially wet fogs.

All the cases were picked out in which the temperature at the time the fog was reported, either agreed with the maximum for the day or fell only 1° below it.

Of the 27 anticyclonic fogs, 11 fulfilled this condition, and of the 108 cyclonic fogs 61 fulfilled it. Accordingly, out of 135 fogs, 72 or 54 per cent., occurred with temperatures either agreeing with, or very close to, the maximum for the day.

It appeared interesting to examine into the relation of these strong wind fogs to storms. They sometimes occur with actual gales and there were 11 such instances among the fogs classified as cyclonic. No fewer than 25 cases are put down as "preceding severe gales." That fogs sometimes occur just before gales is well known. They are frequently only the last dregs of a regular anticyclone fog to be dispersed by the incursion of the gale.

The overwhelming majority of these cyclonic fogs with South-westerly winds—81 out of 108—and their much greater prevalence on the south-west coast (Scilly, Pembroke, Prawle Point) than elsewhere, points distinctly to their marine origin. They come in to us from the Atlantic Ocean.

They are apparently very thick mist, or very dense rain, and in the author's opinion, should not receive the name of "fog," but that of "mist."

Captain Wilson Barker said that there is a well marked area between cyclones and anticyclones where fog may be expected and is, with a falling barometer, a good prognostic of wind.

Captain Tissard would have liked some observations at sea to be included in the paper, and thought that more precise definition of fog was wanted; many instances in the paper of fog and drizzle would have been described by seamen simply as dirty weather.

Mr. Charles Harding agreed as to the great need for definitions of fog, mist, &c., and referred to the prognostics of fog in the United States, based on the distribution of pressure and the direction of the wind. He thought that as most of the stations reporting the fogs were on the coast, the temp. of the sea would be an important element.

Mr. Gaster, in referring to the definitions of fog and mist, said there were two classes of phenomena which obscured luminaries. One with low temp., dry air, calm and no sensation of drops of moisture; the other with low barometer, high temp., strong wind and wetness—the only characteristic in common being the obscuration. He thought it most necessary that the two should be distinguished.

Dr. Marcet thought the most striking fact was that the fogs referred to occur so frequently with the max. temp. when one would not expect condensation.

Mr. R. H. Curtis spoke of the confusion between London and country fogs, the irritating properties of fog being entirely due to town products, dry fogs being confined to towns, while country fogs are all more or less moist.

Mr. Symons referred to the great differences of opinion expressed in the previous discussion as to the definition of fog, mist, haze, and raised the question of the adoption of some measure of the intensity of fogs, asking whether two objects at different distances but subtending the same angle would be equally obscured.

Mr. H. N. Dixon said that on land dust nuclei and a saturated atmosphere were necessary for the condensation of mist, while at sea saline particles in the air would induce a fog or mist when the air was not saturated.

Mr. Scott, in replying, said that the Meteorological Office was not responsible for any definition of fog, but that the paper was based simply on the reports of the observers. The limits of an adjoining cyclone and anticyclone are absolutely undefined, and it is at times impossible to state in which a given fog area should be included. As a rule observations were not commenced till the vessels were far from land, so that no records at sea were available for the paper. At Kew observations had been made for some time on the visibility of objects

at various distances, but the results were affected enormously by variations of illumination and by the direction of the sun.

Mr. R. H. Curtis, F.R. Met. Soc., read a paper on "Some characteristic features of Gales and Strong Winds." After calling attention to the unsatisfactory state of anemometry, and after describing the "bridled" anemometer at Holyhead, Mr. Curtis stated that the greatest force of an individual gust which he had met with, was registered in December, 1891, and amounted to a rate of 111 miles per hour, which with the old factor would be equivalent to a rate of about 160 miles per hour. Gusts at a rate from 90 to 100 miles per hour have many times been recorded, but the usual limit for gusts may be taken to equal about 80 miles per hour, which on the old scale would be equivalent to about 120 miles per hour. Gales and strong winds differ in character very much, and as the result of a prolonged study of their general features as recorded by the bridled anemometer, the author has been able to group them into three general classes.

The first class comprises those gales which are essentially squally in character—in which the gusts constitute the main feature of the gale. In such a case the squalls and lulls alternate very rapidly, and indeed the wind is never constant in force for many seconds together. Usually it oscillates over a range of perhaps 10 or 20 miles at a mean strength of perhaps 40 miles per hour, but every now and again it bursts out with a velocity of perhaps 40 or 50 miles an hour above the average, and after a few seconds sinks to a rate of 10 or 20 miles below it. This is certainly the most usual character of the gales experienced on our coasts, although they vary immensely as regards the strength and frequency of the gusts and lulls, and also as to the average velocity which may be called the "normal of the gale."

The second class of gales is that in which the velocity of the wind is tolerably steady, much steadier than in the first. The "normal" of the gale covers a much smaller range, perhaps not more than a rate of five or six miles per hour, and the squalls are far less severe; and I have noticed that generally they are not accompanied by lulls falling much below the "normal," or if the lulls are frequent then the squalls above the "normal" are comparatively few. This is a rather curious feature, but I have noticed it in several cases.

The third class should perhaps have been the second, inasmuch as it is a distinctly squally variety of gale. But the characteristic by which it is distinguished is peculiar. The record made by the anemometer has two "normals," connected by a lighter band of shading. Indeed the gale appears to be made up of two series of rapidly succeeding squalls, the one series at a comparatively low rate of velocity, the other at a much higher one, the wind force shifting rapidly and very frequently from the one series to the other.

On looking carefully over the records, the author found, often-

times very distinctly marked, a long pulsation in the wind force which recurs again and again with more or less regularity at intervals of perhaps 20 minutes or half-an-hour in some cases, and in others at longer intervals of about an hour, more or less.

SUN SPOTS AND AIR TEMPERATURE.

To the Editor of the Meteorological Magazine.

SIR,—A.B.M. is persevering. He now, in your number for April, suggests, in regard to sun spots and air temperature, a difference in the summer and winter effects, and thinks that I have assumed that these must necessarily be similar. Not at all. The essence of my comparison was that January was compared with January, February with February, and so on. This should bring out any possible different effect at different seasons of the year. But to save space I did not, in the communication printed in your March number, give all the figures that might have been presented. Of the four columns of temperature there included, two refer to sun spot minima, and two to sun spot maxima, equally distributed, and therefore all equally representative (as regards sun spot influence) of the complete period discussed, 1763 to 1892, no monthly mean depending on less than five epochs of minima or maxima. I there compared Min. No. 1 with Max. No. 1, and Min. No. 2 with Max. No. 2. I now repeat these, giving in addition comparison of Min. No. 1 with Max. No. 2, and Min. No. 2 with Max. No. 1 :—

Month.	Min. No. 1 above Max. No. 1.	Min. No. 2 above Max. No. 2.	Min. No. 1 above Max. No. 2.	Min. No. 2 above Max. No. 1.
January	-0.13 ...	+0.48 ...	+0.75 ...	-0.40
February	-0.85 ...	-0.32 ...	-0.42 ...	-0.75
March	-0.17 ...	-0.92 ...	-1.54 ...	+0.45
April.....	+1.88 ...	-0.38 ...	-0.81 ...	+2.31
May	+1.04 ...	-0.51 ...	-0.43 ...	+0.96
June	+1.11 ...	+0.88 ...	+0.81 ...	+1.18
July	+0.95 ...	-1.45 ...	-0.69 ...	+0.19
August.....	+1.10 ...	-0.81 ...	+0.01 ...	+0.28
September	+2.15 ...	+0.35 ...	+1.04 ...	+1.46
October	+1.66 ...	-1.31 ...	+0.55 ...	-0.20
November	+2.18 ...	+0.13 ...	+0.43 ...	+1.88
December.....	-0.21 ...	-0.02 ...	-0.53 ...	+0.30
The Year.....	+0.88 ...	-0.32 ...	-0.07 ...	+0.63

The discordance between the four values, exhibited in individual months, arising probably from general irregularity of temperature due to various causes, seems to render it hopeless to endeavour from discussions of this nature to evolve any definite sun spot effect.

W. E.

June 18th, 1894.

THE ANTWERP CONGRESS.

IN connection with the International Exhibition now being held at Antwerp, there is to be on August 16th to 18th a congress of persons interested in the Science of the Atmosphere.

The General Secretary has requested us to bring the subject before our readers, and we have much pleasure in complying with his wish.

The aim of the Congress is not so ambitious as is its title. The Congress will be divided into two sections; the first will deal with:—

1. General theory of the currents of the atmosphere and of their causes.
2. Methods of observation at various altitudes.
3. Instruments, recording apparatus, &c.
4. Maps of the permanent and variable currents of the atmosphere and comparison with those of the oceans.

The second section will deal with Aerodynamics, divided as follows:—

1. Measures of the velocity of the wind.
Actions on plane and inclined surfaces; friction; experimental apparatus; effect of wind on bridges, buildings, towers, &c.; wind as a motor; aeroplanes, windmills, turbines, ship's sails; wind as a retarder of motion; transport by land, by sea, and by air.
2. Application of ascertained facts to the problem of Ærial navigation; Ærial propulsion by wheels, helices, &c.

We understand that the Congress will be under Royal Patronage, and if we may judge of all the officers by the two whom we know, they are probably the best of the country; for the President of Section 1 is M. Lancaster, Meteorological Inspector at the Royal Observatory, the well-known Astronomical Bibliographer and Editor of *Ciel et Terre*; and he is supported by M. Vincent, also of the Royal Observatory, who acts as Secretary.

The circular points out that while the problem of ærial navigation is the leading one for consideration, many other questions will be considered, and knowledge will be gained as to the motion of upper clouds, as to the effect of wind upon buildings, as to weather-forecasting and other matters, and, moreover, as there will be some other congresses in session at the same time, there will be various fêtes and public functions at which the members can be present.

The Committee invite communications, and members—Gentlemen's tickets 10 fr. (including a copy of the volume when published). Ladies' tickets 5 fr.

We wish the meeting good success, and conclude by giving the address of the General Secretary, to whom all communications and enquiries should be addressed.—Monsieur le Chevalier Le Clement de Saint Marcq, Rue du petit Chien, 16, Anvers.

SHORT NOTES.

A WHIRLWIND IN SURREY.—Mr. Sidney H. Burchall writes from Reigate under date of June 21st: Whilst standing to-day in an open hay field, situated about a mile south of this town, I and others witnessed what may be described as a whirlwind, but of such unusual character that it may perhaps be worth recording. The field lies on high ground, exposed to the south, and at the time of my visit about one o'clock, several men were engaged in turning over a heavy crop of hay. The day had been a brilliant one, and was then very warm, and I could not perceive any movement of the trees which bounded the field on the east and west sides. Without warning an extraordinary whirlwind broke on the field within a few yards of where I stood, catching up the hay with violence. For some moments the air was filled with wisps of hay, whirling in rapid movements, and in circles gradually getting larger and larger as they rose in the air; but, what was so striking, rising to a great height. At the same time that this happened several rooks were passing. These appeared also to be caught by the tornado, and were likewise carried up to a great elevation; in fact, until I could no longer follow them. The passage of the storm was from west to east, but it seemed to travel very slowly, and was ultimately dispelled by the trees at the opposite end of the field.

The above is of interest as giving (unconsciously) a graphic picture of the cause of the formation of whirlwinds. An open field, high and exposed to a brilliant sun, the air calm and very warm, therefore expanded and of light specific gravity, hence unstable equilibrium, suddenly broken with the inevitable result of circular motion and the lifting of light objects like the hay.

HARVEST WEATHER FORECASTS.—For some years the Meteorological Council (the Government Office be it understood—not the Council of the Royal Meteorological Society) have during the summer issued forecasts of what they expected the weather to be. These telegrams are sent at the public cost to certain counties so that their value or otherwise may be demonstrated. The following cutting from the *Ayrshire Observer* gives a general idea of the local arrangements.

CUMNOCK.—WEATHER TELEGRAMS.—The first of these telegrams, which are to be sent out by the Board of Agriculture for the next eight weeks, reached the Post Office here and was displayed in the window about 4 p.m. on Wednesday, June 27th. These weather warnings are being sent to all the telegraph Post Offices in Ayrshire and Haddingtonshire, and are meant to be of use to farmers in ordering their operations during the hay and grain-crop harvests. It should be borne in mind that the prognostications of the kind of weather which is likely to be experienced always refer to the day succeeding their arrival, and should be studied that night or next morning; and if the morning, then of course they refer to the day then entered upon. Most certainly they are well worthy the attention of farmers, for, as a rule, they will be found to foretell the weather with remarkable correctness. In every district a person has been appointed to keep a daily register of the weather actually experienced, and which, at the end of the eight weeks, will show how far these forecasts

have been accurate and may in future be depended on. "Our own Correspondent" of many years on "Weather, Farming, &c," has been appointed to keep the register here, and from the deep interest he has long taken in the subject, it is sure to secure his closest attention. These forecasts have commenced two full weeks too early for Scotland, and ought to have continued till the end of September, it being very seldom that the grain-harvest is over before that time. Ending, as is proposed, about the middle of August, hardly any crops will be reaped at that date. The Board of Agriculture ought to have consulted some leading agriculturists in Ayrshire and Haddingtonshire on the matter.

INJURY BY LIGHTNING.—Mr. Alfred Littlejohn, of The Bounds, Hernhill, near Faversham, Kent, writes of an extraordinary occurrence which took place in his farmyard during the recent thunderstorm. He says: "It may interest your readers to know that during the severe thunderstorm I had 100 head of poultry struck by lightning, three-parts of which were Aylesbury ducks, and the remainder young chickens. They were in a cherry orchard, with plenty of shelter, but were found early this (Saturday) morning lying about in all directions. They seemed to have been struck in the eye, as in most cases there was a black mark which extended about a quarter of an inch each side of the orbit, and had enlarged the pupil to a very great extent." The incident shows the necessity of ducks and chickens carrying about their own lightning conductors.—*Daily Telegraph*, July 10th, 1894.

This may well be described as an "extraordinary occurrence." Much additional information is desirable—*e.g.* Were any of the trees struck? Were the chickens mostly found under the trees? Was every one of the 100 killed; or were there more than 100 in the orchard, and only 100 killed; *i.e.*, were there any survivors?

THE SUNSHINE OF 1893.—The number of hours of bright sunshine recorded at Greenwich during 1893 by the Campbell-Stokes sunshine instrument was 1,454, the greatest number on record since the commencement of the registration in 1877. This is 171 hours above the average of the preceding 16 years, after allowance is made for the small difference of indication of the Campbell and Campbell-Stokes instruments. The aggregate number of hours during which the sun was above the horizon was 4,454, so that the mean proportion of sunshine for the year was 0.326, constant sunshine being represented by 1.

A WEATHER PROPHECY.—"July will be a dry month, and there will be very few days with a maximum temperature under 70°, and at times it will exceed 90°."—*Hugh Clements in "Hereford Times" of July 7th.*

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JANUARY, 1894.

STATIONS. (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver. Cloud.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
England, London	52·0	11 ^a	13·1	5	43·2	32·6	34·8	87	76·8	14·3	2·87	25	7·1
Malta	63·8	25	42·0	18	59·1	47·4	46·0	84	114·2	35·5	4·00	19	7·2
<i>Cape of Good Hope</i> ...	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>Mauritius</i>	86·4	6	71·0	17	83·1	73·7	70·0	78	137·6	65·1	14·58	20	6·6
Calcutta	84·1	22	50·1	9	78·1	55·7	55·7	71	135·1	41·0	·00	0	6·6
Bombay	87·3	7	65·8	5	83·1	68·7	64·8	69	132·2	57·0	·22	1	0·3
Ceylon, Colombo	90·1	16	66·0	29	87·0	70·9	68·4	74	153·5	54·0	·62	5	4·4
<i>Melbourne</i>	102·5	21	52·0	15	80·2	58·6	57·4	69	149·2	45·6	·47	8	4·5
<i>Adelaide</i>	105·7	2	50·2	16	86·4	60·7	52·1	47	164·5	43·2	·68	4	2·7
<i>Sydney</i>	97·0	12	60·5	20	78·5	66·3	62·6	72	155·6	49·9	1·61	19	6·7
<i>Wellington</i>	80·0	13 ^b	44·0	30	71·9	58·4	55·9	75	145·0	30·0	6·84	11	4·6
<i>Auckland</i>	82·0	27	50·0	30	75·0	62·4	61·2	79	148·0	47·0	2·68	...	4·8
Jamaica, Kingston.....	89·0	30	64·3	19	84·8	66·7	65·2	76	...	...	·19	4	3·5
Trinidad .....	...	...	...	...	...	...	...	...	...	...	...	...	...
Toronto	47·3	4	10·3	25 ^a	34·5	22·1	24·3	81	...	4·0	1·67	17	7·0
New Brunswick, Fredericton	49·8	25	-30·5	11	23·4	-1·9	9·7	80	...	...	2·99	13	5·0
Manitoba, Winnipeg ...	39·0	13	-46·1	24	4·9	-18·3	...	...	...	...	1·16	...	5·0
British Columbia, Esquimalt	51·0	14	24·3	6	41·4	32·9	35·0	91	...	...	7·24	21	8·0

a And 27. b And 15.

REMARKS.

MALTA.—Adopted mean temp. 52°·5; mean hourly velocity of wind 7·8 miles. TS on 12th, 27th, and 30th. L on 6 days. H on 5 days. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·5 below, dew point 0°·2 above, and rainfall 7·07 in. above, their respective averages. Mean hourly velocity of wind 13·5 miles, or 2·2 above average; extremes, 41·0 on 13th, and 1·9 on 16th; prevailing direction, E.S.E. to E. by N. L on 2nd, T on 8th, and T and L on 28th. Disturbed weather from the 9th to the 14th, during which a cyclone passed E. and S.E. of Mauritius. C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—Lightning was seen on the 12th. D. G. MANTELL.

Melbourne.—Lightning on the 3rd, 13th and 25th; thunder on the 6th.

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

Adelaide.—Mean temp. 0°·8 below the average of 37 years. Rainfall ·15 in. below the average. First half of the month very cool, latter half very hot.—C. TODD, F.R.S.

Sydney.—Weather generally hot and dry. H. C. RUSSELL, F.R.S.

Wellington.—Showery for first few days, wind S.E., then fine weather, with moderate N.W. wind, until the night of the 16th, when E came on from N.W. and continued until 19th, wind changing to S.E., 2·22 in. rain recorded on the 18th. Fine from 20th to 24th, then showery for remainder of month. Prevailing N.W. wind, and generally moderate. On the whole pleasant and warm weather. Slight earthquake on 11th at 10.15 p.m. R. B. GORE.

Auckland.—On the whole an average and seasonable month. Mean temp. slightly in excess of the average of the previous 27 years. Rainfall slightly below the average. T. F. CHEESEMAN.

JAMAICA.—Rainfall one-seventh of the average. Mean hourly velocity of wind 2·9 miles. For the whole Island the rainfall was only one-half the average.

R. JOHNSTONE.

SUPPLEMENTARY TABLE OF RAINFALL,
JUNE, 1894.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			
II.	Dorking, Abinger Hall.	2·75	XI.	Rhayader, Nantgwillt..	2·55
„	Birchington, Thor	1·90	„	Lake Vyrnwy	3·08
„	Hailsham	1·64	„	Corwen, Rhug	1·24
„	Ryde, Thornbrough	1·86	„	Carnarvon, Cocksida ...	1·97
„	Emsworth, Redlands ...	1·80	„	I. of Man, Douglas	3·41
„	Alton, Ashdell	2·40	XII.	Stoneykirk, Ardwell Ho.	3·87
III.	Oxford, Magdalen Col...	2·77	„	New Galloway, Glenlee	3·25
„	Banbury, Bloxham	1·87	„	Melrose, Abbey Gate ...	3·38
„	Northampton, Sedgebrook	2·18	XIII.	N. Esk Res. [Penicuick]	3·10
„	Alconbury	2·10	„	Edinburgh, Blacket Pl..	2·65
„	Wisbech, Bank House..	2·67	XIV.	Glasgow, Queen's Park.	2·76
IV.	Southend	2·28	XV.	Inverary, Newtown	4·42
„	Harlow, Sheering	2·05	„	Islay, Gruinart School..	·83
„	Colchester, Lexden.....	2·01	XVI.	Dollar	2·99
„	Rendlesham Hall	2·81	„	Balquhiddier, Stronvar..	3·51
„	Diss	2·16	„	Ballinluig	1·92
„	Swaffham	2·92	„	Dalnaspidal H.R.S. ...	2·86
V.	Salisbury, Alderbury ...	2·29	XVII.	Keith H.R.S.	1·54
„	Bishop's Cannings	2·82	„	Forres H.R.S.	1·38
„	Blandford, Whatcombe .	2·88	XVIII.	Fearn, Lower Pitkerrie.	1·54
„	Ashburton, Holne Vic....	2·51	„	Loch Shiel, Glenaladale	...
„	Okehampton, Oaklands.	2·43	„	N. Uist. Loch Maddy ...	2·37
„	Hartland Abbey	2·05	„	Invergarry	2·05
„	Lynmouth, Glenthorne.	1·79	„	Aviemore H.R.S.	1·68
„	Probus, Lamellyn	2·05	„	Loch Ness, Drumnadrochit	1·66
„	Wellington, Sunnyside..	1·76	XIX.	Invershin	1·59
„	Wincanton,StowellRec.	2·86	„	Scourie	1·90
VI.	Clifton, Pembroke Road	2·41	„	Watten H.R.S.	1·55
„	Ross, The Graig	1·76	XX.	Dunmanway,Coolkelure	3·36
„	Wem, Clive Vicarage ...	2·68	„	Fermoy, Gas Works ...	1·88
„	Cheadle, The Heath Ho.	2·51	„	Killarney, Woodlawn ...	2·57
„	Worcester, Diglis Lock	2·07	„	Tipperary, Henry Street	2·19
„	Coventry, Coundon	1·93	„	Limerick, Kilcornan ...	1·98
VII.	Ketton Hall [Stamford]	1·98	„	Ennis .....	...
„	Grantham, Stainby	1·88	„	Miltown Malbay.....	3·08
„	Horncastle, Bucknall ...	2·50	XXI.	Gorey, Courtown House	2·70
„	Worksop,Hodsck Priory	2·25	„	Athlone, Twyford	2·26
VIII.	Neston, Hinderton	2·14	„	Mullingar, Belvedere ...	2·58
„	Lancaster, Rose Bank ...	2·81	„	Longford, Currygrane ...	1·84
„	Broughton-in-Furness..	5·01	XXII.	Galway, Queen's Coll...	2·75
IX.	Ripon, Mickley	3·76	„	Crossmolina, Enniscoe..	3·04
„	Scarborough,South Cliff	4·24	„	Collooney, Markree Obs.	2·52
„	EastLayton[Darlington]	4·00	„	Ballinamore, Lawderdale	2·40
„	Middleton, Middleton..	3·19	XXIII.	Lough Sheelin, Arley ..	1·89
X.	Haltwhistle, Unthank..	3·89	„	Warrenpoint	2·48
„	Bamburgh	2·09	„	Seaforde	3·92
„	Keswick, The Beeches...	3·86	„	Belfast, Springfield	4·25
XI.	Llanfrechfa Grange	2·59	„	Bushmills, Dundarave...	2·10
„	Llandovery	2·63	„	Stewartstown	3·24
„	Castle Malgwyn	1·74	„	Buncrana	2·19
„	Builth, Abergwessin Vic.	3·48	„	LoughSwilly, Carrablagh	2·24

JUNE, 1894.

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 Night below 32°.	
		Total Fall.	Differ- ence from average 1880-9.	Greatest Fall in 24 hours		In shade. On grass		Max.		Min.			
				Dpth	Date			Deg.	Date	Deg.	Date.		
		inches.	inches.	in.			Deg.	Date	Deg.	Date.			
I.	London (Camden Square) ...	1·84	— ·17	·43	3	12	83·8	30	43·7	12	0	0	
II.	Maidstone (Hunton Court)...	2·31	+ ·69	·63	6	14	...	...	...	...	...	...
III.	Strathfield Turgiss	2·43	+ ·63	·65	3	18	81·1	30	43·2	12	0	0	
IV.	Hitchin .....	...	...	...	...	...	...	...	...	...	...	...
V.	Winslow (Addington)	2·57	+ ·71	·89	4	14	83·0	30	39·0	1	0	...	
VI.	Bury St. Edmunds (Westley)	2·43	+ ·64	·50	15	14	74·0	30	43·0	14	0	...	
VII.	Norwich (Brundall)	2·43	—	·75	15	15	73·4	30	42·0	1	0	1	
VIII.	Weymouth(LangtonHerring)	1·91	— ·32	·65	3	14	75·0	30	43·0	12	0	...	
IX.	Torquay (Cary Green) ...	2·36	—	1·20	6	15	72·9	30	45·0	1	0	0	
X.	Polapit Tamar [Launceston]..	1·80	— ·41	·31	12	18	75·5	30	46·0	1	0	...	
XI.	Stroud (Upfield)	1·72	— ·67	·53	3	16	76·0	29 _a	46·0	18	0	...	
XII.	ChurchStretton(Woolstaston)	1·95	— ·60	·29	3	17	76·5	30	39·0	7	0	1	
XIII.	Tenbury (Orleton)	1·71	— ·90	·44	3	13	82·2	30	34·8	1	0	1	
XIV.	Leicester (Barkby)	1·91	— ·44	·45	4	14	82·0	30	37·0	13 _c	0	0	
XV.	Boston	2·55	+ ·66	·67	4	16	95·0	30	44·0	6	0	...	
XVI.	Hesley Hall [Tickhill].....	2·41	+ ·49	·98	4	12	86·0	30	36·0	1	0	...	
XVII.	Manchester(PlymouthGrove)	3·29	+ ·64	·88	4	16	85·0	30	40·0	6, 18	0	0	
XVIII.	Wetherby (Ribston Hall) ...	3·58	+ 1·69	1·19	5	10	...	...	...	...	...	...
XIX.	Skipton (Arneliffe)	3·81	+ ·45	·64	4	18	...	...	...	...	...	...
XX.	Hull (Pearson Park)	4·20	+ 2·45	·95	4	15	73·0	22 _a	37·0	1	0	...	
XXI.	Newcastle (Town Moor)	3·27	+ 1·63	·46	2, 10	16	...	...	...	...	...	...
XXII.	Borrowdale (Seathwaite).....	7·19	+ ·61	1·40	23	19	...	...	...	...	...	...
XXIII.	Cardiff (Ely)	2·86	+ ·43	·72	3	15	...	...	...	...	...	...
XXIV.	Haverfordwest	3·67	+ 1·11	·95	4	15	79·3	30	35·0	1	0	2	
XXV.	Aberystwith, Gogerddan	2·05	—	·39	3	14	87·0	29	30·0	20	2	...	
XXVI.	Llandudno	1·71	— ·06	·51	3	14	...	...	...	...	...	...
XXVII.	Cargen [Dumfries]	4·03	+ 2·08	·86	4	17	83·6	30	35·6	1	0	...	
XXVIII.	Jedburgh (Sunnyside).....	4·04	+ 2·30	1·10	10	16	85·0	30	35·0	7	0	...	
XXIX.	Colmonell	2·60	—	·48	9	15	83·0	30	34·0	20	0	...	
XXX.	Lochgilphead (Kilmory)	2·94	— ·16	·50	16	14	...	...	35·0	20	0	...
XXXI.	Mull (Quinish)	3·88	+ ·59	·94	16	15	...	...	...	...	...	...
XXXII.	Loch Leven Sluices	2·40	+ ·65	·70	11	8	...	...	...	...	...	...
XXXIII.	Dundee (Eastern Necropolis)	2·00	+ ·50	·60	4	17	74·8	26	38·0	6	0	...	
XXXIV.	Braemar	2·02	+ ·03	·50	4	12	80·0	30	30·9	1	2	11	
XXXV.	Aberdeen (Cranford)	1·82	—	·36	10	13	70·0	30	38·0	17	0	...	
XXXVI.	Strathconan [Beaully]	3·27	+ ·78	·90	2	8	...	...	...	...	...	...
XXXVII.	Glencarron Lodge	4·38	—	·71	23	15	83·0	30	35·5	6	0	...	
XXXVIII.	Cawdor [Nairn]	1·63	+ ·23	·46	10	15	...	...	...	...	...	...
XXXIX.	Dunrobin .....	...	...	...	...	...	...	...	...	...	...	...
XL.	S. Ronaldsay (Roeberry).....	1·84	+ ·08	·40	16	15	72·0	27	42·0	4, 10	0	...	
XLI.	Darrynane Abbey	2·44	—	·42	16	20	...	...	...	...	...	...
XLII.	Waterford (Brook Lodge) ...	2·71	+ ·64	·67	3	14	77·0	30	36·0	1	0	...	
XLIII.	O'Briensbridge (Ross)	2·51	—	·93	4	16	...	...	...	...	...	...
XLIV.	Carlow (Browne's Hill)	2·52	+ ·68	·77	4	13	...	...	...	...	...	...
XLV.	Dublin (Fitz William Square)	1·65	— ·01	·41	17	19	72·8	30	49·0	6	0	0	
XLVI.	Ballinasloe	2·10	— ·20	·42	17	15	76·0	28 _b	41·0	12	0	...	
XLVII.	Clifden (Kylemore)	4·59	—	·64	22	16	...	...	...	...	...	...
XLVIII.	Waringstown	3·64	+ 1·57	1·08	4	16	81·0	30	35·0	6	0	1	
XLIX.	Londonderry (Creggan Res.)..	2·64	+ ·22	·40	23	17	...	...	...	...	...	...
L.	Omagh (Edenfel)	2·62	+ ·15	·40	24	16	80·0	30	39·0	5, 15	0	...	

a And 30. b And 29, 30. c And 20.

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

METEOROLOGICAL NOTES ON JUNE, 1894.

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

ENGLAND.

STRATHFIELD TURGISS.—The first half of the month was showery but warm, and the close of the month was very hot. All agricultural crops looked extremely well, and with an experience of 36 years I never saw the corn so fine. Hay very abundant and carried in the finest possible weather.

ADDINGTON.—From the 1st until the 21st dull and unsettled, from that date until the end, very fine; first rate weather for hay making. The last day of the month was very hot, although a brisk N.E. wind was blowing all day.

BURY ST. EDMUNDS.—Cold and wet till the 21st, then fine summer weather till the end of the month. The last week was very favourable for hay making. Distant T on 20th.

NORWICH, BRUNDALL.—Weather very cloudy and unsettled, with frequent R, during the first three weeks. The last ten days very fine and sunny, with heat tempered by a sea breeze from N.E. Strawberries ripe on 16th, or three weeks later than last year. Corn in ear on 21st. T and L on 5th, 15th, 18th, and 20th. Almost continuous R for 80 hours from 8th to 11th.

LANGTON HERRING.—From the beginning of the year to the end of June R fell on 100 days; this is the greatest number of rainy days in the first half of any year of the last 20, and is 22 above the average. Up to the 23rd the weather was cold and unsettled, but the last week of the month was fine and very hot and most favourable for securing the hay crop, which was exceptionally heavy. The mean temp. at 9 a.m. ($59^{\circ}0$) is $1^{\circ}3$ below the mean of 22 years. Fogs were frequent. Solar halos were observed on the 12th and 16th.

TORQUAY, CARY GREEN.—Rainfall $\cdot 02$ in. below, and wet days 1 above, the average. Mean temp. $57^{\circ}8$, or exactly the average. Amount of sunshine 184 hours 30 min., being 41 hours 30 min. below the average. Two sunless days.

STROUD, UPFIELD.—T and heavy R in early morning on 3rd.

WOOLSTASTON.—A splendid month for the hay harvest. The early part was rather cold, but the last fortnight was very dry and hot. Mean temp. $56^{\circ}3$.

TENBURY, ORLETON.—Very cold and wet till the 14th, then finer, the last week being brilliant, hot weather. Mean temp. for the month about $0^{\circ}5$ below the average. T and L on 4th.

LEICESTER, BARKBY.—Chilly and drizzly during the first fortnight, then dull and cloudy till the last few days, which were hot and cloudless. Mean temp. for the month $58^{\circ}2$.

MANCHESTER, PLYMOUTH GROVE.—The coldest June experienced since observations commenced 27 years ago, with the one exception of June, 1871, when the mean temp. was 54° . Weather up to the 25th very unsettled and unseasonable; from 26th to 30th fine and summer-like. Mean temp. $55^{\circ}5$.

WALES.

HAVERFORDWEST.—Up to the 26th there really was no day that could be called a summer day, and the shade temp. three times fell as low as 37° . On 26th the wind shifted to E., with sudden heat and bright sunshine to the end of the month. The keen frosts of the last days of May checked vegetation to such an extent as to dishearten those engaged in gardening and agriculture. The ash and oak—the former particularly—were brought almost to a standstill in putting forth their leaves, and in many places looked black and blasted. Fruit will not be nearly so abundant as was expected earlier. Corn looking well, and hay crops will be fully up to the average. Heavy TS at 3 a.m. on 3rd.

GOGERDDAN.—Very stormy and dull during the first three weeks of the month, but very hot, with bright sunshine, in the last week.

SCOTLAND.

CARGEN.—The mean temp. of the month was a little more than 2° below the average. The first 25 days were unusually cold, the mean temp. for that period being $4^{\circ}\cdot 2$ below the average for June. The last five days were very warm, the max. on the 30th being, with two exceptions, the highest recorded in June during 34 years. The range of temp. (48°) was unusually great. Light winds, mostly easterly and northerly, prevailed, with dull, wet weather, the hours of sunshine being greatly below the average. T on 1st.

JEDBURGH.—The weather of more than the first half of the month was cold and ungenial, with low night temp. ; but as there was a good deal of sunshine, vegetation progressed fairly. The heat of the last week was great. Prevailing winds E., N.E. and S.E. The apple blossom was completely destroyed by the frosts at the end of May.

COLMONELL.—Mean temp. $54^{\circ}\cdot 8$, being $1^{\circ}\cdot 9$ below the average of 18 years.

BRAEMAR.—Cold and unsettled, with frosts up to the 26th, afterwards hot and dry. Duration of sunshine 158 hours.

ROEBERRY.—The first half of the month was cold and dry, the latter half warmer. Mean temp. $52^{\circ}\cdot 9$, 1° below that of June, 1893.

IRELAND.

DARRYNANE ABBEY.—The first half of the month was cold and wet, the third week very foggy, and the end fine and hot.

O'BRIENSBRIDGE, ROSS.—Summer weather commenced on the 26th. T on the 4th.

DUBLIN.—Although somewhat cloudy and rather cool, this proved a favourable month, and its closing days were exceptionally warm and brilliant. The rainfall was frequent, but not heavy, and a decided advance in the night temperature was perceptible as compared with the frosty May. No electrical disturbances occurred. Mean temp. ($57^{\circ}\cdot 0$) $0^{\circ}\cdot 8$ below the average. High winds were noted on 9 days, attaining the force of a gale on the 23rd. Temp. reached or exceeded 70° in the screen on only 2 days. H fell on the 10th and 18th ; fog occurred on the 3rd, 4th and 9th.

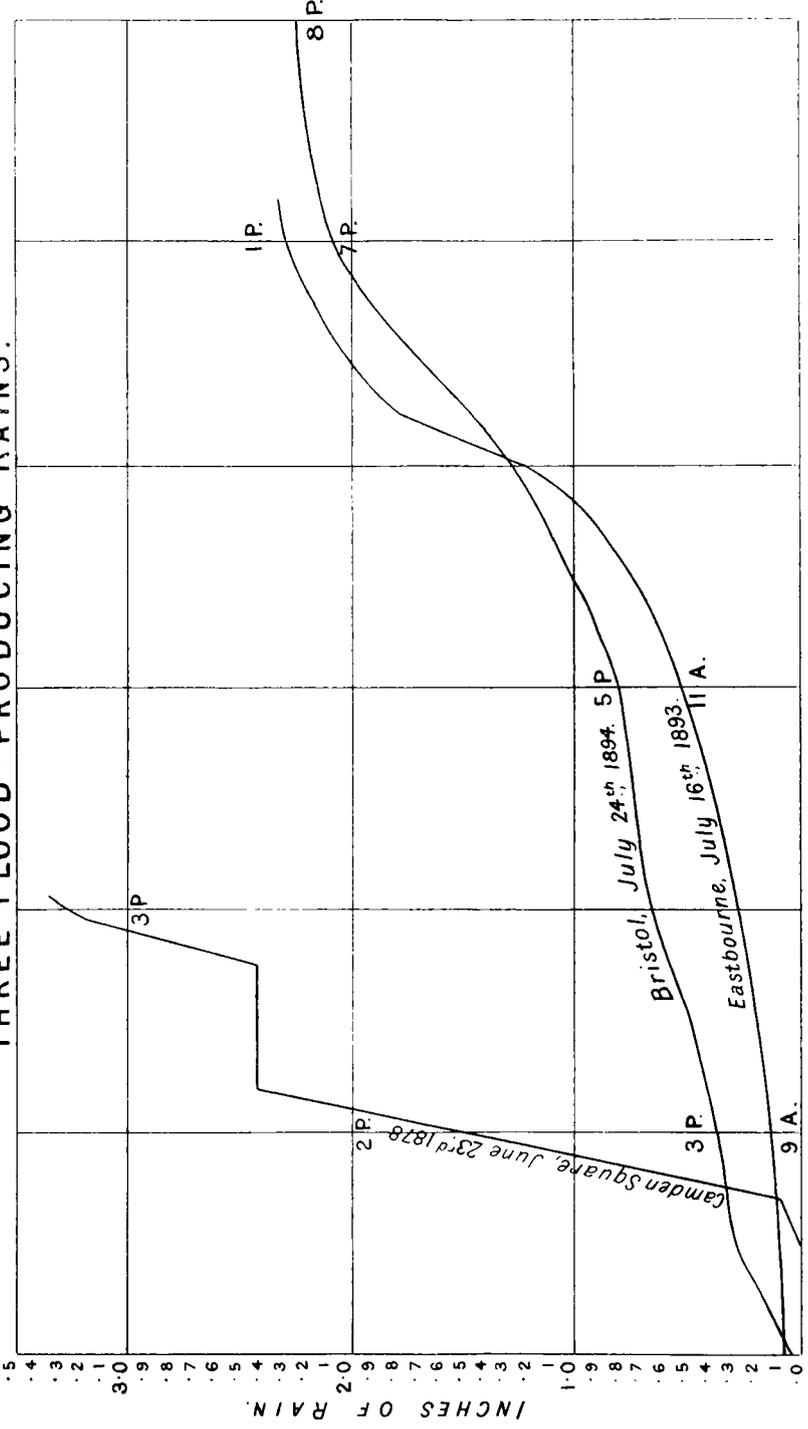
EDENFEL.—With the exception of the last few days, the weather possessed most of the unfavourable characteristics of May—great absence of sunshine, with temp. considerably below, and rainfall rather above, the average. The excess of R for the six months amounts to $8\cdot 02$ in. On the 27th a brilliant hot spell of summer weather set in, breaking again, however, on the night of July 1st.

TWO RECENT RAINS.

AT Camden Square we had a sharp thundershower on July 9th ; the total fall was less than a quarter of an inch, but the fall was very heavy while it lasted. Rain began at 10·47 a.m., and in successive minutes the fall was ·05, ·03, ·02, ·01, ·01, ·02, ·02, ·02, ·02, or ·20 in. in nine minutes.

On the evening of July 10th rain began a little before 7 p.m., and the following was the fall in successive hours :—·08, ·10, ·13, ·15, ·21, ·17, ·14, ·04, ·08, ·02, or 1·12 in. in 10 hours. The fall was much heavier in the neighbourhood of Brighton. The following returns have been received :—Surrey House, Littlehampton, 2·25 in. ; Ditchling, Hassocks Gate, Sussex, 2·13 in. ; St. Martin's, Guernsey, 2·06 in. ; Benenden, Kent, 1·67 in. ; Chiddingfold, Godalming, Surrey, 1·47 in. ; Tenterden, Kent, 1·04 in. ; Emsworth, Hants, ·99 in.

THREE FLOOD-PRODUCING RAINS.



SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

CCCXLIII.]

AUGUST, 1894.

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RAINFALL AND FLOOD AT BRISTOL.

It is rather singular that in *British Rainfall*, 1893, there are given details of a great rain at Eastbourne in 1893, and that before the volume has been received from the binders, we have the details of a remarkably similar one at Bristol. The Docks Engineer, Mr. J. M. McCurrich, M.I.C.E., has kindly favoured us with a copy of his report and a diagram showing the half-hourly reading of the storm rain gauge at the Cumberland Basin. We give the report verbatim, and reproduce the diagram, but have altered the scale to that adopted in *British Rainfall*—viz., one inch to represent one hour of time and one inch of rain. Diagrams are most useful, but unless great care is used to secure uniformity in the relations between the scales for time and for the phenomena represented, diagrams will suggest false ideas. On the diagram given herewith we have not merely adhered to the scale adopted in *British Rainfall*, but we have reproduced two of the rains there represented so as to facilitate comparison.

We now give Mr. McCurrich's report, which we have broken up into numbered paragraphs for the convenience of reference from the few notes which we have added at the end.

1. The rainfall on Tuesday, July 24th, was so exceptional that I think it well to make a short report upon it.

2. The rain began to fall about 1.30 p.m., and continued without intermission until nearly 10 p.m. The total rainfall between 1.30 p.m. and 10 p.m. was 2.47 in., and the total up to 12 p.m. was 2.53 in. Between 3 p.m. and 7 p.m. 1.80 in. fell. The rainfall between 6 p.m. and 7 p.m. was the heaviest, being .52 in the first half-hour, and .35 in the second half-hour, making a total of .87 in. during the hour.

3. Mr. Francis Fox, in his report of August 27th, 1889, to the Bristol Town Council, on the prevention of From floods, said that from data furnished to him by Mr. Robert F. Sturge, Fellow of the Royal Meteorological Society:—"It is seen that in August, 1865, 2.90 in. fell in 15 hours, of which quantity about $2\frac{1}{4}$ in. fell in four hours. Later in the same month $1\frac{1}{2}$ in. of rain fell in seven hours. In June, 1884, 2.40 in. fell in $10\frac{1}{2}$ hours. In March, 1889, nearly three inches fell in 48 hours, of which about $1\frac{1}{2}$ in. fell in eight hours.

In October, 1882, when the previous severe flood took place, the rainfall was $3\frac{1}{2}$ in. in 48 hours, of which quantity $2\frac{1}{2}$ in. fell in 36 hours."

4. A fall of one inch in 12 hours is very exceptional at Bristol, and occurs on an average less than once a year. From the records kept here I have prepared a list of the times since 1876 when the rainfall exceeded .90 in. in 12 hours. It must be remembered that the rainfall is entered into a book at fixed times twice a day. Formerly the readings were taken at 9 a.m. and 9 p.m., but now they are taken at 12 noon and 12 midnight. In the event of a heavy rainfall beginning at, say 9 a.m., and lasting until 3 p.m., the rainfall in the three hours before noon would be booked to the first half of the day, and the rainfall after noon to the second half of the day. The readings will not, therefore, in every case give the maximum fall during any consecutive 12 hours. They are as follow :—

		in.			in.
1877	August 31st	0·91	1887	October 30th	0·98
1879	August 17th	1·11	1888	February 14th	1·00
1880	October 5th	1·40	1889	March 8th	1·70
1881	June 5th	1·28	„	April 8th	0·94
1882	July 7th	0·92	„	September 24th	0·92
„	October 23rd	0·93	1890	July 17th	1·33
„	October 24th	1·03	1891	January 23rd	1·19
1884	June 22nd	2·00	„	June 25th	1·18
„	July 17th	1·04	„	October 6th	1·05
„	December 6th	0·91	„	October 19th	1·03
1885	October 10th	1·04	1892	July 16th	0·98
„	November 5th	1·08	„	September 29th	0·93
1886	December 26th	1·02	1894	July 24th	2·53
1887	September 1st	0·93			

5. According to the readings taken here, two inches of rain fell on the 22nd June, 1884, between 9 a.m. and 9 p.m. No rain fell for several days before that, and only .04 in. fell in the succeeding 12 hours.

6. On July 24th, 1894, the barometer stood here at 29·90 in. at noon, and it fell gradually to 29·82 in. at midnight. There was a slight breeze from the north.

7. The rainfall on July 24th appears not to have been so heavy to the north of Bristol [as in the City], as the Froom at Frampton Cotterell only rose to a very slight extent. At Bristol the Froom rose less than 2 ft. The Malago was, however, high, and the fields above St. John's Cemetery were flooded. The Avon rose about four feet, the maximum height at Cumberland Basin at 5.20 on Wednesday, July 25th, being 7 ft. 4 in. on the gauge.

4. We are sorry to hear that the good old custom of reading at 9 a.m. and 9 p.m. has been abandoned. It was most unwise, because (irrespective of breaking Rule IX.) it prevents the Dock record being comparable with any other.

7. This point cannot be adequately considered until all the returns

are collected at the end of the year; but probably Mr. McCurrich's inference is correct, as we hear from Miss Fry that 2·65 in. fell at Failand House, while at the Fishponds Mr. Harding recorded only 2·01 in. The absence of serious flooding (such as Bristol has often suffered from) is due to the fact that it was a local rain, and not a general one over the watersheds of the Avon and the Froom.

HEAVY RAIN AND HAIL STORMS, JULY, 1894.

To the Editor of the Meteorological Magazine.

SIR,—A remarkable hailstorm visited us on July 2nd. The morning was bright and extremely hot, the thermometer marking 85° at 10 a.m.; the maximum of the day was only 1° higher (86°). At 1.40 p.m. a violent and sudden squall brought with it from the S.E. such a thunder and hailstorm as I do not remember to have seen before in my rather long experience. The curious uniformity in size, form, weight, and general appearance of the hailstones was most interesting, and a description of them may enable some of your correspondents to build theories as to their formation. Each stone was of a double convex form, slightly flattened at the poles, and surrounded by a zone of transparent ice, arranged in spiculæ or minute plates, and projecting about the eight of an inch from the equatorial level. This zone was, as I have said, transparent, while the body of the stone resembled frosted or finely-ground glass. The long diameter varied from an inch to an inch and a-half, including the zone, and the short diameter was about three-quarters of an inch. Nine of them weighed exactly 320 grains, or nearly 35½ grains each.

About a mile to three miles west of us the storm was still heavier, judging from the mischief done. Much glass was broken, fruit trees were knocked to pieces, and looked next day as if they had been scorched; wheat and beans were decapitated, and a large tree was shivered to atoms by lightning, about a mile to our N.E. After the storm the sky remained overcast, but the days preceding and succeeding it were fine and bright.—Very faithfully yours,

THOMAS E. AMYOT.

Diss, Norfolk, August 5th, 1894.

To the Editor of the Meteorological Magazine.

SIR,—On Saturday, the 21st inst., we experienced the heaviest rain-storm I have ever witnessed in this locality. Thunder was heard at 3.50 p.m. (after a fine and warm day), and almost exactly at 4 o'clock the rain commenced, descending in sheets and torrents, mingled with hailstones of large size, for about 20 minutes, when its violence somewhat abated, rain entirely ceasing at 4.30 p.m.

On emptying the gauge, I measured *over one inch* (exact amount, 1·02 in.) as the product of this extraordinary shower, and I cannot

help thinking that this amount, large as it is, may be really less than the true rainfall, for there was very probably some loss due to out-plashing in so violent a fall. I may add that the roads near this house were completely flooded, and washed completely bare, the "oldest inhabitants" of the adjacent village declaring they had never seen such a shower before. The storm, or cloud-burst, was very local. It appeared to travel from almost due south to north, and at a place under two miles from here (in a N.W. direction) *no rain fell during the afternoon*, and hay was being carried all evening.—Yours truly,

B. T. GRIFFITH-BOSCAWEN.

Trevalyn Hall, Rossett, Denbighshire, July 28th, 1894.

To the Editor of the Meteorological Magazine.

SIR,—Finding in this morning's *Times* no account of the storm of yesterday, I conclude that it was of small area, and perhaps at its heaviest here. If so, you may like to hear of it. The morning of July 29th was bright at intervals, though rather hazy, with barometer falling slightly from 30·10 in. to 30·05 in., but there was nothing to indicate the approach of any great disturbance. About 10.30 a.m. the sky began to darken, especially in the N.E., but without any perceptible wind. A few very large drops fell about 11.45 a.m., and the rain began in earnest about 12.15 p.m. In a few minutes the downpour was as heavy as any I have ever watched, and almost, if not quite, vertical, while the size of the drops was remarkable, as well as their close contiguity. But I saw no hail, though some hail is said to have fallen at Strawberry Hill; neither was the lightning very vivid. In fact, I saw no lightning in the early part of the downfall, and probably there were not from first to last more than thirty flashes visible here.

The storm, which had approached us from N.E. and passed very slowly, began to return from W. at about 12.45 p.m., as was manifest from the inclination of the drops, which had hitherto been vertical. But from whatever quarter it descended, it scarcely ever slackened for one instant, until at about 1.20 p.m. the sky towards the south began to brighten, and the clouds went slowly northwards.

The bulk of it was down by this time, and I measured 1·94 in. at 1.30 p.m., that amount having fallen in an hour and a quarter. There was still some short lightning and sharp thunder in the north, where the blackness of the storm now lay; and presently up it came again, but most of its burden had been discharged.

The entire fall up to 9 a.m. July 30th was 2·26 in., which is, I think, the heaviest in my record, beginning in September, 1866.—Faithfully yours,

R. D. BLACKMORE.

Teddington, July 30th, 1894.

RAIN OF JULY, 1894, IN THE S.E. OF ENGLAND.

THE rainfall of July having been exceptionally heavy in the South-Eastern Counties of England, we have, in addition to the usual tables, extracted from the returns received all falls exceeding five inches, and tabulated them with the difference from the average of the ten years, 1880-89, where the records extend over that period.

It will be seen that in every case the total fall for the month is considerably more than twice the average:—

STATION.	COUNTY.	Total Fall. in.	Difference from the average. in.
Teddington	Middlesex ...	5·95 ...	+ 3·46
Abinger Hall	Surrey	5·66 ...	+ 3·12
Benenden (East End).....	Kent	5·33 ...	+ 3·06
Tenterden.....	„	5·26 ...	+ 2·91
Cranbrook (Hartley)	„	5·63 ...	+ 2·93
Hythe	„	5·64 ...	+ 3·02
Paddock Wood (Capel)	„	5·50 ...	—
Steyning	Sussex	6·56 ...	+ 3·83
Hailsham	„	6·12 ...	+ 3·58
Ditchling	„	6·25 ...	—
Niton (St. Catherine's Ho.)	Hants	5·32 ...	—
Ryde (Thornbrough)	„	5·26 ...	—
Emsworth (Redlands)	„	5·14 ...	—
Liss (Lingwood)	„	5·63 ...	—
Alton (Ashdell)	„	5·36 ...	+ 2·86

Abinger Hall.—Two heavy falls of rain occurred, without thunder, viz. : 1·55 in. on 10th and 1·46 in. on 29th. G. PAYNE.

Benenden, East End.—1·22 in. fell on 6th, 1·18 in. on 10th and ·93 in. on 29th. At *Rolvenden*, 1·44 in. fell on 6th, 1·26 in. on 10th, and 1·03 in. on 29th. J. ELLIS MACE.

Tenterden.—The largest fall for July during 32 years, the next largest being 5·08 in. in 1888. Thunderstorms on 24th and 29th. J. ELLIS MACE.

Cranbrook, Hartley.—Total fall 2·97 in. more than the average of 25 years, and only once exceeded in 29 years, namely in 1888, when 5·73 in. fell. On 6th 1·48 in. fell, on 10th 1·36 in., and on 29th ·73 in. In the 28 days ending August 7th the fall was 6·20 in. GEORGE PILE.

Ditchling.—Fine and warm till the 6th, when a severe thunder storm occurred, and the rest of the month was very wet and dull. The falls of rain on 10th (2·13 in.) and 29th (1·82 in.) were exceptionally heavy. F. H. PHILLIPS.

Liss, Lingwood.—The heaviest fall yet recorded here (2·00 in.) fell on the 30th, and 1·05 in. fell on 11th. ROBERT BARNES.

THE MAY FROST OF 1894.

To the Editor of the Meteorological Magazine.

SIR,—I note your criticism on my criticism, and thank you for the same. I had not overlooked what the Rev. Mr. Boys reported. I do not myself think that what he says at all upsets my theory. I think that, if inquired into, it may be found only to confirm my idea. Mr. Boys simply says "there was no wind at 3.20 a.m.;" my theory is that the damage was done by the wind after sunrise. Mr. Boys should say what happened after sunrise, say at 5 or 6 a.m. He speaks, earlier in his letter, of very piercing N.N.E. winds. If that very piercing N.N.E. wind sprang up after sunrise, my theory is confirmed. The stillness at 3.20 a.m. would aid deposition of hoar frost, which would be melted by the sun, and then the wind would cause rapid evaporation. If, however, no wind sprang up, my theory is gone as far as he is concerned. Would it not be interesting to ask him?

Regarding the height at which the damage here took place, the most damage was done in the valley between here and Croydon, say about 150 to 200 ft. above sea level, exposed to N.N.E. and N.N.W. There the ashes were blackened, oaks and maples shrivelled; at Ingleside, 375 feet above sea, the ashes were no worse, but yew trees nipped, and the damage was comparatively slight. Higher on the hill, say to the top (500 feet), the result was about the same as at Ingleside. Ingleside hillside faces N.E.—Yours sincerely,

HAROLD SMITH.

Ingleside, Kenley, Surrey, July 25th, 1894.

To the Editor of the Meteorological Magazine.

SIR,—I have no desire to impugn anything that Mr. Harold Smith says in his letter published in the July Magazine touching the May frost and the N.E. wind.

I fully admit that the N.N.E. wind, which set in on the 15th, and suddenly became so bitter about noon May 19th, brought the cold; but I maintain that, in Northamptonshire at least, it was the dropping of the wind that made that cold so powerful for mischief. It was precisely that dropping of the wind which made me on the Sunday evening foresee, and make preparations for, the frost; and of the intense stillness of the air at 3.20 a.m. on May 21st there can be no doubt.

You attributed the mischief mainly to radiation; and for this county your remarks are strongly corroborated by the reports which have reached me from many members of the Northamptonshire Natural History Society (Meteorological Branch).

The mischief done by the frost has only gradually been revealed. I had hoped that my apples and pears, of which I had an extraordinarily abundant crop, and which seemed well set, would have survived, but they have been dropping off by slow degrees ever since, until most trees have none left, and the rest but very few. Many

gooseberries dropped at once, but more were left than I at first supposed. Currants at first seemed less hurt, and have nearly all disappeared since.

Wasps were very numerous on the first days of June, but I have hardly seen any for the last four weeks; and now I am wondering whether they will presently be appearing in swarms proportionate to their numbers in the early spring.

H. A. BOYS.

Easton Mauduit Vicarage, Northampton, July 23rd, 1894.

P.S.—A saying has been reported to me from N.W. Essex: "As many misties in March, so many frosties in May;"—too well borne out this year!

To the Editor of the Meteorological Magazine.

SIR,—I see that in the July *Met. Mag.* you notice Mr. H. Clements' forecast for July. He was singularly wrong for this district, the rainfall here being 5.02 in., against an average of 2.72 in. for 19 years.

Among Mr. Harold Smith and your remarks on the May frost, here a young plantation, facing north, had nearly every tree damaged, whereas another, facing south, had scarcely one injured. This seems to support Mr. H. Smith's view. The frost was—20th, 29° in Stevenson screen and 25° on ground; and 21st, 29° and 25° respectively.—Yours truly,

EDWARD SIMPSON.

Walton Hall, Wakefield, August 1st, 1894.

THE BRITISH ASSOCIATION AT OXFORD.

A generation has passed since the British Association has visited that grand old city, which may in some respects claim to be the ancestral home of British science—the home of Boyle, Wallis, Hooke—and for a time, in its early days, of the Royal Society.

Old and grand as are the traditions of Oxford, what has struck us most is the growth since 1860—then the new museum was just being filled by Professor Phillips, and it stood almost in the fields, now it is in the city—Keeble College was not thought of—nor was there, we believe, one of the excellent ladies' colleges—now we find telephones, tramways, electric lightning—in fact Oxford, while retaining all its old charm, is at the same time seizing all the good things, and showing a vigour which centuries do not seem to check.

The Association meeting has been a large and very pleasant one, considerably larger than that of 1860.

We give notes of some of the meteorological papers, and hope to complete the series in our next.

EARTH TREMORS COMMITTEE.

Abstract of Report drawn up by the Secretary, MR. C. DAVISON.

Since the last Report was written, several changes have been made by Mr. H. Darwin in his bifilar pendulum. (1) The mirror is mounted in a light frame so that its plane is perpendicular to that of the suspending wire, thus diminishing the disturbing effects of changes of temperature. (2) The lever used for tilting the frame of the pendulum through a known angle is constructed so that its centre of gravity coincides with the axis of the tilting-screw. (3) Without approaching the instrument the spot of light can be adjusted to the centre of the scale or photographic paper, and the sensitiveness altered, by means of tangent-screws connected with the foot-screws and worked by long handles.

The Greek earthquake pulsations of April 27th were observed in Birmingham with the bifilar pendulum from 7.59 to 8.28 p.m. (G.M.T.) Their average period was from 12 to 14 seconds, and their range in the E.-W. plane not less than $\frac{1}{4}$ " when greatest. The pulsations of April 20 and 27 were recorded by tromometers at several geodynamic observatories in Italy, by horizontal pendulums at Nicolaiew and Charkow in the south of Russia, and by magnetographs at Potsdam, Wilhelmshaven, Parc St. Maur, Utrecht and Kew. The Brassart seismoscopes at the observatory of Athens enable the time at the epicentrum to be determined fairly accurately. Making use of the epochs at which the first large pulsations are registered, the following are the estimates of the mean velocity :

April 20.—2.08 km. per sec. [78 miles per min.] (from 6 observations).

April 27.—3.21 km. per sec. [120 ,, ,,] (from 13 observations).*

One of the improved bifilar pendulums with photographic recording apparatus will shortly be erected at Birmingham. The Committee consider it desirable that its records should be compared for about a year with those of a similar instrument placed a short distance from it. They accordingly ask to be re-appointed so as to continue their work, and to be provided with a grant of £100 for the purchase and installation of a duplicate apparatus.

[*The Japan earthquake of March 22nd, 1894, was recorded at Rome, and in *Nature* of August 9th the velocity of propagation is taken as 2.50 km. per second, or 93 miles per minute.—Ed.]

UNDERGROUND TEMPERATURE COMMITTEE.

TWENTIETH REPORT.

Report drawn up by PROF. EVERETT, Secretary.

The Committee were re-appointed for the purpose of investigating the rate of increase of underground temperature downwards in various localities of dry land and under water.

The nineteenth report contained the results of observations taken in 1891 by Mr. Hallock, of the Smithsonian Institution, at depths extending to 4,462 ft. in a nearly dry well at Wheeling, Virginia.

Mr. Hallock, who now dates from Columbia College, New York, has recently furnished the Secretary with printed copies of a paper, contributed by him to the American Association for the Advancement of Science last year, containing further observations in the well, made at the expense of the U.S. Geological Survey.

When the observations of 1891 were finished, an oak plug was driven into the top of the casing to protect the hole. In July, 1893, the plug was with-

drawn, and the well, instead of being dry as before, was found to be full of fresh water to within 40 ft. of the top. This water is believed to have leaked in at the lower end of the innermost casing—that is, at 1,570 feet below the surface.

By means of inverted Negretti maximum thermometers, protected against pressure by sealing them in stout glass tubes, careful observations were taken at various depths from 1,586 ft. to 3,196 ft., two thermometers being employed to check one another at each depth. The results were practically identical with those obtained two years previously, when the well was full of air, the greatest certain difference being only one-fifth of a degree. An obstruction at 3,200 ft. prevented observation at greater depths; but this obstruction will probably be removed, the well pumped dry, and the drilling continued.

In making the observations, four thermometers were lowered at a time, two of them being in an iron bucket 3 feet long and 3 inches in diameter at the end of the wire, and the other two in an open wire frame 260 ft. from the end of the wire, the diameter of the bore being just under 5 inches.

The temperatures at 103 ft., 206 ft., and 300 ft. were also observed with suitable thermometers, the temperature at 103 ft. being $52^{\circ}\cdot53$, which is $1^{\circ}\cdot2$ higher than the true temperature of the soil at that depth, as determined by other observations in the immediate neighbourhood.

The smallness of the disturbance of temperature by convective circulation in this well, both when dry and when filled with water, is very remarkable, and renders the well specially suitable for determinations of the increase of temperature downwards.

The Committee have to record with deep regret the loss of their valuable member, Mr. Pengelly.

REVIEW.

Aero-therapeutics, or the treatment of Lung Diseases by Climate . . . with an address on the High Altitudes of Colorado, by CHARLES THEODORE WILLIAMS, M.D. Oxon., Senior Phys. to the Consumption Hospital, late President Royal Meteor. Soc. 8vo. Macmillan: London, 1894. 188 pages.

THIS volume contains the Lumleian Lectures for 1893, delivered by the author before the Royal College of Physicians, with its esteemed President, the late Sir Andrew Clark, Bart., M.D., in the chair.

Dr. Theodore Williams in his brief preface says:—

“I have attempted in the following pages to sketch a scientific system of Aero-therapeutics, based on the combination of modern meteorology with clinical experience, each element of climate being duly considered in its bearing on Health and Disease.

“Unfortunately our knowledge in these departments contains many gaps, which increasing experience may, it is to be hoped, gradually fill in.”

In our opinion, Dr. Williams has produced a work which goes far beyond the above limits, and we have not noticed one point in which he appears to us to have laid himself open to attack. In fact, it would have been strange if he had, because he possesses several

special qualifications for writing upon the subject. (1) We do not see anything wrong in his meteorology.* (2) Dr. Theodore Williams is thoroughly devoted to his profession, and has travelled largely so as to be personally familiar with the districts to which he sends his patients. (3) He is evidently most careful in keeping, and in working up, statistics as to his patients; in fact, while rigorously securing the anonymity of his patients, the way in which he combines the doctor and the statistician is excellent. As a specimen, we reproduce one of his tables dealing with 814 cases:—

TABLE IV.—*Results of Different Climates compared.*

	No. of Patients.	Average length of Residence.	RESULTS.									
			First Stage.	Second and Third Stages.		Bilateral Affection.	GENERAL.			LOCAL.		
				Per cent.	Per cent.		Per cent.	Improved.	Stationary.	Worse.	Arrest.	Improved (including Arrest).	Stationary.	Worse.
High altitudes.	247	12·2	65·0	35·0	37·0	83·4	2·0	14·6	42·5	75·5	5·3	19·1
Sea voyages ...	65	1·6	63·0	37·0	37·0	77·0	—	21·6	7·7	53·3	10·7	33·8
		average of voyage										
Riviera	210	9·0	59·0	41·0	36·0	65·2	10·0	24·8	5·9	36·6	17·8	45·6
Home climates.	292	9·7	58·0	42·0	42·0	63·7	8·2	28·0	2·0	38·9	20·0	41·1

We see no advantage in the second decimal in columns 8 and 9 in the original, and have, therefore, omitted them; and in the "Results" for the second line—sea voyages—there is 1·4 per cent. lost somewhere in the "General" columns, and 2·2 per cent. in the "Local" columns.

Our meteorological readers must not, however, assume that the work is wholly medical; on the contrary, it may be regarded as consisting of three ingredients in nearly equal proportions, meteorology, medicine, statistics.

It is not usual to set up part of the index of a book in a review but we know of no plan which will give in smaller space an equally

* Except quite unimportant little things, such as printing 47·5° for 47°·5, and quoting, on page 38, the humidity at Cairo to two places of decimals, 58·46. Doubtless it was so given in the work whence Dr. Williams quoted it; but the second decimal place of humidity is about the equivalent of the third decimal place of temperature, and few would trust a wet-bulb thermometer to the thousandth of a degree. We therefore gibbet the error. Dr. Williams is responsible merely for copying a bad example without thinking of its absurdity,

good indication of the variety of information which the book contains :—

	PAGE		PAGE
Eden, Australia	69	Elevations, Four series of, in	
Egger, Dr.	111	Colorado	153
Egypt, Climate of	37	Equador	139
,, Statistics of Patients		Esneh, Province of, Egypt ...	38
sent to	39	Estes Park, Colorado	149, 166
Electricity, Atmospheric ...	2, 178	Ewart, Dr. W.	127
,, Phenomena on			
Pike's Peak	161		

ÆRIAL, AERIAL OR AËRIAL.

To the Editor of the Meteorological Magazine.

SIR,—I am disposed to question the propriety of two cases of typography in the *Meteorological Magazine* for July, page 89. In lines 25 and 26 you print “Ærial,” and in line 34 “ærial;” it seems to me that these should be “Aerial” and “aerial,” just as in line 17 you print Aerodynamics. “Ærial” reminds me somewhat of what people call “areated” instead of “aerated” bread. Excuse my hypercriticism, and believe me, yours very faithfully,

J. M. DU PORT.

Denver Rectory, Downham, July 31st, 1894.

[We felt very penitent on reading the above, and also on turning up “Ærial” in Nuttall’s Dictionary; but, before pleading guilty, wrote to ask Mr. Washington Moon. He replied “Æ is not justifiable in Aërial, which is the only word we have beginning with *aer* in which the accent is on the second vowel, therefore do not omit the diæresis; Aerial is as wrong as is Ærial. Probably the pronunciation of *aer* in *aërial* was differentiated from that of other words which begin with *aer* in order to distinguish aerial from the sound of the proper name *Ariel*.” Thus far, therefore, the Canon and the Editor and the Dictionary are alike condemned.

Finally, we turned to Nuttall itself for the definition of the word Diæresis, and found “the mark (¨) placed over two vowels, denoting that they are to be pronounced as distinct letters, as *aër*.”

In the first place, this statement says “over *two* vowels,” and as an illustration puts the mark over *one* ! and in the second place, while on p. 272 it quotes *aër* as a type of what should be done, on p. 21 it gives—

Orthography.	Pronunciation.
AERATE	<i>á-ër-ate.</i>
AERATION	<i>a-ër-á-shun.</i>
AERIAL	<i>a-é-re-al.</i>
ÆRIFEROUS	<i>ayr-í-f-er-us.</i>
AERIFIED	<i>ayr-e-fí-de.</i>
AERONAUT.....	<i>ayr-o-nawt.</i>

The diæresis is not omitted because the printer had no capital E with the diæresis, for in the definitions they are similarly omitted; evidently Dr. Nuttall forgot them.—ED.]

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, FEBRUARY, 1894.

STATIONS. <i>(Those in italics are South of the Equator.)</i>	Absolute.				Average.				Absolute.		Total Rain.		Aver. Cloud.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
England, London	56·4	7	23·3	19	47·8	35·5	36·6	83	91·1	18·0	1·75	16	5·8
Malta.....	64·8	28	42·8	16	58·7	49·9	47·1	82	117·5	37·4	4·40	8	6·5
<i>Cape of Good Hope</i> ...	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>Mauritius</i>	85·5	20	69·6	1	83·1	74·0	70·1	78	138·1	62·2	4·48	18	6·0
Calcutta.....	91·5	17	54·1	6	84·0	62·0	61·2	70	143·9	44·6	·25	1	1·4
Bombay.....	88·6	15	64·6	3	84·0	70·9	66·7	70	137·5	55·4	·00	0	0·4
Ceylon, Colombo	91·8	14	68·0	1	88·7	72·0	69·8	75	147·0	61·0	·52	6	1·8
<i>Melbourne</i>	96·1	5	46·2	13	77·6	56·3	51·7	62	146·1	36·1	·39	4	4·5
<i>Adelaide</i>	101·3	4	49·8	19	82·6	58·3	50·0	48	158·3	42·5	·01	1	2·5
<i>Sydney</i>	83·3	21	58·8	14 ^a	75·5	64·4	58·3	75	155·9	50·1	5·06	18	5·5
<i>Wellington</i>	80·0	23	48·0	26	71·0	57·6	53·8	69	140·0	35·0	5·22	12	4·5
<i>Auckland</i>	81·5	9	49·0	27	74·8	61·3	60·6	77	147·0	47·0	3·65	11	5·3
Jamaica, Kingston.....	89·0	7	62·8	5	84·0	66·2	65·4	79	...	...	·67	8	2·9
Trinidad	95·0	2	63·0	8, 9 ^b	86·6	65·6	67·1	76	167·0	61·0	2·36	12	...
Toronto	43·1	28	— 9·9	24	28·0	12·4	18·4	81	...	— 10·0	2·25	14	6·0
New Brunswick, Fredericton	44·9	18	— 30·5	14	24·0	— 2·7	8·0	77	...	...	2·95	9	4·0
Manitoba, Winnipeg ...	37·6	28	— 30·7	19	15·2	— 9·9	...	...	...	...	1·00	6	5·0
British Columbia, Esquimalt.....	51·9	26	20·2	19	41·6	32·3	34·6	90	...	...	4·27	22	8·0

a And 23. b And 10.

REMARKS.

MALTA.—Mean hourly velocity of wind 14·6 miles, the highest recorded in 11 years; for the 5 days 19th to 23rd the velocity averaged 30 miles per hour. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·4 below, dew point equal to, and rainfall 1·73 in. below, their respective averages. Mean hourly velocity of wind 13·3 miles, or 2·0 miles above average; extremes, 62·2 on 22nd, and 0·0 on 27th and 28th; prevailing direction, E.S.E. T and L on 7th, 8th, and 9th, T on 18th, and L on 21st. A cyclone passed N.E., E. and S.E. of the island between the 19th and 24th.

Melbourne.—Aurora Australis visible from 7.30 to 10.30 on the 25th. T and L on 27th and 28th. C. MELDRUM, F.R.S.

Adelaide.—Mean temp. 3°·3 below the average of 37 years, the month being, with one exception, the coolest February experienced since records began. Rainfall very light, ·62 in. below the average. R. L. J. ELLERY, F.R.S.

Sydney.—Weather dry in the first part of the month, wet in the latter part; generally hot and oppressive. C. TODD, F.R.S.

Wellington.—Showery in the early part of the month, and strong N.W. wind on 2nd, 3rd, and 12th; fine during the middle, with light variable winds; the end of the month very wet, with strong winds from S.E., 2·90 in. of rain falling on the 25th and 26th. Prevailing winds N.W. Sleet fell on 25th and 26th. Mean temp. 1°·8, and rainfall 1·68 in. above, the average. H. C. RUSSELL, F.R.S.

Auckland.—A heavy fall of rain occurred on the 16th, 1·95 in. being recorded, but no other noteworthy peculiarities. Barometrical pressure, mean temp., and rainfall all close to the average of 27 years. R. B. GORE.

JAMAICA.—Mean hourly velocity of wind 4·0 miles. Weather fine, with average rainfall. On the 5th the barometer reached the highest point since the establishment of the service in 1880, viz., 30·180 in. (cor. and red.) at 7 a.m. T. F. CHEESEMAN.

R. JOHNSTONE.

SUPPLEMENTARY TABLE OF RAINFALL,
JULY, 1894.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			
II.	Dorking, Abinger Hall.	5·66	XI.	Rhayader, Nantgwilt..	6·73
„	Birchington, Thor	3·95	„	Lake Vyrnwy	3·14
„	Hailsham	6·12	„	Corwen, Rhug	1·90
„	Ryde, Thornbrough	5·26	„	Carnarvon, Cocksida ...	3·48
„	Emsworth, Redlands ...	5·14	„	I. of Man, Douglas	2·46
„	Alton, Ashdell.....	5·36	XII.	Stoneykirk, ArdwellHo.	2·12
III.	Oxford, Magdalen Col...	3·36	„	New Galloway, Glenlee	2·97
„	Banbury, Bloxham	3·23	„	Melrose, Abbey Gate ...	2·25
„	Northampton, Sedgebrook	2·89	XIII.	N. Esk Res. [Penicuick]	2·15
„	Alconbury	2·49	„	Edinburgh, Blacket Pl..	2·83
„	Wisbech, Bank House..	3·55	XIV.	Glasgow, Queen's Park.	2·71
IV.	Southend	4·00	XV.	Inverary, Newtown	5·79
„	Harlow, Sheering	3·10	„	Islay, Gruinart School..	1·39
„	Colchester, Lexden.....	3·96	XVI.	Dollar	2·96
„	Rendlesham Hall	2·05	„	Balquhiddel, Stronvar..	5·78
„	Diss	4·08	„	Ballinluig	2·64
„	Swaffham	2·67	„	Dalnaspidal H.R.S. ...	4·81
V.	Salisbury, Alderbury...	3·49	XVII.	Keith H.R.S.	7·62
„	Bishop's Cannings	4·38	„	Forres H.R.S.	5·41
„	Blandford, Whatcombe.	4·93	XVIII.	Fearn, Lower Pitkerrie.	4·78
„	Ashburton, Holne Vic. ...	6·09	„	Loch Shiel, Glenaladale	6·55
„	Okehampton, Oaklands.	3·70	„	N. Uist. Loch Maddy ...	4·77
„	Hartland Abbey	4·39	„	Invergarry	3·11
„	Lynmouth, Glenthorne.	4·59	„	Aviemore H.R.S.	2·96
„	Probus, Lamellyn	4·55	„	Loch Ness, Drumnadrochit	3·29
„	Wellington, Sunnyside..	4·05	XIX.	Invershin	4·82
„	Wincanton, Stowell Rec.	5·64	„	Scourie	5·29
VI.	Clifton, Pembroke Road	5·35	„	Watten H.R.S.	4·07
„	Ross, The Graig	2·60	XX.	Dunmanway, Coolkelure	4·20
„	Wem, Clive Vicarage ...	2·63	„	Fermoy, Gas Works ...	5·26
„	Cheadle, The Heath Ho.	2·48	„	Killarney, Woodlawn ...	5·22
„	Worcester, Diglis Lock	2·58	„	Tipperary, Henry Street	4·19
„	Coventry, Coundon	2·93	„	Limerick, Kilcornan ...	4·54
VII.	Ketton Hall [Stamford]	3·03	„	Ennis	4·05
„	Grantham, Stainby	3·16	„	Miltown Malbay.....	5·66
„	Horncastle, Bucknall ...	2·94	XXI.	Gorey, Courtown House	3·93
„	Worksop, Hodsack Priory	2·70	„	Athlone, Twyford	3·61
VIII.	Neston, Hinderton	2·79	„	Mullingar, Belvedere ...	3·44
„	Lancaster, Rose Bank ...	...	„	Longford, Currygrane...	4·56
„	Broughton-in-Furness..	5·23	XXII.	Galway, Queen's Coll...	5·79
IX.	Ripon, Mickley	3·32	„	Crossmolina, Enniscoe..	...
„	Scarborough, South Cliff	2·57	„	Collooney, Markree Obs.	5·87
„	East Layton [Darlington]	2·52	„	Ballynamore, Lawderdale	...
„	Middleton, Mickleton..	2·98	XXIII.	Lough Sheelin, Arley ..	4·65
X.	Haltwhistle, Unthank..	2·74	„	Warrenpoint	3·85
„	Bamburgh	1·33	„	Seaforde	4·16
„	Keswick, The Beeches...	3·75	„	Belfast, Springfield	5·20
XI.	Llanfrechfa Grange	4·82	„	Bushmills, Dundarave...	3·75
„	Llandovery	4·24	„	Stewartstown	3·38
„	Castle Malgwyn	4·69	„	Buncrana	4·06
„	Builth, Abergwessin Vic.	6·50	„	Lough Swilly, Carrablagh	4·48

JULY, 1894.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					TEMPERATURE.				No. of Nights below 32°.	
		Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours		Days on which ≥ 0.1 or more fell.	Max.		Min.		In shade.	On grass.
				Dpth	Date		Deg.	Date	Deg.	Date		
I.	London (Camden Square) ...	3.25	+ .57	1.12	10	17	88.2	6	48.9	14	0	0
II.	Maidstone (Hunton Court)...	4.27	+ 2.09	1.25	10	19	...	...	...	...	...	...
III.	Strathfield Turgiss	3.93	+ 1.54	1.34	29	24	85.7	1	44.0	4	0	0
III.	Hitchin	1.94	— .78	.52	10	17	83.0	1,6	48.0	3	0	0
IV.	Winslow (Addington)	2.86	— .43	.68	22	19	85.0	6	45.0	4	0	0
IV.	Bury St. Edmunds (Westley)	3.25	+ .68	.61	10	19	78.0	2	53.0	14	0	0
V.	Norwich (Brundall)	4.14	...	.79	22	20	84.6	2	48.0	15	0	0
V.	Weymouth (Langton Herring)	4.31	+ 2.16	1.00	28	21	72.0	2,6	49.0	5	0	0
V.	Torquay (Cary Green)	4.18	...	1.00	22	19	72.3	6	49.6	14	0	0
VI.	Polapit Tamar [Launceston]..	3.29	— .12	.55	23	23	77.0	1	51.0	14	0	0
VI.	Stroud (Upfield)	2.40	— 1.17	.40	22	18	86.0	1	51.0	13	0	0
VI.	Church Stretton (Woolstaston)	2.99	+ .02	.81	24	23	80.0	6	48.0	11	0	0
VI.	Tenbury (Orleton)	5.34	+ 2.48	2.06	29	17	83.8	1	41.2	14	0	0
VII.	Leicester (Barkby)	2.34	— .65	.48	22	22	86.0	6	43.0	3, 13	0	0
VII.	Boston	3.48	+ .69	.86	24	16	85.0	27	46.0	21	0	0
VII.	Hesley Hall (Tickhill).....	3.02	+ .35	.90	25	18	85.0	1	43.0	14	0	0
VIII.	Manchester (Plymouth Grove)	3.06	— .73	.53	16	18	86.0	1	45.0	11	0	0
IX.	Wetherby (Ribston Hall) ...	3.19	+ .01	.72	26	12	...	...	...	...	...	...
IX.	Skipton (Arncliffe)	4.47	— 1.17	1.04	25	17	...	...	...	...	...	...
IX.	Hull (Pearson Park)	3.23	+ .64	.51	10	15	80.0	5	47.0	8, 12	0	0
X.	Newcastle (Town Moor)	1.69	— 1.83	.39	10	13	...	...	...	...	...	...
X.	Borrowdale (Seathwaite).....	8.08	— 2.91	2.77	17	19	...	...	...	...	...	...
XI.	Cardiff (Ely).....	4.42	+ .36	.93	24	25	...	...	...	...	...	...
XI.	Haverfordwest	2.86	— 1.35	.69	29	21	81.0	2	47.2	13	0	0
XI.	Aberystwith (Gogerddan) ...	4.62	...	1.60	24	16	85.0	1	40.0	13	0	0
XI.	Llandudno.....	1.93	— 1.07	.66	24	20	82.6	1	48.6	12	0	0
XII.	Cargen [Dumfries]	2.61	— 1.32	.72	6	12	81.0	1	43.6	23	0	0
XII.	Jedburgh (Sunnyside).....	3.54	+ .10	1.08	9	13	81.0	1	43.0	8	0	0
XIV.	Colmonell	2.79	...	1.31	6	15	86.0	1	40.0	10	0	0
XV.	Lochgilthead (Kilmory).....	3.77	— .53	.75	6	17	...	...	40.0	22	0	0
XV.	Mull (Quinish)	4.75	+ .70	1.36	4	19	...	...	...	...	...	...
XVI.	Loch Leven Sluices	2.90	— .72	.50	7a	10	...	...	...	...	...	...
XVI.	Dundee (Eastern Necropolis)	3.45	— .01	.70	25	21	73.9	6	43.8	19	0	0
XVII.	Braemar	3.07	— .14	1.00	2	18	78.0	2	39.0	8	0	0
XVII.	Aberdeen (Cranford)	3.50	— .70	.70	17	21	72.0	4	43.0	20	0	0
XVII.	Strathconan [Beaully]	2.98	— .52	.72	13	9	...	...	...	...	...	...
XVII.	Glencarron Lodge.....	5.54	...	1.00	12	22	83.6	2	42.0	23	0	0
XVII.	Cawdor [Nairn]	4.57	+ 1.27	1.17	12	19	...	...	...	...	...	...
XIX.	Dunrobin	5.02	+ 2.17	1.05	12	18	75.5	1	48.0	25	0	0
XIX.	S. Ronaldsay (Roeberry).....	4.75	+ 2.39	1.07	12	13	68.0	5	47.0	19	0	0
XX.	Darrynane Abbey.....	5.94	...	1.19	30	25	...	...	...	...	...	...
XX.	Waterford (Brook Lodge) ...	5.09	+ 1.56	.81	28	21	74.5	30	43.0	22	0	0
XX.	O'Briensbridge (Ross)	4.96	...	.54	29	25	...	...	...	...	...	...
XXI.	Carlow (Browne's Hill)	4.23	+ .71	1.45	24	23	...	...	...	...	...	...
XXI.	Dublin (Fitz William Square)	3.77	+ 1.09	1.56	24	21	75.7	1	48.3	23	0	0
XXII.	Ballinasloe	4.20	+ .65	.65	24	25	78.0	1	47.0	23	0	0
XXII.	Clifden (Kylemore)	9.48	...	1.35	5	27	...	...	...	...	...	...
XXIII.	Waringstown	2.98	— .54	.35	24	20	84.0	31	46.0	22	0	0
XXIII.	Londonderry (Creggan Res.)..	4.74	+ .62	.48	4b	24	...	...	...	...	...	...
XXIII.	Omagh (Edenfel)	3.08	— .64	.35	10	24	80.0	1	40.0	21	0	0

a And 16, 26. b And 7, 11. c And 14.

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

METEOROLOGICAL NOTES ON JULY, 1894.

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

ENGLAND.

STRATHFIELD TURGISS.—A wet month, with only seven days without R. From the 6th to the 26th R fell every day, and on the 29th 1·34 in. fell within 24 hours. The continued R sadly interfered with the hay harvest, rendering the ensilage principle very useful to the farmers. T on 26th and 29th.

ADDINGTON.—From the 6th until the 24th the weather was unsettled, and very hindering for hay making. T was heard on several days, but there was no severe storm. The last week was fine. The max. temp. in shade was above 80° twice, namely on the 1st and 6th, but was generally low for July.

BURY ST. EDMUNDS.—A usual July month; many days with R, but no very heavy quantities here, the storms being very partial. Corn much laid. TSS on 6th, 10th, and 24th; T on 2nd, 9th, and 11th.

NORWICH, BRUNDALL.—Mean temp. was quite up to the average, and almost precisely the same as in July, 1893. The absolute max. was 3° lower and the absolute min. 3° higher than last year, R nearly double. T and L on nine days and T on two other days. Between 7 a.m. and 8 a.m. on the 23rd ·79 in. of R fell in a TS.

LANGTON HERRING.—From the 6th to the end of the month the weather was most unsettled. Between 3 a.m. and 4 a.m. on the 29th a heavy TS occurred, and T was heard on the 7th, 11th, 12th and 24th. A solar halo was observed on the 6th, and there was a dense fog on the morning of the 30th. Mean temp. at 9 a.m. (61° 6) 1°·3 below the average. Night temp. very uniform. Since the beginning of the year rain has fallen on 121 days, which is 28 above the average number of rainy days for the first seven months, and for the same period the excess of R is 2·53 in.

TORQUAY, CARY GREEN.—R 1·44 in., and wet days 3, above the average. Mean temp. 60°·2, or exactly the average. Amount of sunshine 160 hours, 45 minutes, being 22 hours, 45 minutes below the average. Three sunless days.

WOOLSTASTON.—The first week was very hot and oppressive; the remainder of the month was rather wet, R falling almost every day and doing a good deal of damage to the later hay harvest, T and L on 6th. Mean temp. 59°·6.

TENBURY, ORLETON.—The first 8 days of the month were very fine and warm, but the remainder was rather below the average temp. with a great amount of R, nearly all of which fell in heavy partial storms. T on 1st, 21st and 29th. Of the 5·33 in. which fell during the month 3·18 in. fell in 7 hours, 10 minutes, viz.: on the 10th ·73 in. in 40 mins.; on the 21st ·39 in. in 30 mins.; and on the 29th 2·06 in. in 6 hours. The amounts on the 10th and 21st were very remarkable from the fact that on each occasion not more than ·01 in. fell at Eastham, one mile distant. The R on the 29th (2·06 in.) is believed to be the heaviest ever recorded here in the time. It commenced at 2.30 p.m., and at 5 p.m. the quantity in the guage was ·64 in. There was then about 30 mins. with practically no R, but at 5.30 p.m. it began again and poured in torrents till 8.30 p.m., when the amount was 1·42 in., giving a total quantity of 2·06 in.

LEICESTER, BARKBY.—Hay harvest much delayed by R from 6th to 26th; occasional T and L. Mean temp. for month 62°·5; the nights warm.

MANCHESTER, PLYMOUTH GROVE.—Fine summer weather on the 1st, from the 4th to the 10th and from the 24th to the 31st; T and L on the 13th; TS on the 25th. Mean temp. 62°·8.

SEATHWAITE.—TSS on 6th and 25th; R on the 6th 1·03 in., on the 16th 2·20 in., and on the 17th 2·77 in.

WALES.

HAVERFORDWEST.—Many wet days, greatly interfering with hay-making, especially in the last week. In many places hay had been cut a fortnight, much to its detriment. Corn crops looking well, but sadly wanting sunlight

and heat to ripen them. With the exception of the high temp. on the 2nd, the ther. rose to 70° or upwards on 11 days only. Wind mostly from W. and S.W., and S.E. Many days were damp, warm and relaxing.

GOGERDDAN.—Stormy throughout the month, with very little bright sunshine.

SCOTLAND.

CARGEN.—The temp. during the first 25 days of the month, with the exception of the first two days, was somewhat cold and ungenial, but from the 25th to the end was very warm, the mean temp. of the month being about the average. Westerly winds prevailed for 20 days. A severe TS, lasting an unusually long time, was experienced on the 6th, and T was heard on the 19th. A remarkable solar halo was seen on the 11th. All crops abundant and looking well. The hay crop much above the average.

JEDBURGH.—The R in the first half of the month was frequent, but generally the weather was agreeable, and as there was much sunshine, all crops look well. Corn cutting will be a month later than last year. The atmosphere was very still after the 15th. T, L and heavy R on the 9th and 15th.

MULL QUINISH.—Generally a warm, wet month; great heat from 1st to 4th, and from 24th to 31st; all crops and vegetation most luxuriant.

BRAEMAR.—A month of fine, settled weather; sunshine 162 hours; sharp TS, with vivid L, from 9 p.m. to 11 p.m. on the 6th; T and L from 3 to 6 p.m. on the 21st.

ROEBERRY.—The wettest July recorded in 27 years, the R being 2·19 in. above the average of that period. Mean temp. 57°·3.

IRELAND.

DARRYNANE ABBEY.—A wet, bad month. Very heavy R all the morning on 31st, 1·19 in. falling in rather under 8 hours. Potato blight much spread and increasing fast.

WATERFORD, BROOK LODGE.—A wet month, with a good deal of T. The max. temp. very regular at about 65°. Blight commenced to show in the potatoes, and very little hay was got in from the fields. Green crops look well. T on 1st, T, L and H on 7th, L on 10th, heavy T with H on 23rd.

O'BRIENSBRIDGE, ROSS.—The worst possible month for hay-making, causing heavy loss in all the early cuttings. T and L frequent, and a cow killed by L on 23rd.

DUBLIN.—A very changeable, showery and thundery, but tolerably warm month, of average mean temp., but considerable R, with a decided prevalence of winds from westerly points, but easterly towards the close. Mean temp. (60°·3) slightly below the average. Rainy days 4 above the average. High winds on 7 days, attaining the force of a gale on the 18th. Electrical disturbances were frequent, and a severe TS occurred on the night of the 25th. A parhelion appeared on the evening of the 25th. [The mean temp. for June should have been 43°·1, not 49°·0.]

EDENFEL.—There can be no better example of how mere figures without explanation may mislead as to the character of weather than in contrasting the returns for July, 1893 and July, 1894. The former, with a R of 3·64 in., was a fine, fresh, mostly dry and sunshiny month, and one of the most favourable hay harvests for many years, while the month just passed, with a R of but 3·08 in., has been (with but a short interval) in all respects the reverse. A cloudy, saturated atmosphere, with Scotch-misty "dropping" weather, rendered hay-saving the most difficult and prolonged in 30 years, and fruit of all kinds almost flavourless.

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CCCXLIV.]

SEPTEMBER, 1894.

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THE BRITISH ASSOCIATION.

WE reported some of the proceedings in our last, and now complete our notice. The following were, we believe, the only papers bearing upon Meteorology :—

- A.—Report of Committee on Meteorological Photography (1).
- A.—Report of Committee on Solar Radiation (2).
- A.—Report of Committee on Underground Temperature (3).
- A.—Report of Committee on the Ben Nevis Observatory (4).
- A.—Dr. A. BUCHAN.—On the Scottish Rainfall (5).
- A.—J. PARK HARRISON.—On Lunar Curves of Mean Temperature at Greenwich : and the Heat of the Moon (6).
- B.—Dr. S. RIDEAL.—Iodine Value of Sun-light in the High Alps (7).
- B.—Report on Earth Tremors (8).
- C.—Report of the Committee on Underground Waters (9).
- C.—Report of the Committee on the Volcanic Phenomena of Vesuvius (10).
- E.—Address of President (11).
- E.—Report on the Climatology of Tropical Africa (12).
- E.—Report of the Committee on Antarctic Exploration (13).
- H.—OSBERT H. HOWARTH, C.E., F.R.G.S.—Life at High Altitudes in the Great West (14).

We have prefixed the letter of the Section before which each report or paper was read ; it does not say much for organization that they should have been distributed among five Sections. Numbers 3 and 8 were given in our last ; Number 5 did not arrive ; of Numbers 6, 7, 10, and 14 we have not been able to obtain particulars. All the others are noticed below :—

Fourth Report on the Application of Photography to the Elucidation of Meteorological Phenomena. Drawn up by the Secretary, MR. A. W. CLAYDEN.

In presenting their report on the work of the last year, your committee have but little to say on the subject of the representation of clouds and lightning by photography. They consider that their collection is nearly complete as far as the different varieties of cloud form are concerned, and it is only likely to be increased slowly and at long intervals by photographs of scarce forms of clouds or by particularly interesting series. During the year, the Secretary has secured many new negatives, but since the collection already includes satis-

factory examples of the same types, it has not been thought desirable to add more duplicates, and the offers of co-operation from other photographers have not been fulfilled.

With regard to photographs of lightning also, the collection has not been increased, for your committee have not been made aware of any photographs which show any features not already familiar, and no opportunity has occurred for the Secretary to make any observations for the further elucidation of the known phenomena.

Your committee propose to invite the Royal Meteorological Society to take charge of such photographs from their collection as are not likely to be required for further investigation.

The attention of the committee has been drawn to another application of photography which seems to open up a possibility of very valuable work. This is in the measurement of cloud altitudes.

This is a question which has become more important since the acceptance by the Munich Congress of the system of cloud nomenclature devised by Hildebrandsson and Abercromby, and it is remarkable that few actual measurements have been carried out.

As far as your committee are aware, the only measurements of the kind which have been systematically organised in this country are those which were begun some years ago at Kew.

It is not only important to have more observations, but it is specially desirable to have them from other places than the vicinity of London for comparison, and in the residence of the Secretary, at Exeter, such an opportunity is presented.

In the course of experiments on methods of cloud photography, it has been found easy to secure well-defined images of clouds, even when the sun is in the middle of the field of view. If then two such photographs are taken simultaneously by a pair of cameras at some distance apart, there will be a displacement of the image relatively to that of the sun. The amount of this displacement will depend upon a number of things, but it will be increased by adding to the focal length of the lens, and by increasing the distance between the cameras. By knowing these values, and the altitude and azimuth of the sun, the distance of the cloud and its height above the ground may be calculated without difficulty.

The azimuth and altitude of the sun at the time of exposure may be ascertained by direct observation, or it may be found by calculation from the known time at which exposure was made. There seems to be a manifest advantage in thus using the sun as a fixed point of reference, and it provides a means whereby any error in the observation of altitude and azimuth may be effectively checked.

Your committee have therefore prepared a pair of cameras so constructed that they may be easily directed towards the sun. They are provided with lenses of 18 inches focus, covering a plate of whole-plate size, thereby giving a large displacement, and allowing room for a displacement of several inches. The lenses are provided with adjustable shutters which can be simultaneously freed by an electrical attachment. They are placed on stands which serve as cupboards for them when not in use.

At present for purely trial purposes they are placed in the Secretary's garden at a distance of thirty-five yards, yet even that short distance gives a displace-

ment of half an inch with clouds 3,780 feet distant. This, of course, is too small for very accurate measurement, and would be far smaller with high level clouds, the determination of the altitudes of which is most important.

The intention of your committee is to place them on a plot of level ground by the side of the London and South-Western Railway near Exeter. There is available a strip of waste ground just over a quarter of a mile in length, commanding an uninterrupted view of the sun from sunrise until nearly sunset. The ground is level, and the cameras can be placed due east and west, thereby greatly simplifying the reduction of the observations.

The directors of the London and South-Western Railway have kindly consented to allow the ground to be used under conditions which seem to your committee quite satisfactory, but which involve the payment of a nominal rent of £1 per annum. The cameras would have been placed in position by the present time had it not been necessary to get another meeting of the committee to sanction the agreement.

The method is easy to apply, and promises to yield results at least as accurate as any which have yet been tried; therefore your committee ask for re-appointment, with a grant of £10.

Dr. Hugh R. Mill gave the results of a bathymetrical survey of the English lakes. Ten of the largest English lakes were sounded by the author, assisted by Mr. E. Heawood, Mr. Shields, and others, and the final discussion of the work enabled a tabular statement to be drawn up, which showed the following and other details:—

Name.	Length, miles.	Depth, feet.		Volume, million cubic feet.
		Max.	Average.	
Windermere	10·50	219	78½	12,250
Ullswater.....	7·35	205	83	7,870
Wastwater	3·00	258	134½	4,128
Coniston	5·41	184	79	4,000
Crummock	2·50	144	87½	2,343
Ennerdale	2·40	148	62	1,978
Bassenthwaite.....	3·83	70	18	1,023
Derwentwater.....	2·87	72	18	1,010
Haweswater	2·33	103	39½	589
Buttermere	1·26	94	54½	537

There are two main types amongst these lakes, the shallow and the deep. The former including only Derwentwater and Bassenthwaite, are the broadest of all the lakes, and they average only 18 ft. in depth. The bed of these lakes may be roughly described as an undulating plain, grooved and ridged into shallow hollows, and low shoals running parallel to the long axis of the lake. The second, or deep type, the shallowest of which has an average depth of 40 ft., comprises all the other lakes. Ennerdale combines the characteristics of both types, conforming to the deep type in its upper, to the shallow in its lower, reach. They are long, narrow, sometimes winding like Ullswater, or slightly curved in outline like Wastwater and Haweswater. The most characteristic lie in long, narrow valleys with steeply sloping sides, and the slopes are con-

tinued under water with almost equal steepness—in some cases with greater steepness—and terminate in an almost flat floor. The typical form of this class of lake is thus a steep-sided flat-bottomed trough, diversified along the slopes by the still steeper conical mounds of *débris* thrown down at the mouths of streams.

Third Report of a Committee on the Climatological and Hydrographical Conditions of Tropical Africa. Drawn up by MR. E. G. RAVENSTEIN.

YOUR Committee, up to the end of July last, had issued five sets of meteorological instruments at a cost, including forms, carriage, &c., exceeding £100. The first of these sets was entrusted to Mr. J. W. Moir (British Central Africa), the second to Mr. Buchanan (British Central Africa), the third to Captain Gallwey (Warri, Benin), the fourth to the Rev. C. Bonzon (Lambarene, on the Ogowe), and the fifth to the Rev. R. Glennie (Bolobo, Congo). A sixth set is kept in reserve for British East Africa.

Two of these sets, namely, those in the hands of Mr. Buchanan and Mr. Glennie, include Fortin barometers, whilst that granted to Captain Gallwey includes a black bulb thermometer.

Observations up to the latest possible date have been received from Mr. Glennie, Mr. Bonzon, and Dr. Roth, as representing Captain Gallwey.

Instructions have been issued to the officials of the Royal Niger Company to make their observations in future in accordance with the rules laid down by your Committee, and the like step is contemplated by the British East Africa Company.

Summaries of meteorological returns are appended to this report. Your Committee are quite aware that these observations are not in every instance as complete and trustworthy as could be desired. In some cases the hours of observation are ill chosen (a very common occurrence), in others the instruments are defective, or the corrections to be applied to the readings are unknown. If they are published notwithstanding it is done because they refer to localities concerning which nothing or very little is known at the present time.

Quite a number of meteorological records offered to the Committee for publication have had to be rejected as being on the face of them utterly untrustworthy. It seems a pity that so much time and labour should have been wasted upon recording observations which, with a little forethought and caution, might have furnished important information on the climate of Tropical Africa.

The grant of £5 made to the Committee last year was not claimed.

[From the tables appended to this report we have prepared the following abstract.—ED. M. M.]

ABSTRACT OF METEOROLOGICAL OBSERVATIONS IN AFRICA.

Name of Station ...	Bolobo Congo 2° 10' S. 16° 13' E. 1080 ft. Rev. R. Glennie	Warri Benim 5° 31' N. 5° 51' E. 10 ft. Capt. Gallwey	Kips Hill Niger 8° 48' N. 6° 25' E. — Rev. C. Paul	Namirembe Uganda 0° 18' N. 32° 34' E. 4000 ft. Rev. E. Millar	Fort Salisbury 17° 50' S. 31° 4' E. 5050 ft. Major Forbes	Ribe 3° 55' S. 39° 40' E. 500 ft. Rev. T. Wakefield	Mochi Kilimanjaro 3° 18' S. 37° 23' E. 5000 ft. Rev W Morris	Sagala Taita 3° 32' S. 38° 35' E. 3300 ft. Rev J A Wray
Observer	1891-3	1891-3	1881	1893-4	1891-2	1876-77	—	—
Period of Observtn.	7, 2, 9	—	9, 9	—	25-398	29-492	—	—
Rar. { Time of Obs.	28-813	—	81	—	66-2	6, 3, 9	—	—
at 32° { Mean pressure	7, 2, 9	—	—	67-2	78-9	78.8	65	72
{ Mean	77°-5	80-1	—	76-9	53-5	? 83	73	83
{ Mean Max.	85-9	85-8	—	57-4	93	? 76	57	61
{ Mean Min.	70-7	74-4	—	85-8	34	92	82	96
{ Absolute Max.	96-6	68-0	96	52-1	25-4	? 7	50	54
{ Absolute Min.	55-0	11-4	74	19-5	59	23	16	22
{ Mean Range ...	15-2	31-0	22	33-7	34 in.	51 in.	32	42
{ Absolute Range	41-6	150 in.	—	35 in.	E.N.E.	E.S.E.	—	—
Rain per year*	56 in.	—	—	—	—	—	—	—
Prevalent Wind ...	—	—	—	—	—	—	—	—

* Computed and only a rough approximation.

Address to the Geographical Section, by CAPTAIN W. J. L. WHARTON, R.N., F.R.S., Hydrographer to the Admiralty, President of the Section.

THIS address dealt exclusively with features analogous to those treated by Maury in his "Physical Geography of the Sea." We can reprint only some of the principal facts.

After long hesitation and much argument, I think that it may now be safely held that the prime motor of the surface currents of the ocean is the wind. Not, by any means, the wind that may blow, and even persistently blow, over the portion of water that is moving, more or less rapidly, in any direction, but the great winds which blow generally from the same general quarter over vast areas. These, combined with deflection from the land, settle the main surface circulation.

I do not know if any of my hearers may have seen a very remarkable model devised by Mr. Clayden, in which water disposed over an area shaped like the Atlantic, and sprinkled over with lycopodium dust to make movement apparent, was subjected to air impelled from various nozzles, representing the mean directions of the permanent winds. It dispelled the last doubt I held on the subject, as not only were the main currents reproduced, but the smaller effects and peculiarities of the Atlantic drifts were produced with surprising accuracy.

There is a small current, long shown on our charts, but which I had always regarded with suspicion. I refer to the stream which, after travelling from the Arctic Ocean southward along the east coast of Greenland, turns sharply round Cape Farewell to the northward into Davis Straits, where it again doubles sharply on itself to the southward. This is exhibited, in the model, in all its details, and is evidently caused by the pressure of the water forced by the mimic Gulf Stream into the Arctic region, where it has no escape except by this route, and is pressed against the land, round which it turns as soon as it can. This is, no doubt, the explanation of the real current.

One instance of the underrunning of one current by another is brought very plainly to our notice in the North Atlantic, to the east of the Great Banks of Newfoundland, where the icebergs borne by the arctic current from Baffin Bay pursue their course to the southward across the Gulf Stream running eastward.

These great masses of ice, floating with seven-eighths of their volume under the surface, draw so much water that they are all but wholly influenced by the under-current. A large berg will have its bottom as much as six or seven hundred feet below the surface. The only reason that these bergs continue their journey southward is the action of the cold under-current.

Our knowledge of the depth of the ocean is steadily, though slowly increasing. The whole of it has been gained during the last fifty years.

Commenced by Sir James Ross, whose means were very small, but who nevertheless demonstrated that the so-called unfathomable ocean was certainly fathomable everywhere, the sounding of the ocean has continuously proceeded. The needs of submarine cables have constantly demanded knowledge in this particular, and the different cable companies have had a large share in ascertaining the facts.

It is hopeless to do more than to briefly sketch the amount of our knowledge.

First, as to the greatest depths known. It is very remarkable, and from a geological point of view significant, that the very deepest parts of the ocean are not in or near their centres, but in all cases are very near land.

One hundred and ten miles outside the Kurile Islands, which stretch from the northern point of Japan to the north-east, the deepest sounding has been obtained of 4,655 fathoms, or 27,930 feet ($5\frac{1}{2}$ miles). This appears to be in a deep depression, which runs parallel to the Kurile Islands and Japan; but its extent is unknown, and may be very large.

Seventy miles north of Porto Rico, in the West Indies, is the next deepest cast known, viz., 4,561 fathoms, or 27,366 feet ($5\frac{1}{4}$ miles); not far inferior to the Pacific depth, but here the deep area must be comparatively small, as shallower soundings have been made at distances sixty miles north and east of it.

A similar depression has been sounded during the last few years west of the great range of the Andes, at a distance of fifty miles from the coast of Peru, where the greatest depth is 4,175 fathoms ($4\frac{3}{4}$ miles).

Other isolated depths of over 4,000 fathoms have been sounded in the Pacific. One between the Tonga or Friendly Islands of 4,500 fathoms, one of 4,478 fathoms near the Ladrones, and another of 4,428 fathoms near Pylstaart Island, all in the Western Pacific. They all require further investigation to determine their extent.

To give an idea of what remains to be done, I will mention that in the eastern part of the Central Pacific there is an area of 10,500,000 square miles in which there are only seven soundings, whilst in a long strip crossing the whole North Pacific, which has an area of 2,800,000 square miles, there is no sounding at all. Nevertheless, while the approximate mean depth I am mentioning may be considerably altered as knowledge increases, we know enough to say that the Pacific is generally deeper than the other oceans. The immensity, both in bulk and area, of this great mass of water, is difficult to realise; but it may assist us when we realise that the whole of the land on the globe above water level, if shovelled into the Pacific, would only fill one-seventh of it.

The temperature of the ocean is interesting.

The temperature of the surface is most important to us, as it is largely on it that the climates of the different parts of the world depend. This is comparatively easy to ascertain. We know so much about it that we are not likely to improve on it for many years. We are quite able to understand why countries in the same latitude differ widely in their respective mean temperatures; why fogs prevail in certain localities, and others are subject to tempestuous storms.

On the latter point nothing has come out plainer from recent discussion than the fact that areas where great differences of surface temperature of the sea prevail are those in which storms are generated.

A remarkable point recently brought to light by the researches of Mr. John Murray in Scotch lochs is the effect of wind on the surface temperature. It has been observed that wind driving off a shore drifts the surface water before it. This water is replaced by the readiest means, that is to say, by water from below the surface rising to take its place. As the lower strata are in all cases cooler than the surface a lowering of the temperature results, and we find, in fact, that near all sea-shores off which a steady wind blows the water is cooler than further to seaward.

This has an important bearing on coral growth, and explains why on all western coasts of the great continents off which the trade winds blow we find an almost absolute dearth of coral, while on the eastern coasts, on which warm currents impinge, reefs abound, the coral animal flourishing only in water above a certain temperature.

In the meantime we can state certain known facts.

The depth of the warm surface water is small.

In the equatorial current between Africa and South America, where the surface is of a temperature of 78° , at 100 fathoms it is only 55° , a difference of 23° , and a temperature of 40° is reached at 400 fathoms. In this region, as far as knowledge goes, the fall in temperature as we descend is most rapid, but generally speaking the same variations prevail everywhere.

In the tropical Pacific the temperature falls 32° from the surface, where it stands at 82° , to 50° at a depth of 200 fathoms, and to 40° at from 500 to 600 fathoms below the surface. Below the general depth of from 400 to 600 fathoms, the temperature decreases very slowly, but there is considerable variation in the absolute amount of it when we get to great depths in different parts of the ocean.

It is interesting that the investigation into the translation of the great seismic wave caused by the eruption of Krakatoa in 1883 led to a similar and entirely independent conclusion. The wave caused by the explosion in the Straits of Sunda reached Cape Horn, where by good chance a French meteorological expedition had erected an automatic tide gauge, but instead of one series of waves being marked on the paper there were two. A little consideration showed that the South Pole having directly interposed between Sunda Straits and Cape Horn, the waves diverted by the land about the pole would arrive from both sides.

One wave, however, made its appearance seven hours before the other.

Study showed that the earliest wave coincided in time with a wave travelling on the Pacific side of the pole, with a velocity due to the known depth, while the later wave must have been retarded in its journey *via* the South Atlantic. The only possible explanation is that the wave had been impeded by comparatively shallow water.

In the great oceans the greatest cold is found on the western side of the South Atlantic, where the thermometer stands at $32^{\circ}\cdot3$ F., but temperatures of 29° F. have been obtained of recent years east of the Færoe Islands, north of the ridge which cuts off the deeper waters of the Arctic from the Atlantic.

The waves which for ever disturb the surface of the sea demand much study.

The greatest of these, and the most regular, is the tidal wave. On this many powerful intellects have been brought to bear, but it still presents many unsolved anomalies.

Lord Kelvin and Professor Darwin have demonstrated that the tidal movement is made up of many waves depending upon different functions of the moon and sun, some being semi-diurnal, some diurnal. The time of transit over the meridian, the declination of both bodies, create great variations; the changing distance and position of the moon and the position of her node, also have great effect, while the ever-varying direction and force of the winds, and the different pressure of the atmosphere, play their part, and sometimes a very large part, on what is somewhat loosely known as the meteorological tide.

Though after long observation made of the times and ranges of tides at any one spot, they can now be predicted with great accuracy, for that particular place, by the method of harmonic analysis, perfected by Professor G. Darwin, the meteorological tide excepted, no one can yet say what the tide will be at any spot where observations have not been made.

The waves due to wind, though not so far-reaching in their effects as the

majestic march of the tide wave, are phenomena which are more apparent to the traveller on the ocean.

The deep sea in a heavy gale presents, perhaps, the most impressive manifestation of the powers of nature which man can behold, and doubtless many of us have experienced feelings that may vary from awe and wonder to sheer delight, according to the temperament of each individual, at for the first time finding himself face to face with this magnificent sight, though I rather fear that discomfort is the prevailing feeling that many carry away.

The height to which storm waves may rise has never been satisfactorily determined. Apart from the difficulty of the task and the small number of people who will address themselves to it when they have the chance, it is but rarely that any individual sees really abnormal waves, even though he may be at sea all his life.

Different heights for what are called maximum waves have been recorded, and they vary from 40 to 90 feet from crest to hollow.

All we can say is that the most probable figure is about 50 or 60 feet.

These great storm waves travel very far. In some cases they convey a warning, as their velocity always far exceeds that at which the storm is travelling. In others they intimate that a gale of which no more is seen has occurred somewhere—it may be many miles distant.

When they have travelled beyond the limits of the wind which raised them, they lose the steepness of slope which characterises them when under its influence, and become an undulation which is scarcely noticed when in deep water.

On approaching shallow water, however, they are again apparent, and the "rollers" that occur unperiodically at various places in latitudes where gales never occur would seem to be caused by such waves, originating in areas many thousands of miles distant. Such appears to be the originating in areas many rollers at Ascension and St. Helena, where the rocky and exposed nature of the landing has caused this phenomenon to be especially noticed.

Other rollers are, however, undoubtedly due to earthquakes or volcanic eruptions occurring in the bed of the sea.

The variations in the pressure of the atmosphere play an important part in changes of sea level.

A difference of one inch in the barometer has been shown to be followed by a difference of a foot in the mean level of the sea, and in parts of the world where the mean height of the barometer varies much with the seasons, and the tidal range is small, this effect is very marked.

Of any secular change in the level of the sea little is known. This can only be measured by comparison with the land, and it is a question which is the more unstable, the land or the water—probably the land, as it has been shown that the mass of the land is so trifling, compared with that of the ocean, that it would take a great deal to alter the general mean level of the latter.

THE MAY FROST OF 1894.

To the Editor of the Meteorological Magazine.

SIR,—To answer the question put by Mr. Harold Smith in the August Magazine as to the strength of the wind at Easton Mauduit, on May 21st, during the daytime between the two severe night frosts, I may reply that the "wind" entries in my register (made by estimate, not by instruments,) show a force at 9 a.m. of 3, and during the whole day of 2 (on scale 0–12), *i.e.*, there was a light breeze at 9 a.m. which lessened as the day went on. It was the quietest day of the period, 19th to 24th. The 22nd showed 3 and 4 respectively, and the two next days 5 and 4, which, by estimate, means a considerable wind, but nothing like a gale. I give these figures as being good for comparison between themselves, but not as of precise absolute value.—Yours sincerely,

H. A. BOYS.

*Easton Mauduit Vicarage, Northampton, Aug. 28th, 1894.**To the Editor of the Meteorological Magazine.*

SIR,—Although it is rather late to be talking about the May frost, yet, having noticed in your Magazine for June the low temperatures given for different parts of the country on 21st of May and following nights, I cannot refrain from drawing your attention to the comparative freedom of London, and especially South London, from severe frosts during that period, the lowest temperature taken by me being 35°, on the night of the 20–21st May, the shed in which the thermometer hung being open to the N.E. wind, which was blowing at the time. I notice that this is even two degrees higher than the value given by you for North-west London on the same date.

This position is at the summit of the hill, and fully exposed, yet nothing in the garden was damaged.

I am, yours faithfully,

AN AMATEUR METEOROLOGIST.

Clapham Park, S. W., July 7th, 1894.

[This is another illustration of the variability of temperature in and around the metropolis. It was 32°·3 at Greenwich Observatory, 33°·0 at Camden Square, 35°·0 at Clapham, and 36°·0 at Acre Lane. Brixton]

AN INDICATION OF RAIN.

To the Editor of the Meteorological Magazine.

SIR,—I find hereabouts a general belief that when corn in sheaves on the field dries rapidly in the morning rain may be expected. This seems to be contrary to all sound theory. The above conditions obtained yesterday, rain following. It was triumphantly argued to me that the popular belief must be correct.—Your obedient servant,

DUCIE.

Tortworth Court, Falfield, Glos., Sept. 5th, 1894.

THE VIENNA HAILSTORM OF JUNE 7TH.

In the latest *Meteorologische Zeitschrift*, Dr. Hann, chief of the Austrian Weather Department, has given some interesting particulars relating to the terrific and destructive hailstorm, accompanied by a perfect hurricane and thunder and lightning, which visited Vienna on the morning of June 7th last. The storm is shown to have travelled from west to east. Originating apparently about 9.30 p.m. on the 6th in Wurtemberg it passed over Munich shortly before 3 a.m., the wind blowing in very severe squalls, rain and hail falling like a deluge, and in ten minutes there were more than 80 flashes of lightning. Travelling at the rate of 35 miles an hour, the disturbance reached Gmunden, but the storm was not violent here, and only a little rain fell. The distance of 120 miles from Gmunden to the Austrian capital was covered in 1hr. 40min., or at the rate of 72 miles an hour, the average rate for the whole distance from Munich being 48 miles an hour. Around Vienna the storm broke about 6.30 a.m., and a few minutes after 7 o'clock it was all over. There are a number of observers in and about the city, and few of them reported less than an inch of water, one or two from rain alone, the others from rain and melted hail. The largest totals were 1.7lin. in the Rathhauspark and 1.67in. in the Skodagasse, Josefstadt. At the central office, Hohe Warte, 0.4in. fell in 16 minutes, but at the Schmelz Reservoir the hail, which came down between 6.35 and 6.50 a.m., yielded 1.47in. of water, or at the rate of nearly six inches per hour. Further afield, at Purkersdorf, however, Mr. Francis A. Heath, C.E., had a total of 1.26in., but in five minutes, 6.45 to 6.50 a.m., he measured the enormous quantity of 1.1in., or at the rate of more than 13 inches an hour. At Mariabrunn, the Imperial Experimental Forest Station, 1.48in. was registered in 20 minutes.

INTERNATIONAL METEOROLOGICAL COMMITTEE.

The International Meteorological Committee held its meeting, as arranged, at Upsala, on August 20—24. M. Wild, the president, was unfortunately prevented from attending, owing to indisposition. M. Mascart was elected president for the meeting and Mr. Scott, as usual, secretary. The principal points dealt with at the meeting were as follows:—1. The establishment of an international meteorological bureau was recognized as impracticable. 2. It was resolved to publish in the report of the meeting a *résumé* of the measures adopted in all countries to communicate to agriculturists meteorological results likely to be useful to them. 3. The acceleration of meteorological telegrams. It was decided to address the international telegraphic bureau at Berne on this subject. 4. "The scintillation of stars as an indication of weather," a paper by M. C. Dufour, will be reproduced in the report. 5. The study of clouds. This was the great feature of the meeting. The cloud committee appointed at Munich in 1891 held a meeting at the same time as the International Meteorological Committee, and presented a report dealing with definitions for the ten classes (Hildebrandsson and Abercromby) adopted at Munich, and with instructions for cloud observations. They also proposed to prepare and issue an authoritative cloud atlas. This report was, with some modification, adopted. 6. The subject of the treatment of the wet bulb below the freezing point was discussed, and the use of Ekholm's formula was recommended *ad interim*. 7. It was decided to arrange for a conference of the same character as that at Munich in 1891, which was not an official congress, to be held in Paris in September, 1896.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MARCH, 1894.

STATIONS. <i>(Those in italics are South of the Equator.)</i>	Absolute.				Average.				Absolute.		Total Rain.		Aver. Cloud.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
England, London	65·8	31	28·6	3	54·2	36·0	38·9	81	108·8	22·1	1·19	9	4·8
Malta.....	68·3	14	41·7	29	62·0	51·2	46·1	74	131·6	36·6	1·49	11	5·8
<i>Cape of Good Hope</i> ...	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>Mauritius</i>	84·5	21	68·1	19	82·4	72·5	69·3	78	133·3	59·6	3·99	17	5·4
Calcutta.....	98·8	24	59·8	9	92·0	69·6	66·5	66	153·5	50·1	1·50	2	2·1
Bombay.....	91·0	25	67·6	12	86·4	74·3	69·7	71	140·0	61·4	·06	3	1·9
Ceylon, Colombo.....	90·8	15	72·0	12	88·3	74·9	72·2	77	152·0	64·0	7·44	11	4·5
<i>Melbourne</i>	93·0	8	47·3	29	75·5	56·9	54·9	69	146·5	37·9	·88	8	6·5
<i>Adelaide</i>	96·2	12	52·8	27	80·3	60·4	53·4	55	155·5	46·8	1·59	12	4·6
<i>Sydney</i>	83·0	7	57·8	26	73·8	64·2	61·2	81	143·2	48·5	11·58	25	6·6
<i>Wellington</i>	72·0	5a	44·3	31	67·3	55·2	51·7	72	132·0	33·0	4·07	10	4·2
<i>Auckland</i>	76·0	2	51·0	22	71·6	57·5	58·8	81	144·0	49·0	1·42	9	4·8
Jamaica, Kingston.....	87·7	6	61·2	9	83·9	66·6	66·4	78	...	...	·74	4	3·4
Trinidad .....	...	...	...	...	...	...	...	...	...	...	...	...	...
Toronto.....	63·4	18	14·1	26	43·1	28·4	29·6	76	...	10·0	1·33	19	7·0
New Brunswick, Fredericton.....	64·7	6	1·5	31	40·5	20·1	23·2	68	...	...	1·87	12	6·0
Manitoba, Winnipeg.....	40·4	2	—20·5	25	29·8	9·5	...	...	...	...	1·63	10	6·0
British Columbia, Esquimalt.....	56·9	25	29·2	3b	47·3	35·2	37·3	86	...	...	4·64	25	7·0

a And 7. b And 6.

REMARKS.

MALTA.—Adopted mean temp. 54°·9, one degree below the average of 10 years; cloud and rainfall above the average. Mean hourly velocity of wind 9·8 miles. Thunderstorm on 13th; L on 22nd and 30th; H on 25th. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·5 below, dew point 0°·5 below, and rainfall 3·97 in. below, their respective averages. Mean hourly velocity of wind 10·7 miles, or 0·8 mile above average; extremes, 29·3 on 12th, and 0·0 on 1st; prevailing direction, E.S.E. T and L on the 11th and 22nd, and L on 13th and 30th. C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—Lightning was seen on the 13th, 14th and 28th. Thunderstorms occurred on 6 days. D. G. MANTELL.

Melbourne.—Lightning on the 5th, 8th and 18th. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean temp. 0°·1 below the average of 37 years, and rainfall ·55 in. above the average. The first half of the month was warm and dry, the second half cool and wet. C. TODD, F.R.S.

Sydney.—Temperature 0°·2 below, humidity 5 above, and rainfall 5·97 in. above, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Fine up to the 6th, then showery with fine intervals up to the 18th, when 2·55 in. of R fell; fine for the remainder, except showers on 26th, 27th and 28th. Prevailing wind N.W. Mean temperature 0°·9 below, and rainfall ·97 in. above, the average. R. B. GORE.

Auckland.—An unusually fine and dry month, the rainfall being more than an inch below the average. Mean temp. slightly below, and barometrical pressure slightly above, the average. T. F. CHEESEMAN.

JAMAICA.—Mean hourly velocity of wind 3·9 miles, prevailing direction S.S.E. Rainfall in Kingston half the average, but over the Island as a whole the average fall was received. R. JOHNSTONE.

SUPPLEMENTARY TABLE OF RAINFALL,
AUGUST, 1894.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			
II.	Dorking, Abinger Hall.	2·39	XI.	Rhayader, Nantgwiltt..	...
„	Birchington, Thor	1·70	„	Lake Vyrnwy	4·51
„	Hailsham	2·38	„	Corwen, Rhug	2·44
„	Ryde, Thornbrough	2·62	„	Carnarvon, Cocksidia ...	3·20
„	Emsworth, Redlands ...	1·93	„	I. of Man, Douglas	3·06
„	Alton, Ashdell	3·22	XII.	Stoneykirk, Ardwell Ho.	2·11
III.	Oxford, Magdalen Col...	2·30	„	New Galloway, Glenlee	3·91
„	Banbury, Bloxham	2·53	„	Melrose, Abbey Gate ...	5 50
„	Northampton, Sedgbrook	2·07	XIII.	N. Esk Res. [Penicuick]	5·50
„	Alconbury	2·66	„	Edinburgh, Blacket Pl..	3·83
„	Wisbech, Bank House..	2·05	XIV.	Glasgow, Queen's Park.	4·87
IV.	Southend	2·51	XV.	Inverary, Newtown	5·96
„	Harlow, Sheering	2·61	„	Islay, Gruinart School..	...
„	Colchester, Lexden	1·45	XVI.	Dollar	5·25
„	Rendlesham Hall	2·51	„	Balquhidder, Stronvar..	4·99
„	Diss	2·06	„	Ballinluig	4·68
„	Swaffham	2·28	„	Dalnaspidal H.R.S. ...	6·48
V.	Salisbury, Alderbury ...	1·86	XVII.	Keith H.R.S.	5·14
„	Bishop's Cannings	2·60	„	Forres H.R.S.	3·90
„	Blandford, Whatcombe.	1·83	XVIII.	Fearn, Lower Pitkerrie.	3·86
„	Ashburton, Holne Vic. ...	5·32	„	Loch Shiel, Glenaladale	9·25
„	Okehampton, Oaklands.	4·40	„	N. Uist. Loch Maddy ...	4·92
„	Hartland Abbey	4·24	„	Invergarry	4·75
„	Lynmouth, Glenthorne.	4·49	„	Aviemore H.R.S.	4·84
„	Probus, Lamellyn	3·67	„	Loch Ness, Drumnadrochit	5·55
„	Wellington, Sunnyside..	3·85	XIX.	Invershin	4·47
„	Wincanton, Stowell Rec.	2·57	„	Scourie	5·21
VI.	Clifton, Pembroke Road	3·26	„	Watten H.R.S.	3·35
„	Ross, The Graig	2·97	XX.	Dunmanway, Coolkelure	3·42
„	Wem, Clive Vicarage ...	3·28	„	Fermoy, Gas Works ...	3·08
„	Cheadle, The Heath Ho.	2·61	„	Killarney, Woodlawn ...	3·14
„	Worcester, Diglis Lock	2·30	„	Tipperary, Henry Street	...
„	Coventry, Coundon	2·97	„	Limerick, Kilcornan ...	3·09
VII.	Ketton Hall [Stamford]	2·00	„	Ennis .....	...
„	Grantham, Stainby	3·90	„	Miltown Malbay	3·95
„	Horncastle, Bucknall ...	2·72	XXI.	Gorey, Courtown House	4·03
„	Worksop, Hodsck Priory	2·03	„	Athlone, Twyford	3·13
VIII.	Neston, Hinderton	3·41	„	Mullingar, Belvedere ...	3·85
„	Lancaster, Rose Bank... ..	6·61	„	Longford, Currygrane...	3·96
„	Broughton-in-Furness..	6·61	XXII.	Galway, Queen's Coll... ..	4·19
IX.	Ripon, Mickley	2·40	„	Crossmolina, Enniscoe..	3·13
„	Scarborough, South Cliff	3·38	„	Collooney, Markree Obs.	2·31
„	East Layton [Darlington]	2·37	„	Ballinamore, Lawderdale	2·82
„	Middleton, Mickleton..	2·97	XXIII.	Lough Sheelin, Arley ..	2·96
X.	Haltwhistle, Unthank..	5·04	„	Warrenpoint	2·10
„	Bamburgh	3·14	„	Seaforde	2·25
„	Keswick, The Beeches...	6·34	„	Belfast, Springfield	2·36
XI.	Llanfrechfa Grange	4·19	„	Bushmills, Dundarave...	2·90
„	Llandovery	4·79	„	Stewartstown	1·57
„	Castle Malgwyn	3·73	„	Bunrana	2·90
„	Builth, Abergwessin Vic.	5·58	„	Lough Swilly, Carrablagh	3·63

AUGUST, 1894.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					TEMPERATURE.				No. of Nights below 32°.	
		Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours		Days on which '01 or more fell.	Max.		Min.		In shade.	On grass.
				Dpth	Date		Deg.	Date	Deg.	Date		
I.	London (Camden Square) ...	2·85	+ ·97	·90	23	18	79·3	14	44·3	21	c	0
II.	Maidstone (Hunton Court)...	1·55	- ·14	·28	10	13	...	...	...	...	...	...
III.	Strathfield Turgiss	2·56	+ ·85	·72	24	22	77·1	14	39·3	21	0	0
IV.	Hitchin	4·18	+ 2·36	1·06	10	18	75·0	26	44·0	29	0	0
V.	Winslow (Addington)	2·32	+ ·35	·48	23	17	75·0	24	40·0	21	0	0
VI.	Bury St. Edmunds (Westley)	3·17	+ ·97	·70	23	21	72·0	14	47·0	17d	0	0
VII.	Norwich (Brundall)	2·17	...	·72	23	21	75·6	14	45·0	17	0	0
VIII.	Weymouth (Langton Herring)	3·17	+ 1·24	1·62	25	12	71·0	28	47·0	17	0	0
IX.	Torquay (Cary Green)	3·31	...	·94	24	14	71·6	31	50·0	7	0	0
X.	Polapit Tamar [Launceston]..	4·11	+ 1·63	·76	25	20	74·0	31	51·0	17e	0	0
XI.	Stroud (Upfield)	3·13	+ 1·04	·51	25a	22	71·0	1	42·0	20	0	0
XII.	Churchstretton (Woolstaston)	3·94	+ 1·18	1·00	25	16	69·0	26b	46·0	20	0	0
XIII.	Tenbury (Orleton)	2·72	+ ·60	1·07	25	16	72·7	30	41·0	21	0	0
XIV.	Leicester (Barkby)	2·12	- ·32	·35	5	24	75·0	14c	38·0	20	0	0
XV.	Boston	2·16	+ ·04	·30	25	23	75·0	10	45·0	17	0	0
XVI.	Hesley Hall [Tickhill].....	1·75	- ·41	·51	25	17	71·0	1	41·0	21f	0	0
XVII.	Manchester (Plymouth Grove)	3·80	+ ·71	·70	1	23	70·0	4,5	45·0	22	0	0
XVIII.	Wetherby (Ribston Hall) ...	2·46	+ ·12	·39	9	15	...	...	...	...	...	...
XIX.	Skipton (Arncliffe)	5·33	+ 1·00	·90	2	20	...	...	...	...	...	...
XX.	Hull (Pearson Park)	2·22	- ·42	·50	25	18	71·0	30	41·0	23	0	0
XXI.	Newcastle (Town Moor)	3·12	+ ·41	·63	9	21	...	...	...	...	...	...
XXII.	Borrowdale (Seathwaite).....	13·10	+ 4·65	2·47	2	23	...	...	...	...	...	...
XXIII.	Cardiff (Ely).....	4·96	+ 1·35	1·36	25	21	...	...	...	...	...	...
XXIV.	Haverfordwest	4·17	+ ·99	·99	24	23	70·0	1	40·9	30	0	0
XXV.	Aberystwith (Gogerddan) ...	4·70	...	1·10	12	19	74·0	22	37·0	28	0	0
XXVI.	Llandudno	2·66	+ ·30	·57	25	23	66·2	6	49·4	30	0	0
XXVII.	Cargen [Dumfries]	3·38	+ ·39	1·50	2	16	69·8	9	39·0	28	0	0
XXVIII.	Jedburgh (Sunnyside).....	5·55	+ 3·31	2·97	2	17	72·0	1	39·0	25	0	0
XXIX.	Colmonell	3·09	...	1·28	2	17	73·0	8,24	39·0	22	0	0
XXX.	Lochgilthead (Kilmory).....	5·89	+ 1·33	1·87	13	19	...	...	37·0	26	0	0
XXXI.	Mull (Quinish)	5·71	+ 1·56	1·76	13	24	...	...	...	...	...	...
XXXII.	Loch Leven Sluices	4·00	+ 1·06	1·40	3	11	...	...	...	...	...	...
XXXIII.	Dundee (Eastern Necropolis)	4·50	+ 1·93	1·20	2	17	70·1	29	43·0	22	0	0
XXXIV.	Braemar	5·53	+ 2·20	1·92	2	21	66·0	29	33·1	25	0	2
XXXV.	Aberdeen (Cranford)	4·75	...	1·87	2	18	68·0	8,13	41·0	24	0	0
XXXVI.	Strathconan [Beaully]	4·37	+ 1·07	·72	9	17	...	...	...	...	...	...
XXXVII.	Glencarron Lodge.....	8·60	...	1·38	11	27	65·8	1	39·0	25	0	0
XXXVIII.	Cawdor [Nairn]	4·51	+ 2·26	·84	9	23	...	...	...	...	...	...
XXXIX.	Dunrobin	3·76	+ 1·36	·52	11	16	65·5	1	44·0	22	0	0
XL.	S. Ronaldsay (Roeberry).....	3·22	+ ·66	·71	19	21	62·0	7	47·0	21g	0	0
XLI.	Darrynane Abbey.....	4·32	...	·76	21	23	...	...	...	...	...	...
XLII.	Waterford (Brook Lodge) ...	3·19	- ·23	1·00	24	16	69·0	19	44·0	17h	0	0
XLIII.	O'Briensbridge (Ross)	3·40	...	·58	25	21	...	...	...	...	...	...
XLIV.	Carlow (Browne's Hill)	3·14	+ ·17	1·13	25	17	...	...	...	...	...	...
XLV.	Dublin (Fitz William Square)	3·73	+ 1·21	1·37	25	18	67·9	8	47·1	20h	0	0
XLVI.	Ballinasloe	3·44	+ ·26	·98	25	20	68·0	5,9	47·0	16	0	0
XLVII.	Clifden (Kylemore)	5·29	...	·70	7	24	...	...	...	...	...	...
XLVIII.	Waringstown	1·82	- 1·29	·26	25	23	77·0	4	40·0	6	0	0
XLIX.	Londonderry (Creggan Res.)..	2·90	- 1·22	·32	8	27	...	...	...	...	...	...
L.	Omagh (Edenfel)	2·44	- 1·05	·38	9	25	67·0	2	37·0	21	0	0

a And 27. b And 30. c And 26. d And 21. e And 30. f And 23. g And 31. h And 22.

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

METEOROLOGICAL NOTES ON AUGUST, 1894.

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

ENGLAND.

STRATHFIELD TURGISS.—A showery month with a large rainfall. Wild flowers very luxuriant. Harvest much impeded by R; crops generally very good, but much laid by heavy R. TS on 25th. Swifts departed on 6th.

HITCHIN.—Between 7 a.m. and 10 a.m. on 25th 1·58 in. of R fell, with a few flashes of L.

ADDINGTON.—Weather very unsettled, and hindering for the finishing of hay-making until the last week, which was fine.

BURY ST. EDMUNDS.—Twenty-one days of R in the harvest month has been most disastrous for the Eastern Counties; the most damage was done from the 22nd to the 26th, which period was very wet and almost without wind. Barley much grown and discoloured. Distant T on 9th, TS on 10th.

NORWICH, BRUNDALL.—A very unsettled month; frequent R, though heavy only on the 23rd. Day temperatures remarkably low, only reaching 70° or upwards on five days, against 18 days in 1893. T, L, R and H on the morning of the 20th.

LANGTON HERRING.—At 9 a.m. on the 25th ·89 in. of R was measured, and on the 26th 1·62 in.; the R began at 3.45 a.m. on the 25th, and ceased at 11.30 p.m. on the same day, so that 2·51 in. fell on the 25th. No damage, however, was done here, but the floods caused great destruction of property at Beaminster and Bridport. The temp. was remarkably uniform through the month, and the mean at 9 a.m. (60°·4) was 1°·7 below the average. Two heavy TSS occurred on the 25th; fogs on 4th, 8th and 23rd. The last six days of the month were very fine.

TORQUAY, CARY GREEN.—R ·39 in. above, and wet days 1 below, the average. Mean temp. 60°·1, or 0°·3 below the average. Amount of sunshine 156 hours 35 minutes, being 31 hours below the average; three sunless days.

POLAPIT TAMAR.—An unusually wet month, but the last six days were beautifully fine, dry and warm, typical harvest weather. The R on the 25th was particularly heavy, lasting not more than 3 or 4 hours.

WOOLSTASTON.—A cold and stormy month, with very little sunshine, and very unfavourable for harvest. The last week was dry and much warmer. A very heavy R with T and L occurred on the 25th. Mean temp. 56°·9.

TENBURY, ORLETON.—A very cold ungenial month. Although there was not much more than the average quantity of R, the ground never got dry because there was no sun. The ther. never reached 70° until the 26th, and only upon three days after that date. A great storm occurred on the night of the 25th, with very heavy R, T and L.

LEICESTER, BARKBY.—Continuous R till the last few days, and the nights generally warm. Mean temp. 58°·7. T and L three times in the second week.

SEATHWAITE.—More than two inches of R fell on the 2nd and 14th, and more than one inch on the 5th, 7th and 13th.

WALES.

HAVERFORDWEST.—A wet hinderable month, and much hay spoiled; the more to be deplored as the crops were fine and very heavy. The wind blew throughout the month from S. and S.W., and the climatic conditions were very relaxing, although the temp. was never high, 70° being reached only on one day. Corn crops very heavy with abundance of straw, but much beaten down during the disastrous rains which fell uninterruptedly from the 19th to 27th. Sharp TS on the night of the 24th from 10 p.m. to midnight, the L very vivid with a deluge of R. The weather changed on the 28th to N.E. wind with fine clear sky.

ABERYSTWITH, GOGERDDAN.—Very stormy throughout the month.

SCOTLAND.

CARGEN.—The first three weeks of the month were wet and damp, although the rainfall each day was generally small; the latter part of the month was fine. Sunshine was considerably deficient, and temp. much below the average. Conditions were very unfavourable for ripening the crops. TS on the 15th at 5 p.m.

JEDBURGH.—The month was marked by great unsettledness of weather, and was unfavourable to the agriculturist, whose harvest operations were much retarded. A large portion of the crop was still uncut at the close. The night temp. was generally low. T and L on the 17th. T on 28th and 29th.

BRAEMAR.—A wet cold month. Duration of sunshine 100 hours.

ABERDEEN, CRANFORD.—From 9 p.m. on the 2nd to 6 a.m. on the 3rd, 1·85 in. of R fell, and on the 8th, between 2 p.m. and 3 p.m., ·23 in. fell in five minutes, in the form of H about the size of peas, accompanied by T.

ROEBERRY.—Wet and cold until the 19th, afterwards cold and dry with northerly winds. Mean temp. 54°·6.

IRELAND.

DARRYNANE ABBEY.—Cold and wet to the 25th, thence to the end very fine and warm, with little or no wind, and remarkably calm sea.

WATERFORD, BROOK LODGE.—L at night on 24th; a heavy TS on 25th. Thick ground fog on 26th, fog on 27th, thick fog on the morning of the 31st.

O'BRIENSBRIDGE, ROSS.—R moderate during the month, but the almost total absence of sunshine made it one of the most unpleasant and difficult months on record for all harvesting operations; even in the last five rainless days there was not a gleam of sunshine.

DUBLIN.—A month of singularly cloudy skies, low mean temp., north-westerly winds, and a heavy rainfall. The ther. did not once reach 70° in the shade, while it failed to reach even 60° on as many as six out of the last seven days of the month. The mean temp. 57°·9, is 1°·8 below the average. High winds were noted on as many as 13 days, and attained the force of a gale on the 10th and 14th; T was heard on the 2nd; H fell on the 8th. A lunar halo was seen on the 21st.

EDENFEL.—Almost up to the close of the month, August was a continuance of the dull dropping sunless weather and saturated atmosphere of July; another wet month in fact, but with R 1·05 in. below the average. The saving of the late hay, as of the early, was the most difficult and expensive in 30 years, its abundance being much more than counteracted in value by its inferior condition. The magnificent harvest weather, however, which set in on the 29th and still continues (Sept. 6th), justifies for once the forecasts of the weather prophets.

ERRATA IN "METEOROLOGICAL MAGAZINE," 1893.

REGULAR TABLES.

Maidstone (Hunton Court) ..	Feby.	Total rain <i>should be</i> 3·46 in. <i>not</i> 3·65 in.
Cardiff (Ely)	Feby.	" " 5·86 in. " 5·72 in.
Loch Leven Sluices	July	" " 2·40 in. " 2·50 in.
" "	Sept.	" " 1·40 in. " 1·60 in.

SUPPLEMENTARY TABLES.

Northampton (Sedgebrook)...	Feby.	Total rain <i>should be</i> 2·54 in. <i>not</i> 2·51 in.
Harlow (Sheering)	Oct.	" " 2·75 in. " 1·75 in.
Okehampton (Oaklands)	Mar.	" " ·77 in. " ·73 in.
East Layton [Darlington] ...	July	" " 2·84 in. " 2·48 in.
Dalnaspidal, H. R. S.	Mar.	" " 2·61 in. " 2·39 in.
Longford (Currygrane).....	April	" " 1·00 in. " ·93 in.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCXLV.]

OCTOBER, 1894.

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PROTECTION FROM LIGHTNING.*

As it is nearly thirteen years since the Report of the Lightning Rod Conference † was published, and as electrical knowledge has greatly increased during that period, we have read Prof. McAdie's work with great interest; and we hope that the Weather Bureau will place some copies on sale in this country, because we think that they would be of general utility.

Most of our readers have heard of—some of them have been privileged to see—the brilliant experiments upon electrical discharges devised and carried out by Prof. Oliver Lodge, F.R.S., and one's first curiosity is to see whether Prof. McAdie considers that Prof. Lodge's experiments have subverted the rules laid down by the Lightning Rod Conference. We see no sign of it. Prof. McAdie renders, as is quite right, full recognition to Prof. Lodge's good work; but when he has to approach the practical part—the laying down of the rules—he does so by the three following sentences:—

“In 1882 appeared the report of the Lightning Rod Conference; in many respects the most important contribution to the literature of the subject yet made. While so many foreign governments, and in particular France, had by means of officially constituted boards, taken a governmental interest in the protection of the people from the dangers of lightning, the English-speaking people of the world, aside from the few directions officially issued for the protection of magazines and lighthouses, remained without any authoritative utterance upon the subject; and while this conference itself did not have strictly official sanction, it carries, from the character of its make-up, a weight certainly as great, if not greater, than an official board. It was simply a joint committee of representative members of the Institute of British Architects, the Physical Society, the Society of Telegraph Engineers and Electricians, the Meteorological Society, and two co-opted members. As might be anticipated from such auspices, the report is an excellent one, and must stand for years as the embodiment of the most widely gathered information and well-considered decisions. The report is emphatically one based upon *experience*.”

* U.S. Department of Agriculture, Weather Bureau. Circular of Information. Protection from Lightning, by Alexander McAdie, U.S. Weather Bureau, Washington, D.C., 1894. 8vo, 20 pages and 11 pages of plates.

† E. and F. N. Spon, London, 1882, 8vo.

“The famous free-for-all discussion which occurred at the British Association Meeting in 1888, so far as our judgment goes, simply proved that the decisions of the conference could not at present be disregarded. As the president of the meeting, Sir William Thomson, said, we have ‘very strong reason to feel that there is a very comfortable degree of security, if not of absolute safety, given to us by lightning conductors made according to the present and orthodox rules.’

“There are one or two further features to which attention may be called. There are some very prevalent misapprehensions with regard to lightning. For example : that it never strikes twice in the same place ; that the most exposed place is always struck ; that a few inches of glass or a few feet of air will serve as a competent insulator to bar the progress of a flash that has forced its way through a thousand feet of air, etc. These are alluded to in the following general directions.”

We have not space to reprint Chapter III., and, as we have above said, we hope that our readers may be able to procure the whole pamphlet. We, therefore, limit ourselves to noting the few portions of it with which we do not agree. In Section II. we read :—
“Use a good iron or copper conductor. If the latter, one weighing about 6 ounces to the foot, and preferably in the form of tape. If iron is used, *and it seems to be in every way as efficient as copper*, have it in rod or tape form, and weighing about 35 ounces to the foot.”

The above weights are practically identical with those recommended by the Lightning Rod Conference (6 oz. and $2\frac{1}{4}$ lbs.) ; but we do not understand the words which we have printed in italics. If iron is “in every way as efficient,” why have six times as much of it as of copper ? The great objection to iron is its deterioration by rust. Except upon Government powder magazines, we may say that practically no lightning conductor is examined after it has once been put up. We think that very possibly *while new* an iron band seven times as large as a copper one would be more effective than a copper one ; but let 10, 20, 30 years pass, and where would be safety with the iron ? while the copper would be as good as on the first day.

Section V., attributed to Prof. Lodge, is really an epitome of the recommendation of the Lightning Rod Conference. (See its Report, bottom of page 11 and top of page 12.)

Section X.—“Area of protection. . . . Many lightning rod manufacturers consider that the rod protects an area of radius equal to the height. The truth is that buildings are struck sometimes within this very area, and we now hold [that] there is no such thing as a definite protected area.” Prof. McAdie here accepts as a proved truth that which previously has never been so authoritatively stated. We should be glad to be referred to the facts upon which this sweeping assertion is based.

It must not be supposed that this pamphlet is merely a code of rules—quite the contrary ; it contains statistical tables of loss by lightning in the United States, deaths (average 200 annually), pecuniary loss by fire about $1\frac{1}{2}$ million dollars (£312,000 per annum).

There is a very clear account of the accident to, and the present protection of, the great Washington monument (555 ft. high), and there is a charming series of lithographs and photographs, with too little said about them.

THE RECENT DROUGHT IN THE MIDLANDS.

To the Editor of the Meteorological Magazine.

SIR,—It is strange that the recent spell of dry weather in parts of the Midland district should have attracted so little attention. Had it not been for the threatened water famine at Leicester, it seems likely that it would have passed altogether without notice by the Press. During the 26 days from August 27th to September 21st we had only one shower here, yielding 0·06 in. in the gauge. The nearest approach to this during the dry time (it could hardly be called a drought here) last year was the period between March 17th and April 13th, with a total of 0·09 in. Rain fell only on 4 days in September, and the total fall was 0·69 in. There was only one month last year with a smaller total, viz., April, of which the total was 0·47 in.

It is a pity that some of the duplicate meteorologists in and about London cannot be transferred to outlying and poorly-manned districts. As it is, anything exceptional occurring in the S.E. of England is apt to assume an exaggerated importance, while equally or more important occurrences in the provinces, receive no notice at all. Even the forecasts of the Meteorological Office, excellent as they are on the whole, are occasionally too much coloured by the weather prevailing at the time in the London district. There is a good deal of human nature even in meteorologists.

G. T. RYVES, F.R.Met.Soc.,

Team Vicarage, October 8th, 1894.

It is not improbable that Mr. Ryves is right as to the influence of surroundings upon writers. With forecasting we have nothing to do, but Mr. Ryves writes of a drought, and compares it with that of 1893, and brings in the Leicester water famine in support of the argument. We have therefore taken up the subject in earnest, and append the result. The station in our regular table nearest to Leicester is Barkby, about $4\frac{1}{2}$ miles N.E. of the town; the record is perfect from January 1st, 1870, to September 30th, 1894; we can have no better guide for investigation, and we therefore give the monthly fall for the 25 years.

Rainfall at Barkby, Leicestershire.

Above Ground, 0·10 in. Above Sea Level, 221 ft. Observer, REV. E. N. POCHIN.

Year.	1870	1871	1872	1873	1874	1875	1876	1877	1878	1879	Mean.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
January.	1·43	·68	3·52	2·22	1·58	2·52	2·18	3·01	1·67	1·18	2·00
Feb	1·45	1·17	2·19	1·11	1·48	1·42	2·22	2·01	1·30	2·02	1·64
March...	1·63	·92	1·44	1·56	1·08	·51	2·55	1·72	·66	·64	1·27
April ...	·50	2·37	2·74	·60	1·16	1·10	3·75	2·51	1·84	2·25	1·88
May ...	·52	1·27	1·52	2·17	1·08	1·46	·58	1·78	4·78	3·67	1·88
June ..	·57	4·65	4·19	2·88	·64	4·26	1·78	·74	1·64	3·77	2·51
July	1·06	4·64	4·92	2·09	·56	6·56	·63	2·66	1·51	2·71	2·73
August..	1·62	·59	2·54	2·51	2·60	1·14	1·51	2·53	6·93	3·57	2·55
Sept. ...	1·50	4·17	2·91	2·04	2·30	2·88	5·20	1·40	1·14	3·45	2·70
October.	3·66	1·84	3·52	1·83	1·85	4·74	1·49	1·32	2·52	·76	2·35
Nov.	1·27	1·34	3·22	2·34	1·86	3·71	2·84	2·31	3·08	1·29	2·33
Dec.	1·94	1·12	3·33	·36	1·89	1·70	4·50	1·53	1·63	1·15	1·92
Yearly } Total {	17·15	24·76	36·04	21·71	18·08	32·00	29·23	23·52	28·70	26·46	25·76

Year.	1880	1881	1882	1883	1884	1885	1886	1887	1888	1889	Mean.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
January.	·33	1·24	2·07	2·13	2·17	1·68	3·09	2·37	1·05	1·42	1·76
Feb.....	2·16	3·36	2·03	3·02	·91	2·41	·30	·57	1·43	1·89	1·81
March...	1·52	1·12	1·12	1·01	1·09	·88	2·39	1·61	2·26	4·08	1·71
April. ...	1·51	1·16	3·06	2·13	1·59	1·83	1·80	1·02	3·68	3·18	2·10
May.....	1·39	1·08	1·62	1·68	·85	2·26	4·64	1·64	·88	3·69	1·97
June	4·09	2·20	4·13	3·76	1·04	2·33	2·03	1·27	1·79	·86	2·35
July.....	7·61	1·28	3·03	3·42	3·28	·09	3·02	·72	5·59	1·89	2·99
August..	1·57	5·09	1·92	1·15	2·17	4·03	2·01	1·33	2·38	2·79	2·44
Sept.....	5·46	2·21	2·68	4·32	·91	3·21	1·61	2·37	1·30	2·29	2·64
October.	5·16	2·66	5·46	1·80	1·23	5·39	4·51	1·81	·52	2·99	3·15
Nov. ...	1·58	2·20	3·14	3·76	1·52	2·78	2·05	1·69	3·28	·86	2·29
Dec.....	2·79	2·94	3·91	1·00	1·76	·58	3·47	1·43	1·71	1·85	2·14
Yearly } Total {	35·17	26·54	34·17	29·18	18·52	27·47	30·92	17·83	25·87	27·79	27·35

YEAR.	1890	1891	1892	1893	1894	Mean 1870-89	Least.		Least in 1st 9 mth.	
							Amt.	Year.	Amt.	Year.
	in.	in.	in.	in.	in.	in.	in.		in.	
January.	2.38	1.69	1.03	1.52	1.32	1.88	.33	1880	10.28	1870
Feb. ....	.84	.13	2.52	2.32	1.77	1.73	.13	1891	12.48	1874
March....	2.12	1.10	1.00	.37	.89	1.49	.37	1893	12.90	1887
April ...	.82	2.07	.85	.30	1.67	1.99	.30	1893	13.06	1893
May.....	1.85	2.64	2.21	1.81	1.99	1.92	.52	1870	14.01	1884
June ...	1.79	3.36	2.96	.73	1.91	2.43	.57	1870	15.11	1894
July.....	2.50	2.24	2.75	2.70	2.34	2.86	.09	1885		
August..	2.59	3.27	1.41	1.57	2.12	2.50	.59	1871		
Sept.	1.64	1.18	2.03	1.74	1.10	2.67	.91	1884		
October.	1.37	4.89	3.79	2.23		2.75	.52	1888		
Nov.	3.07	2.62	1.04	1.91		2.31	.86	1889		
Dec.....	.49	3.33	1.25	1.80		2.03	.36	1873		
Yearly } Total }	21.46	28.52	22.84	19.00		26.56				

The first nine months of 1894 according to this record have been dry, but not nearly so dry as in the previous years ending with 4, for we have

1874.	...	1884.	...	1894.	average for 20 years.
12.48		14.01		15.11	19.47

and the last two columns in the table show that out of 25 years there have been five in which the first nine months were drier than they have been in 1894. So again, if we take the individual months there is not one month in 1894 which was unprecedentedly dry, while two of them, February and May, were above the average. The only thing that we can see in the least approaching justification for calling attention to a deficiency is the fact of one dry season following another dry season, but that is just what water works are intended to provide for. However, we are not here discussing why Leicester is short of water, but whether there has been in the Midland counties anything like the drought which we had in the South of England in 1893. It was shown in these pages, and by the map in *British Rainfall*, 1893, that the drought of 1893 was far less severe in Leicestershire than in the South, and yet the Barkby figures give for the driest four consecutive months of 1894 very nearly double the fall in 1893, 5.65 in. against 3.21 in.

That September, 1894, was dry, is amply shown by the table on page 142, for Seathwaite had only one-twentieth of its average, and actually had much less than Leicester, but we think that we have proved that there has not previously been during this year any exceptional drought in the Midland Counties, and therefore there had been nothing to overlook.

A DRY SEPTEMBER.

We have in the preceding note called attention to the remarkably small rainfall shown by the table on p. 142, and the supplementary table on p. 141 is equally striking. It in many respects resembled September, 1865, but at Northern and Irish stations surpassed it. Seathwaite, with an average for September of 11·73 in. and an actual fall of 0·59 in., or 1-20th of the average, seems a hard case to beat, but the following letter gives a still smaller proportion for Rothesay in Bute.

A DRY MONTH IN THE WEST OF SCOTLAND.

SIR,—In no part of Scotland was the deficiency of rainfall during September more marked than in that portion of the West Coast known as the Clyde sea area.

A rainfall register having been kept at Rothesay since the year 1800, we have reliable data for a West Coast station extending over the long period of 94 years. Previous to this year the smallest September rainfall noted was exactly one inch in the year 1865, while last month had but one-tenth of this small quantity and one forty-fifth of the average. The only months with a smaller downfall were those of April, 1842, and June, 1821; but April, 1873, and May, 1844, had the same rainfall as in September last. During the seven weeks ending on October 8th barely one-third of an inch of rain fell at Rothesay; while at Fort-William during this period only half an inch was measured, or in each instance about one-twentieth of the average. Edinburgh, on the other hand, had an inch and a quarter of rain during the period under review, or about a quarter of the average precipitation, many of the showers off the North Sea extending but a small way inland. Owing to the prevailing easterly winds but little sunshine was registered in Edinburgh, the sunshine recorded showing a daily average of three hours, but at the Ben Nevis Observatory four hours a day was attained.—I am, &c.,

R. C. MOSSMAN.

October 10th, 1894.

ENORMOUS HAILSTONES.

In the *Quarterly Journal of the Roy. Met. Soc.*, Vol. XV., p. 47, will be found description and full size engravings of some immense hailstones which fell about 50 miles S.E. of Paris on August 15th, 1888, and of which actual models to scale can be inspected at the rooms of the Society.

The stones seem to have been surpassed on August 26th, 1894, according to the *Journal d'Amiens* for August 30th, September 1st and 2nd, from which we proceed to translate a few statements:—

“The thunderstorm, accompanied by a cyclone (whirlwind), broke at 10 p.m., and for about half-a-mile blew down not only the trees, but the telegraph posts and the wires along the railway between Moreuil and Montdidier.”

“Most of the hailstones weighed 200 grammes (7 oz.), they broke not merely the windows, but also the tiled roofs; and at Mézières

one which came through a window and broke a workbox is stated by the *Propaganda* to have weighed 1 kilo 200 grammes (2 lbs. 10 oz.)!"

"Sheep were killed, and the next day small birds and game could be picked up by the dozen."

"At Blancfosse (Oise) some of the hailstones weighed more than 300 grammes (10½ oz.)."

"At Beaucourt hailstones were picked up weighing nearly a kilogram (2 lbs.). Great as this appears, we are assured by a person well worthy of confidence that it is correct. Dead hares and partridges have been picked up."

"The damage at Mézières is estimated at 800,000 francs (£32,000), but in the official list it is given as 600,000 francs (£24,000), and the total for the arrondissement of Montdidier as 1,115,766 francs (£44,631)."

Further information is supplied by the following cuttings from *The Times* and the *Morning Post* :—

BRUSSELS, August 27th.—A storm of extraordinary violence yesterday passed over that portion of Belgium situated between Mons and the German frontier. The wind was of almost cyclonic character, and swept across the country, destroying everything in its path, along a well-defined track three kilometres in width. Several farms were struck by lightning and burned to the ground, while much damage was done also by the shower of enormous hailstones which accompanied the storm.

LIEGE, August 27th.—The storm which passed over the S.E. of Belgium yesterday caused considerable damage here. The atmospheric disturbance continued to-day, and the violence of the hurricane was especially felt in this city and the surrounding country. Many houses are flooded, streets are under water, and railway traffic is interrupted. The circular railway connecting the various stations is blocked by a wall having been blown down, and fallen across the line.

BERLIN, August 28th.—The unseasonable weather which has prevailed for the last five weeks throughout Germany has culminated in a series of violent hailstorms and hurricanes, which have done great damage in many parts of the country. At Crefeld the streets were flooded, and a building three storeys high collapsed. Near Breslau a railway carriage was driven down the line by the force of the wind, and three workmen were killed.

VIENNA, August 28th.—The excessive heat which has prevailed in Austria-Hungary during the last few days caused many cases of sunstroke. From Temesvar, in Hungary, it is reported that among the troops leaving for the manoeuvres ten cases, three of which ended fatally, occurred during a march of 12½ miles. Yesterday, during the manoeuvres, about 100 soldiers, the majority of whom belonged to cavalry regiments, were attacked by sunstroke.

BRUSSELS, August 28th.—Immense damage has been done by the recent storms over all the district between the Sambre and the Meuse, and in many cases the harvest has been completely destroyed by the hail.

PARIS, August 28th.—During the great storm which raged in France yesterday, the 117th Regiment of the line was on the march near Eventeul. The horses of the officers, frightened by the enormous hailstones, bolted across

country. A thoroughbred belonging to the colonel was so seriously injured that it is now unfit for further service. With such force did the hailstones fall that some of them pierced the trumpets and other brass instruments of the regimental band.

WHIRLWINDS.

To the Editor of the Meteorological Magazine.

SIR,—In your July issue, page 90, you have an interesting report on a whirlwind which occurred near Reigate on June 21st. Some person, who does not give his name, expresses his ideas as to the formation of these phenomena, founded on the conditions of this one. I regret having to differ from his conclusions: A calm day in June, on a hill side, “high and exposed, under a brilliant sun, and very warm,” with its action on the air, is in summer time so very usual an occurrence, that we might expect a whirlwind in almost every hillside field in such weather. Mr. Burchall does not give the hour, but it curiously happens that at 5.0 p.m. on the same day, a similar phenomenon occurred at the racing grounds of the Athletic Club at Fulham, under, I fancy, as to locality, very different conditions, but apparently with as much force and effect. That at Fulham, however, showed a refined taste in selecting the music books of the band, and carrying their leaves to an inconceivable height. Both these reports were published in the *Times* within a few days of their occurrence. Now, Sir, my contention is that a whirlwind, such as these, is caused by a silent electric current of large volume, but of small intensity, passing from the earth to the higher atmosphere, the electricity in both positions, or places, being of opposite species, that in the earth, as in ordinary thunderstorm, being induced by that in the upper atmosphere; the discharge carries the air and its contents along with it, the whirling motion being given, as is well-known, by the unequal friction, or resistance, on the opposite sides of the current; the effect of this current on the air, giving it almost the force of a gale, was shown by the dilemma in which the poor rooks found themselves; it must have been stronger than anything we can imagine to arise from ordinary heated air. It is much to be desired that meteorologists would give more of their attention to the subject of atmospheric electricity, which, next to the heat and light of the sun, produces the greatest effects in meteorology, and is at present thoroughly ignored.

Yours faithfully,

ROBERT J. LECKY.

London, July 23rd, 1894.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE FOR 1893.

STATIONS.	ABSOLUTE.			AVERAGE.				ABSOLUTE.		TOTAL RAIN.		AVER- AGE. Cloud.	
	Temp.	Maximum. Date.	Minimum. Temp. Date.	Max.	Min.	Mean.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.		Days.
<i>Those in Italics are South of the Equator.</i>													
England, London ...	93·6	August 18	15·4	60·6	43·2	51·9	43·2	76	134·3	10·0	in. 19·80	148	0-10 5·3
Malta	98·8	September 25	39·0	73·0	59·6	66·3	56·5	75	148·8	36·3	25·30	80	3·9
<i>Cape of Good Hope.</i>	98·7	April 5	35·1	70·5	53·6	62·0	54·9	79	...	...	23·37	93	4·1
<i>Mauritius</i>	85·6	December 30	57·4	78·6	67·7	73·1	64·1	76	141·0	48·2	...	...	5·8
Calcutta	96·9	May 20	45·9	83·9	69·7	76·8	69·9	81	159·0	37·7	85·23	97	5·2
Bombay	94·6	April 16	57·9	85·3	74·1	79·7	70·9	76	149·0	49·3	67·24	124	3·9
Ceylon, Colombo ...	92·2	March 9	65·8	85·9	74·7	80·3	70·7	77	157·0	53·0	89·65	192	5·0
<i>Melbourne</i>	105·5	March 2	31·0	67·6	50·1	58·8	...	74	155·5	24·9	26·82	140	6·0
<i>Adelaide</i>	108·0	February 2	35·7	72·4	52·9	62·7	48·0	60	166·4	26·1	21·50	129	...
<i>Sydney</i>	93·6	December 6	38·7	68·8	56·2	62·5	53·6	78	153·0	24·0	49·91	208	4·8
<i>Wellington</i>	82·0	January 24	34·0	62·6	50·9	56·8	48·4	75	150·0	24·0	53·03	183	4·9
<i>Auckland</i>	81·5	January 26	38·5	66·5	54·6	60·6	54·8	82	146·0	30·0	53·81	203	5·9
Jamaica, Kingston..	92·9	July 4	63·8	86·5	70·6	78·6	69·4	79	...	...	34·29	97	5·3
Trinidad.....	93·0	{ May 15, 17 July 12, Aug. 29 }	61·0	87·9	68·6	78·3	71·4	81	171·0	57·0	92·49	194	...
Toronto	93·3	July 25	—17·8	51·0	34·9	42·9	37·4	77	...	—22·0	39·09	198	5·9
New Brunswick, { Fredericton. ... }	94·7	August 11	—26·0	49·9	28·3	39·1	32·9	72	...	...	43·59	148	5·1
Manitoba Winnipeg { British Columbia, { Esquimalt	92·8 80·0	June 13 June 5	—48·0 —1·5	42·1 53·5	18·5 41·0	30·3 47·2	...	...	...	...	23·93 51·03	134 212	5·5 6·7

Summary.

Highest Temp. in Shade	108°·0 at Adelaide, on Feb. 2nd.
Lowest " "	—48°·0 at Winnipeg, on Feb. 1st.
Greatest Range in Year	140°·8 at Winnipeg.
Least " "	26°·4 at Colombo, Ceylon.
Greatest Mean Daily Range.....	23°·6 at Winnipeg.
Least " " "	10°·9 at Mauritius.
Highest Mean Temp.	80°·3 at Colombo, Ceylon.
Lowest " "	30°·3 at Winnipeg.
Driest Station	Adelaide, mean humidity 60.
Dampest "	Esquimalt, mean humidity 87.
Highest Temperature in Sun ...	171°·0 at Trinidad.
Lowest Temperature on Grass...	—22°·0 at Toronto.*
Greatest Rainfall	92·49 in. at Trinidad.
Least "	19·80 in. at Camden Square.
Most Cloudy Station.....	Esquimalt, average amount 6·7.
Least " "	{ Malta... } " " 3·9
	{ Bombay }

REVIEW.

Report on the Epidemic of Enteric Fever in 1893 in Worthing by C. KELLY, M.D., M.O.H. for West Sussex. Southern Publishing Co., Brighton, 1894. 8vo, 60 pages, and 15 maps and plates.

IN bygone times the Worthing disaster of 1893 would have been regarded as a visitation beyond human control. We now know more; we know that this disease arises from dirt; and when human beings realise that cleanliness is of greater importance than politics, this disease will be numbered with the things of the past. Worthing had its water supply fouled, and severe indeed was the penalty. It would be a good thing for the country could Worthing's lesson be brought to the notice of every Borough or County Councillor throughout the land, for Worthing is not the only place where an outbreak of enterics or typhoid fever may occur.

Dr. Kelly has, we think, done most wisely in making this Report perfectly clear and frank. He seems to have concealed nothing, and to have proved his case—the sad one that the fouling of the water (aggravated by warm weather) was the direct cause of 1,416 cases and 188 deaths. Happily, he is able to report the abandonment of the old water works, and the return of the population to an extremely good state of health.

* The Min. on Grass in not recorded at Canadian stations except Toronto.

INJURY TO VEGETATION IN MAY.

To the Editor of the Meteorological Magazine.

SIR,—It is, as another of your correspondents observes, some time since May, yet I venture to think all interest in the injury which many gardens sustained in that month is not yet exhausted.

The greatest cold in May occurred here on the morning of the 21st, when the minimum was 30°·9 ; this degree of cold would not ordinarily have produced the effects observed, it was, however, the fruit trees that principally suffered, and I believe the cause must be sought in the dryness, and the force of the wind which blew all night, and the rainfall.

The degrees of humidity at 9 a.m. were as here given :—

May 20.....	0·70		May 25.....	0·68
,, 21.....	0·65		,, 26.....	0·69
,, 24.....	0·70			

There had been considerable drought for 27 days, from the middle of March to the middle of April, then came about an inch of rain which started the buds again, just before a dry period, from May, 17th to 27th came an inch of rain, and a fresh impulse to the roots, only to cause the tender leaves to feel the full force of the scorching wind and sun. I noticed that potatoes when screened from wind by walls and houses in some instances escaped entirely, while neighbouring gardens had theirs cut to the ground.—Your obedient servant,
JOHN SLATTER.

Whitchurch Rectory, Oxon, 20th Sept., 1894.

WESTMORELAND WEATHER.

To the Editor.

SIR,—Referring to the paragraph in your number of to-day with regard to the fine weather in North Scotland during September, it may interest your readers to learn that similar conditions have prevailed in Westmoreland and the North-West Riding of Yorkshire. On Thursday last I left Westmoreland for London, and the contrast between the bright sunshine there and the chill fog and dampness here is most remarkable.

It is not only a few days of this glorious weather which has prevailed in our mountainous and generally rainy county.

Since August 25th, and over a continuous period of six weeks no rain of any moment has fallen. Days of bright sunshine and summer heat, with cool nights, have been almost uninterrupted.

Taking the rainfall at two places about fifty miles apart, viz., Kendal, in Westmoreland, and Foulridge (near Skipton) in the West Riding, the results are nearly alike during the six weeks, viz. :—At Kendal 31 in., and at Foulridge 39 in., whereas in 1893 the rainfall in September at these places was nearly seven inches.

The effect of this fine weather upon land and farming prospects has been very beneficial. The corn crop, which is up to the average, has been housed in a perfectly dry condition, and with much less labour than usual, whilst the after growth of grass and clover, stimulated by rain in August and sunshine in September, has been so luxuriant that the cattle are feeding knee-deep in herbage.

I hear to-day that rain fell yesterday for three hours in Westmoreland, six weeks and one day having elapsed since the last heavy fall.

The Athenæum, London, Oct 8.

ALFRED HARRIS.

[From the *Westminster Gazette.*]

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, APRIL, 1894.

STATIONS. <i>(Those in italics are South of the Equator.)</i>	Absolute.				Average.				Absolute.		Total Rain.		Aver. Cloud.	
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.		
	Temp.	Date.	Temp.	Date.										
England, London	73·3	8	34·5	22	61·2	42·5	42·9	0·100	76	116·6	27·1	1·74	14	5·8
Malta	72·5	22	47·0	7	66·8	53·9	53·8	82	138·8	41·6	1·51	8	5·6	
<i>Cape of Good Hope</i>
<i>Mauritius</i>	82·4	3, 12	67·3	25	80·5	70·8	67·4	78	131·2	56·1	6·11	18	6·0	
Calcutta	103·3	7	65·1	21	94·6	75·4	74·0	73	158·5	61·6	3·47	4	2·7	
Bombay	91·4	24	74·2	3	88·9	77·9	74·4	75	140·0	67·0	·01	1	1·7	
Ceylon, Colombo ...	90·2	24	72·6	25	87·9	74·9	73·2	80	150·0	69·0	12·51	21	5·9	
<i>Melbourne</i>	84·5	12 ^a	43·9	14	68·1	53·2	51·7	75	134·8	37·2	2·84	9	3·1	
<i>Adelaide</i>	90·2	5	45·2	29	74·2	54·7	49·4	61	145·2	39·6	2·62	11	4·6	
<i>Sydney</i>	77·8	17	50·5	28	71·1	59·4	57·4	82	135·5	40·5	3·59	15	4·9	
<i>Wellington</i>	71·5	7	39·0	16	63·3	50·3	45·3	66	130·0	27·0	2·11	13	4·4	
<i>Auckland</i>	73·0	7	42·0	10	66·7	52·8	52·6	79	136·0	40·0	1·04	14	5·2	
Jamaica, Kingston.....	89·5	29	66·6	20	85·7	69·8	67·7	78	...	...	·61	7	4·0
Grenada	84·8	25 ^b	67·0	3	82·2	72·3	67·9	72	157·0	...	2·32	16	3·6	
Trinidad .....	...	...	...	...	...	...	...	...	...	...	...	...	...
Toronto	69·3	19	18·4	3	53·3	35·6	40·4	68	...	11·0	1·33	10	5·0	
New Brunswick, Fredericton	66·7	28	6·5	3	48·9	27·1	28·0	63	...	...	2·06	7	6·0
Manitoba, Winnipeg ...	76·8	29	3·0	1	49·3	30·8	...	...	...	...	3·56	13	4·0
British Columbia, Esquimalt	69·2	25	31·8	15	52·5	38·8	41·2	86	...	...	4·23	24	6·0

a And 15. b And 26.

REMARKS.

MALTA.—Mean hourly velocity of wind 10·4 miles. The temperature of the sea rose to 63°·7. Thunderstorms on the 13th and 29th; lightning on 30th. Mean temp. 0°·3 below, humidity 5° above, cloud 1·3 above, and wind velocity 1·4 miles per hour below, their respective averages. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·9 below, dew point 0°·9 below, and rainfall 1·5 in. above, their respective averages. Mean hourly velocity of wind 11·0 miles, or 0·4 mile above average; extremes, 29·8 on 27th, and 1·7 on 30th; prevailing direction, E.S.E. to E. Lightning on 6th and 7th, and thunder and lightning on 19th. C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—Thunderstorms occurred on 12 days, and lightning alone was seen on 3 other days. D. G. MANTELL.

Melbourne.—Thunder and lightning on the 1st and 16th; fogs on 7th and 8th; lunar halos on 14th and 15th. R. L. J. ELLERY, F.R.S.

Adelaide.—Both mean pressure and shade temperature slightly above the average of 37 years; cloud slightly less than the average, and 4·2 hours more sunshine than usual. First half of the month fine and very dry; good showers in the latter half over the southern districts, but moderate over more northern areas. C. TODD, F.R.S.

Sydney.—Temperature 0°·5 above, humidity 6 above, and rainfall 1·35 in. below, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Showery at the beginning of the month, then fine from 4th to 20th, with slight rain at intervals; from 21st to the end very showery and unsettled. Rainfall 1·41 in. below the average. Thunder on the 25th; hail on 9th. Prevailing N.W. winds. R. B. GORE.

Auckland.—An unusually fine and dry month, the rainfall being less than one-half the average of 27 years. Mean temp. 2°·0 below the average. T. F. CHEESEMAN.

JAMAICA.—Weather fair. Rainfall below the average in Kingston, but above it for the whole Island. Mean hourly velocity of wind 3·6 miles. R. JOHNSTONE.

SUPPLEMENTARY TABLE OF RAINFALL,
SEPTEMBER, 1894.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			
II.	Dorking, Abinger Hall.	2·10	XI.	Rhayader, Nantgwillt..	1·75
„	Birchington, Thor	1·83	„	Lake Vyrnwy	·94
„	Hailsham	3·27	„	Corwen, Rhug	1·18
„	Ryde, Thornbrough	3·98	„	Carnarvon, Cocksidia ...	·89
„	Emsworth, Redlands ...	3·18	„	I. of Man, Douglas	·53
„	Alton, Ashdell	2·71	XII.	Stoneykirk, Ardwell Ho.	·21
III.	Oxford, Magdalen Col...	1·80	„	New Galloway, Glenlee	·16
„	Banbury, Bloxham	2·35	„	Melrose, Abbey Gate ..	·83
„	Northampton, Sedgebrook	1·37	XIII.	N. Esk Res. [Penicuick]	·45
„	Alconbury	1·18	„	Edinburgh, Blacket Pl..	·48
„	Wisbech, Bank House..	1·29	XIV.	Glasgow, Queen's Park.	·14
IV.	Southend	1·76	XV.	Inverary, Newtown	·11
„	Harlow, Sheering ...	1·59	„	Islay, Gruinart School..	·29
„	Colchester, Lexden.....	1·20	XVI.	Dollar	·08
„	Rendlesham Hall	·98	„	Balquhidder, Stronvar..	·21
„	Diss	·97	„	Ballinluig	·12
„	Swaffham	2·06	„	Dalnaspidal H.R.S. ...	·55
V.	Salisbury, Alderbury ...	1·92	XVII.	Keith H.R.S.	2·17
„	Bishop's Cannings	2·01	„	Forres H.R.S.	·78
„	Blandford, Whatcombe.	2·77	XVIII.	Fearn, Lower Pitkerrie.	·29
„	Ashburton, Holne Vic....	5·05	„	Loch Shiel, Glenaladale	·40
„	Okehampton, Oaklands.	2·10	„	N. Uist. Loch Maddy ...	·46
„	Hartland Abbey	2·26	„	Invergarry	·21
„	Lynmouth, Glenthorne.	2·08	„	Aviemore H.R.S.	·98
„	Probus, Lamellyn	2·06	„	Loch Ness, Drumnadrochit	·60
„	Wellington, Sunnyside..	2·20	XIX.	Invershin	·07
„	Wincanton, Stowell Rec.	2·90	„	Scourie	1·51
VI.	Clifton, Pembroke Road	3·22	„	Watten H.R.S.	·60
„	Ross, The Graig	3·78	XX.	Dunmanway, Coolkelure	1·97
„	Wem, Clive Vicarage ...	·78	„	Fermoy, Gas Works ...	1·07
„	Cheadle, The Heath Ho.	·80	„	Killarney, Woodlawn ...	...
„	Worcester, Diglis Lock	1·79	„	Tipperary, Henry's Coll..	·55
„	Coventry, Coundon	2·70	„	Limerick, Kilcornan ...	·30
VII.	Ketton Hall [Stamford]	1·15	„	Ennis	·16
„	Grantham, Stainby	·75	„	Miltown Malbay.....	·62
„	Horncastle, Bucknall ...	1·00	XXI.	Gorey, Courtown House	·83
„	Worksop, Hodsck Priory	·67	„	Athlone, Twyford	·17
VIII.	Neston, Hinderton	·76	„	Mullingar, Belvedere...	·37
„	Lancaster, Rose Bank...	...	„	Longford, Currygrane...	·10
„	Broughton-in-Furness..	·98	XXII.	Galway, Queen's Coll...	·08
IX.	Ripon, Mickley	·63	„	Crossmolina, Enniscooe..	·77
„	Scarborough, South Cliff	2·16	„	Collooney, Markree Obs.	·26
„	East Layton [Darlington]	·98	„	Ballinamore, Lawderdale	·29
„	Middleton, Mickleton...	1·07	XXIII.	Lough Sheelin, Arley ..	·23
X.	Haltwhistle, Unthank..	·83	„	Warrenpoint	·36
„	Bamburgh	1·28	„	Seaforde	·35
„	Keswick, The Breches...	·69	„	Belfast, Springfield	·30
XI.	Llanfrechfa Grange ...	3·41	„	Bushmills, Dunderave...	·41
„	Llandovery	1·29	„	Stewartstown	·14
„	Castle Malgwyn	1·41	„	Buncrana	·40
„	Builth, Abergwessin Vic.	1·66	„	Lough Swilly, Carrablagh	·77

SEPTEMBER, 1894.

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		Max.		Min.			
				inches.	inches.			in.	Date	Deg.	Date	Deg.	Date
I.	London (Camden Square) ...	1·05	- 1·46	·27	7	11	71·2	1	39·3	29	0	1	
II.	Maidstone (Hunton Court)...	2·96	+ ·37	·44	2	13	...	...	...	...	...	...
III.	Strathfield Turgiss	2·42	- ·03	1·04	7	11	70·6	1	32·5	29	0	3	
III.	Hitchin	1·77	- ·73	·31	23	15	68·0	1d	34·0	28	0	...	
IV.	Winslow (Addington)	1·77	- ·90	·37	25	10	66·0	2	31·0	29	2	3	
IV.	Bury St. Edmunds (Westley)	1·41	- 1·29	·77	25	10	64·0	19	38·0	28	0	...	
V.	Norwich (Brundall)	1·68	...	·62	25	16	71·0	19	40·0	11	0	3	
V.	Weymouth(LangtonHerring)	4·06	+ 1·64	1·32	22	10	67·0	2, 24	40·0	29	0	...	
VI.	Torquay (Cary Green) ...	3·05	...	1·18	21	12	66·6	15	42·5	29	0	0	
VI.	Polapit Tamar [Launceston].	2·10	- 1·61	1·12	21	13	71·5	1	38·0	30	0	4	
VI.	Stroud (Upfield)	2·51	- ·40	·91	7	10	70·0	2	38·0	27	0	...	
VI.	ChurchStretton(Woolstaston)	1·45	- 1·05	·67	25	9	65·0	11	37·0	29	0	3	
VI.	Tenbury (Orleton)	2·51	- ·10	·63	22	11	70·0	11	32·0	28	1	3	
VII.	Leicester (Barkby)	1·10	- 1·54	·45	25	12	70·0	2	28·0	27	4	7	
VII.	Boston	·74	- 2·03	·25	5	11	71·0	1	38·0	27	0	...	
VII.	Hesley Hall [Tickhill].....	·47	- 1·69	·17	25	9	66·0	1, 14	35·0	28	0	0	
VIII.	Manchester(PlymouthGrove)	·98	- 2·49	·62	19	6	68·0	1	30·0	27	4	5	
IX.	Wetherby (Ribston Hall) ...	·94	- 1·52	·42	6	8	...	...	...	...	...	...
IX.	Skipton (Arncliffe)	·54	- 4·22	·27	5	8	...	...	...	...	...	...
X.	Hull (PearsonPark)	·84	- 1·60	·24	7	10	69·0	11	38·0	27	0	0	
X.	Newcastle (Town Moor)	·83	- 1·95	·20	1	11	...	...	...	...	...	...
X.	Borrowdale (Seathwaite)....	·59	-11·14	·38	5	3	...	...	...	...	...	...
XI.	Cardiff (Ely).....	2·32	- 1·42	·91	23	9	...	...	...	...	...	...
XI.	Haverfordwest	1·89	- 2·51	·78	7	7	65·3	3	30·3	30	2	7	
XI.	Aberystwith (Gogerddan) ...	1·60	- 2·67	1·10	7	8	71·0	20	27·0	29	7	...	
XII.	Llandudno.....	·64	- 1·58	·25	4	7	63·6	1	38·8	28	0	...	
XII.	Cargen [Dumfries]	·20	- 3·36	·14	1	3	69·8	14	29·8	27	2	...	
XII.	Jedburgh (Sunnyside).....	1·15	- 1·54	·37	1	9	79·0	10	31·0	28	1	...	
XIV.	Colmonell	·21	...	·21	1	1	72·0	1,16	26·0	27	4	...	
XV.	Lochgilphead (Kilmory).....	·24	- 4·89	·08	25	5	...	...	30·0	27	7	...
XV.	Mull (Quinish)	·14	- 4·89	·11	14	2	...	...	...	...	...	...
XVI.	Loch Leven Sluices	·30	- 2·49	·10	5a	3	...	...	...	...	...	...
XVII.	Dundee (Eastern Necropolis)	·15	- 2·36	·06	25	7	70·9	11	36·2	27	0	...	
XVII.	Braemar	·96	- 1·90	·68	4	12	65·1	17	32·2	24	0	12	
XVIII.	Aberdeen (Cranford)	·62	...	·14	7	14	...	...	...	...	...	...
XVIII.	Strathconan [Beaul]	·43	- 3·25	·20	5	4	...	...	...	...	...	...
XVIII.	Glencarron Lodge.....	·42	...	·08	10c	11	65·0	17	34·7	26	0	...	
XIX.	Cawdor [Nairn]	1·08	- 1·67	·28	3	12	...	...	...	...	...	...
XIX.	Dunrobin	·19	- 2·40	·08	6	5	64·0	10	41·0	4	0	...	
XIX.	S. Ronaldsay (Roeberry).....	·42	- 2·24	·10	4	13	58·0	14e	44·0	22	0	...	
XX.	Darrynane Abbey.....	1·37	...	·97	7	4	...	...	...	...	...	...
XX.	Waterford (Brook Lodge) ...	1·16	- 1·76	·66	7	5	67·0	10f	35·0	10	0	...	
XX.	O'Briensbridge (Ross)	·32	...	·23	7	2	...	...	...	...	...	...
XXI.	Carlow (Browne's Hill)	·35	- 2·47	·18	7	6	...	...	...	...	...	...
XXI.	Dublin (Fitz William Square)	·44	- 1·53	·16	7	8	63·9	10	39·8	28	0	0	
XXII.	Ballinasloe	·23	- 2·56	·09	1	6	67·0	29g	29·0	28	8	...	
XXII.	Clifden (Kylemore)	·31	...	·14	10	4	...	...	...	...	...	...
XXIII.	Waringstown	·20	- 2·96	·10	5, 24	2	75·0	9	29·0	27	3	7	
XXIII.	Londonderry (Creggan Res.)	·50	- 3·28	·33	1	6	64·0	...	...	...	...	...
XXIII.	Omagh (Edenfel).....	·17	- 3·21	·08	24	5	64·0	13h	26·0	27	3	7	

a And 23, 26. c And 14. d And 2, 18. e And 17. f And 25. g And 30.
h And 16. i And 29.

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

METEOROLOGICAL NOTES ON SEPTEMBER, 1894.

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

ENGLAND.

STRATHFIELD TURGISS.—A fair month with several wet days, but with little R. A sharp TS circulated round this station on 7th, with much R, but did not develop, being heavier to the E. T on 6th. Ivy in flower on 12th. Red admiral butterfly flying on 14th.

ADDINGTON.—A dull, cold month with a most unusual predominance of N.E. winds (twenty-nine days out of thirty). The max. shade temp. 66° is the lowest for the month noted during the last twenty-four years. A lower min. temp. has been registered, but not often. On the 28th and 29th many tender plants were cut off by frost. In September, 1880, the max. temp. was 85° , 19 degrees higher than the max. of this month. Fog on four days. T and H on 6th.

BURY ST. EDMUNDS.—A month of northerly winds, low temp. and little sunshine.

NORWICH, BRUNDALL.—A cool and cloudy month, with light rains and damp mists at times. Mean temp. 3° below the average. L on 8th, T on 27th, H on 28th and 29th.

LANGTON HERRING.—The first week of the month was wet and unsettled, with T and L on the 2nd, 5th, 6th and 7th; then followed thirteen days of fine dry weather, most favourable for the in-gathering of the harvest. From the 20th to the 24th 2.36 in. of R fell; the last six days of the month were bright and sunny. On the whole a fine month but rather cold, the mean temp. being $3^{\circ}1$ below the average. The mean reading of the bar. was higher than that of any September in the previous thirteen years, and the reading on the 30th was higher than that of any day during that time.

TORQUAY, CARY GREEN.—R .70 in. above the the average. Mean temp. $56^{\circ}3$, or $0^{\circ}6$ below the average. Amount of sunshine 156 hours 5 minutes, being 1 hour 20 minutes below the average; four sunless days.

POLAPIT TAMAR.—Total R less than half the average of thirteen years. The month was specially noticeable for the prevalence of E. wind and the absence of strong winds or gales. Fogs on three days, thick on 19th and 20th.

STROUD, UFFIELD.—T and L on the 4th, TS on 5th, and T on 6th. Fog at night on the 19th. Prevailing winds N. and N.E.

WOOLSTASTON.—A very dry month without much sunshine. The harvest generally well got in. Mean temp. $52^{\circ}0$.

TENBURY, ORLETON.—A cold and sunless month with about the average quantity of R. With the exception of a few hours on the 7th the wind was N. or N.E. all the month. Sharp frosts on the 28th, 29th and 30th. Fog on 7 days. TS on 4th.

LEICESTER, BARKBY.—Warm nights till 26th. Mean temp. of the month $52^{\circ}4$. Great scarcity of water. T on 5th.

MANCHESTER, PLYMOUTH GROVE.—The driest September experienced since observation commenced twenty-seven years ago, and, with the two exceptions of 1871 and 1878, when the mean temp. was $52^{\circ}6$ each year, the coldest September during that time. Mean temp. $52^{\circ}9$.

WALES.

HAVERFORDWEST.—During the first twelve days six cold nights occurred, and from 25th to 30th the nights were cold and frosty, but the bulk of the nights were above the average for the month. The weather was splendidly fine; the day temp. below the mean, with air crisp; prevailing winds N.N.E.; much bright sunshine; many nights very foggy; small rainfall. One of the finest harvest months on record; 23 days without R.

ABERYSTWICH, GOGERDDAN.—Very fine throughout the month with bright sunshine.

SCOTLAND.

CARGEN.—A remarkably fine month, with mean temp. one degree above the average. Mean bar. pressure 30·150 in. ; on only four occasions during the last 34 years has this mean pressure been exceeded, viz., November, 1867, January, 1880, June, 1887, and February, 1891. On only one occasion since observations were commenced has there been a less fall of R in any one month, viz., April, 1873, when ·10 in. fell. The total R from August 15th to the end of September was only ·40 in. E. winds prevailed for 24 days, and were remarkably light.

JEDBURGH.—The month was marked by generally cold ungenial weather for the season. The R was slight and fell at long intervals, allowing much corn to be saved, but frosts and dew prevailed a good deal, which retarded operations generally till mid-day. The cereal crops are above the average ; the turnip crop rather disappointing.

COLMONELL.—The least rainfall in any September from 1876–94, and, in fact, the least in any month in these years.

MULL, QUINISH.—An unprecedented month of sunshine and dry weather. The harvest in this district has been got in under most unusual conditions.

BRAEMAR.—A fine, dry month. Duration of sunshine 107 hours 45 minutes.

ABERDEEN, CRANFORD.—An exceptionally fine month. All grain crops cut and stacked in good order.

DUNROBIN.—The finest and driest September for at least a quarter of a century.

ROEBERRY.—Very dry and quiet throughout. The driest September recorded for 28 years.

IRELAND.

DARRYNANE ABBEY.—A very dry and fine, sunny month, the number of days with R being the smallest registered. The next smallest were seven days in May, 1876, and nine days in November, 1879, the corresponding falls being ·83 in. and ·75 in. The falls in May, 1874 (1·20 in.), March and April, 1893 (1·02 and 1·26 in.), were less than this month, but on more days (17, 13, 10). The first part of the month was very warm, but the last few days were rather cold.

O'BRIENSBRIDGE, ROSS.—The driest and most beautiful month in this record of 49 years. September, 1888, being the nearest to it, but with many more rainy days.

DUBLIN.—As in 1893, so in 1894, September proved a favourable month throughout ; quiet, cool weather, with an overwhelming prevalence of N. to E. winds, and a very scanty and infrequent rainfall. The mean temp. (53°·8) was exactly 2° below the average. High winds were noted on only two days. L on the 4th. Fog on 5 days.

WARINGSTOWN.—The driest month ever recorded here. Sharp frost on the 27th, earlier than usual by a fortnight or three weeks.

EDENFEL.—The drought which set in on the 27th August, and embracing the whole month of September, has now (6th October) reached its forty-first day, during which time but ·19 in. of R has fallen on seven days. This is by far the driest period of like duration recorded here in 30 years, and as far as I am able to ascertain from some records in my possession and the “oldest inhabitants,” for at least as far back as 1826. A high and steady bar., averaging about 30·3 in. ; winds, if any, from northerly or easterly points, and a smaller proportion of clear sunshine than is common to these conditions has accompanied them. A good harvest has been secured even in the mountain districts in perfect order.

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RAINFALL IN JERUSALEM.*

AMONG our old MSS. we have the portion of the following table preceding 1856. In Beardmore's *Manual of Hydrology*, 1862, p. 361, the table is carried on to the end of 1859, and as it is evidently the same record, we have incorporated the two†:—

Rainfall at Jerusalem.

Observer - - DR. MACGOWAN.

Altitude { Above the Mediterranean..... 2,749 ft.
 ,, ,, Dead Sea 4,116 ,,

Year.	1846	1847	1848	1849	1850	1851	1852	1853	1854	1855	1856	1857	1858	1859	
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
Jan.	6·0	9·8	24·6	19·4	Not observed.	14·6	13·6	4·2	13·2	32·6	17·6	13·0	23·2	11·2	
Feb.	7·4	32·8	5·8	13·2		24·0	25·0	4·0	20·0	13·0	21·8	57·2	23·6	8·2	
March	5·4	6·0	0	11·8		4·0	8·8	21·4	24·2	8·8	10·2	4·0	1·6	16·8	
April	0	0	2	0		2·2	0	1·2	10·8	2·4	24·8	4·0	5·2	6·2	
May	0	0	1·4	0		0	2·4	2·0	0	0	6	1·0	0	0	
June	0	0	0			0	0	0	0	0	0	0	0	4	
July	0	0	0			0	0	0	0	0	0	0	0	0	
Aug.	0	0	0			0	0	0	0	0	0	0	0	0	
Sept.	0	0	0			0	0	0	0	0	0	0	0	0	
Oct.	4·0	0	0			0	0	0	3·8	0	0	1·4	0	4·4	
Nov.	6·4	0	2			6·4	1·8	6·0	0	1·0	14·8	6·6	0	2·8	
Dec.	0	19·0	16·0			33·8	15·2	9·4	12·4	6·4	3·2	4·2	17·0	21·8	8
Totals	29·2	67·6	48·2				60·0	61·0	51·2	78·4	61·0	94·0	104·2	75·4	50·8

Mean for the years 1846-1848 & 1851-59=65·1 in.

Beardmore's table was reprinted (with the mistakes) in Dr. J. I. Whitty's *Proposed Water Supply for Jerusalem*, 1863, p. 194.

For subsequent (and very different) information there are two principal sources, both based upon one series of observations, but each throwing some little light upon the details furnished by the

* On the Fall of Rain at Jerusalem in the 32 years from 1861 to 1892, by J. Glaisher, F.R.S., *Quarterly Statement of the Palestine Exploration Fund*, January, 1894.

† In Beardmore's table the addition is wrong for 1853, the true total being 51·2 in. ; and in 1854 March is given as 24·8 in., instead of 24·2 in., which we believe was the value actually recorded.

other. The sources are (1) several papers by Dr. Buchan, F.R.S.E., and by Dr. Chaplin, published in the *Journal of the Scottish Meteorological Society* in 1867 and subsequent years; and (2) the very valuable paper by Mr. Glaisher, already referred to.

It is rather strange that neither Dr. Buchan nor Mr. Glaisher makes any reference to the early observations. However, we had better reprint the only scraps of information which we possess.

First: Dr. Buchan, *Jour. Scot. Met. Soc.*, 1869, p. 98:—

“While on a tour through Palestine in the spring of 1863, Dr. Keith Johnston, the Society's Honorary Secretary, made arrangements with Dr. Thomas Chaplin for making Meteorological Observations at Jerusalem. The Board of Trade most cordially co-operated with the Society in the supply of instruments.”

And again on p. 104:—

“As the (rainfall) observations began in November, 1863, we cannot go further back than the 1st of the month.”

Mr. Glaisher's account, *Quarterly Statement*, Jan., 1894, p. 39, is equally definite:—

“The series of daily observations of rain was begun by Dr. Chaplin in the year 1861, and was continued by him for the long period of 22 years till the end of 1882: they have since 1883 been continued under the auspices of the Palestine Exploration Fund.

“The rain gauge used during the first six years was a float gauge by Newman, and since then a certified 8-inch gauge by Negretti and Zambra. During four years the gauges were placed side by side; the float gauge registered during these four years 88·83 inches, and Negretti and Zambra's gauge 93·25 inches, and the readings by Newman's gauge have been corrected so as to give results in accordance with the 8-inch gauge.

“Dr. Chaplin says that the position of the gauges was in a garden within the city, about 2,500 feet above the level of the Mediterranean, open on all sides, the houses which bound it on the S. and W. being too far removed to influence the fall of rain on the pluviometer.”

Now let us try to get at the actual facts.

It would have been more frank had Dr. Keith Johnston recognized the earlier work of Dr. Chaplin, but it is evident that what really happened in the spring of 1863 was that Dr. Keith Johnston found Dr. Chaplin working with a Newman rain gauge (and probably indifferent thermometers, &c., but we are not dealing with them), thought it desirable that he should have a good one, obtained a verified Glaisher gauge from Admiral FitzRoy, which arrived in Jerusalem in time to be brought into use on November 1st, 1863.

Thus completed, Dr. Buchan's statement agrees with Mr. Glaisher's, that the gauges used were—

Newman's	1861,	1862,	1863,	1864,	1865,	1866
Negretti's			1863,	1864,	1865,	1866 and onwards.

But in the next place we cannot make Mr. Glaisher's statement correspond with his own table. He says that during the first six years a Newman gauge was used, and that during four years the two gauges were side by side. It is reasonable to assume that this comparison began when the second gauge arrived, viz., in November, 1863, but neither by taking the whole of 1863 and three subsequent years, nor by any combination near that date, can we get from Mr. Glaisher's own table 48 consecutive months giving the total of 93·25 inches mentioned in the extract above quoted.* The matter is probably not important, but it lessens the confidence which otherwise we should have felt in the whole table, which we have not space to reproduce *in extenso*. We therefore give abstracts—

Total Annual Rainfall at Jerusalem.

1861 27·30	1871 23·57	1881 16·50	1891 34·72
1862 21·86	1872 20·26	1882 26·72	1892 31·23
1863 26·54	1873 22·72	1883 31·92	Mean for 32 years = 25·23 in.
1864 15·51	1874 29·75	1884 23·96	
1865 18·19	1875 27·01	1885 29·47	Amount in. $\frac{1}{10}$ Max. 1888 37·79 150 Min. 1870 13·39 53
1866 18·55	1876 14·41	1886 31·69	
1867 29·42	1877 26·00	1887 29·81	
1868 29·10	1878 32·21	1888 37·79	
1869 18·61	1879 18·04	1889 13·56	
1870 13·39	1880 32·11	1890 35·51	
Mean ... 21·85	Mean ... 24·61	Mean ... 27·69	

Monthly Rainfall at Jerusalem.

MONTHS.	DEPTH.					NO. OF DAYS.		
	Average.	Greatest.	Date.	Least.	Date.	Aver.	Greatest.	Least.
January	in. 6·38	in. 13·39	1878	in. ·13	1873	12	19 { 1883 } { 1885 }	3, 1881
Feb	5·06	12·59	1882	·69	1870	10	18 { 1868 } { 1884 }	1, 1870
March	3·56	10·52	1875	·42	1865	8	20 1874	2, 1892
April ...	1·71	6·52	1885	·13	1874	5	13 { 1868 } { 1870 }	1, 1861
May ...	·27	1·25	1887	·00	11 yrs.	2	5 { 1867 } { 1892 }	0, 11 yrs.
June ...	·01	·20	1888	·00	30 yrs.	0	1 { 1885 } { 1888 }	0, 30 yrs.
July.....	·00	·00	32 yrs.	·00	32 yrs.	0	0 32 yrs.	0, 32 yrs.
August.	·00	·08	1890	·00	31 yrs.	0	1 1890	0, 31 yrs.
Sept. ...	·04	·79	1878	·00	27 yrs.	0	2 { 1864 } { 1878 }	0, 27 yrs.
October	·41	2·29	1870	·00	13 yrs.	2	7 1863	0, 13 yrs.
Nov. ...	2·29	7·99	1888	·01	1870	6	13 1888	1, 5 yrs.
Dec.....	5·50	16·40	1888	·49	1876	10	17 1890	2, 1884
Total	25·23	16·40	1888	·00	124times	55	73 1890	36, 1864

* We can get a total of 93·25 in. by taking 4½ years from April, 1864; but if so, the Newman gauge must have been in use for nearly 8 years instead of 6 as stated.

We may add that for 16 out of the 32 years quoted by Mr. Glaisher, we have three independent copies of the record; and for 27 years out of the 32 we have two copies. There are a few differences, but, on the whole, we believe that Mr. Glaisher's values are the best, and that there is no error of more than a few hundredths of an inch in any of the means.

It is obvious that the records for the period 1846-59 and for 1861-92 cannot both be correct; the former gives a mean of 65.1 inches, the latter of only 25.2 inches. There can, we think, be little doubt that the recent observations must be regarded as correct, and those between 1846 and 1859 as erroneous, but it is not easy to understand how so great an error was produced, except upon one hypothesis, for which there is not an atom of evidence except that it would harmonize the two records. The hypothesis is that Dr. Macgowan took out with him an 8-inch gauge, that the measure was broken in transit, and one adapted for a 5-inch gauge was then sent out and used. In that case all his amounts would be too large in the ratio of 2.56 to 1; corrected for that his totals would be—

	in.		in.		
1846	..... 11.4		1854	..... 30.6
1847	.. ... 26.4		1855	..... 23.8
1848	..... 18.8		1856	..... 36.8
1851	..... 23.4		1857	..... 40.7
1852	..... 23.8		1858	..... 29.5
1853	..... 20.0		1859	..... 19.9
				}	Mean = 25.4 in.

This result of 25.4 in. as the mean of one set of observations, and of 25.2 in. as the mean of the others, is a curious coincidence, if it is nothing more. And there is another fact which almost makes it probable that this is really the solution of the mystery.

If the old records were bad from leakage, from malicious interference, or from misplaced decimals, they would, when worked up for monthly means, give anomalous values, but the following table shows that generally the monthly percentages from the two series run very closely together:—

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Old Series ...	23	30	14	7	1	0	0	0	0	2	5	18
New Series ..	25	20	14	7	1	0	0	0	0	2	9	22

It may have occurred to some one that the Newman gauge which Dr. Chaplin used from 1861 to 1866 was the one which had been used from 1846 to 1859 by Dr. Macgowan, but that seems impossible, because the comparison made by Mr. Glaisher showed that the Newman gauge recorded 5% too little, whereas the record by Dr. Macgowan seems about 156% too great.

On the whole we are satisfied that the true mean rainfall at Jerusalem is 25 inches, almost identical in total with that in London, but that no rain falls between May and October, and that about a fourth of the yearly total falls in each of the three months, December, January, and February.

RAINFALL ON MOUNT LEBANON.

IN connection with the above article, it will be of interest to give the monthly totals of the fall of rain as communicated to us by Mr. T. Little, of Ain Salaam, Brumana, Mount Lebanon (a few miles inland from Beyrout), in Lat. 33° 54' N., and Lon. 35° 35' E. ; the gauge being 8 inches in diameter, 1 ft. above ground, and 2,350 ft. above the level of the sea. Mr. Little says that the rainfall of November and December, 1890, was quite exceptionally heavy, and amounted to that of an average year.

	Jan. in.	Feb. in.	Mar. in.	Apr. in.	May. in.	June. in.	July. in.	Aug. in.	Sept. in.	Oct. in.	Nov. in.	Dec. in.	Total. in.
1890...	7·73	9·64	3·06	2·08	·00	·00	·00	·04	·10	·13	16·11	15·48...	54·37
1891...	10·75	8·53	2·71	2·83	2·34	·00	·00	·00	·78	1·82	4·74	10·95...	45·45

STORM OF SEPTEMBER 20TH, 1894, AT MARTINIQUE.

We have been favoured by M. Leon Sully, of St. Pierre, Martinique, with a long letter dated October 8th, and with photographs of the record of his Richard barograph, and of maps of the track of the storm.

Instead of translating the whole letter we shall state the principal points mentioned. For Martinique M. Sully quotes his own observations ; for Guadaloupe those at the Meteorological Office at Pointe à Pitre, and for other localities mostly the local newspapers.

The track of the centre seems to have been over the N. of Dominica, ravaging on its dangerous side, Marie Galante, la Guadaloupe, Montserrat, Antigua, St. Kitt's and Ste. Croix, passing away towards Cuba and Florida.

On the 20th the line perpendicular to that of the propagation of the storm passed St. Pierre, Martinique, at 0.30 p.m., the pressure being 29·69 in., and it passed Pointe à Pitre, Guadaloupe, at 2 p.m. on the same day, pressure 29·77 in. On the 21st it passed Porto Rico, and reached St. Domingo in the night 21st-22nd, in fact it raged furiously from 11 p.m. on 21st to 5 a.m. on 22nd, pressure fell to 29·06 in. It reached Cuba on 24th, and destroyed most of the telegraph lines, and finally passed into Florida near Key West.

M. Sully considers the velocity of translation to have been unusually high for the district, viz., 19½ miles per hour.

One remarkable characteristic of the storm was the absence of electrical phenomena ; there was a slight thunderstorm in the night 19th-20th, but in the afternoon of the 20th, when the cyclone was at its height, there was neither ordinary nor globular lightning, and there was no thunder. Perhaps, if it had been night when the storm passed, instead of day, there might have been seen, as on August 18th, 1891, manifestations of St. Elmo's fire.

Although at Martinique the damage was limited to the carrying away of a few blinds and roofs, and of most of the crop of bananas,

it was very different in the islands on the dangerous side of the storm—Dominica, Marie Galante, Guadaloupe, Antigua and Montserrat, where all the plantations have suffered greatly, four-fifths of the houses have been unroofed, and most of the telegraph lines destroyed.

Porto Rico seems to have escaped lightly, but we are told that in St. Domingo 500 houses and two churches were destroyed, nearly all the roofs, even of the Palace and public buildings, were carried away, and the crops levelled.

As regards Cuba and Florida, there has been such damage to the telegraphs, that we have as yet no details.

The letter is accompanied by transcripts of the observations made each half hour by M. Sully, and by a few made at irregular intervals at Pointe à Pitre, Guadaloupe.

THE SAME STORM IN SOUTH EASTERN MEXICO.

We are glad to be able to add to the foregoing a statement from the N.W. of Yucatan, which we have translated from the Summary for September, 1894, issued by the Central Meteorological Observatory of Mexico.

"*Cyclone [in the Island of Cuba].*—Sr. Félix Gómez, Engineer of Mérida, Yucatan, has sent us the following note :—

"On Saturday, September 22nd, at 4.40 p.m., we observed in the N.E. many scattered clouds of a cumulo nimbus type coming rapidly at a low altitude. This was the first indication which led me to surmise that a storm existed in the S.E., and I immediately began to watch the wind and the barometer; the wind was E.N.E., and the mean pressure for the day was 29.93 in.

"On Sunday, 23rd, the sky was occasionally overcast, there were light northerly squalls; the vane pointed steadily to E.N.E. until the afternoon, when it went to N.N.E., and the pressure fell to 29.92 in.

"On Monday, 24th, the sky continued overcast at intervals; there were light squalls; the vane kept at N.N.E. until the afternoon, when it went to N.N.W., and the pressure fell to 29.87 in.

"On Tuesday, 25th, the wind was variable between N.W. and W.N.W., and the sky clear; the barometer fell to 29.84 in., and in the afternoon the wind backed to W.S.W.

"On Wednesday, 26th, the wind went round to S.W., and the barometer rose to 29.86 in., and a drizzle gave 0.05 in. of rain.

"Though the indications of the barometer were very slight, the aspect of the sky and the backing of the wind showed that Mérida was on the western skirt of a cyclone, wherefore we reported to the observatory on the 23rd and subsequent days that a depression existed to our east.

"Notices (received October 1st) from Habana confirm this by stating that a destructive hurricane passed over Cuba on September 23rd and 24th."

ENORMOUS HAILSTONES.

With reference to the article on the above subject on p. 134 of our last number we give the following notes, the first arrived too late to be quoted with the other details of the Richmond storm on p. [20] of *British Rainfall*, 1893.

Richmond, Yorks.—On 8th July a very remarkable hailstorm took place; almost all the hailstones were over an inch in diameter, numbers 2 in. and $2\frac{1}{2}$ in., and one measured 7 in. long by $4\frac{1}{2}$ in. broad. The storm lasted a very short time, about a quarter of an hour, and was very partial, four miles distant there was none; it was very narrow, and swept over Richmond, and up the valley of the Swale.

ELLEN DAVIDSON.

In the *Indian Engineer* for May 19th, 1894, there are engravings of a hailstone which fell at Kanchrapara* at 5.45 p.m. on April 27th, 1873, which was very much of the form of a potato, $3\frac{1}{2}$ in. \times $3\frac{1}{4}$ \times $2\frac{1}{2}$, and therefore would weigh about 1 lb. 1 oz. The account says that stones of this size were innumerable, and that those that fell on hard roads bounded about like white cricket balls, and in their rebound rose fully 10 ft. It also states (what is obvious from the dimensions) that they would not go into an ordinary tumbler, and that even at dinner time (?) they had not melted sufficiently to go to the bottom of one. This account is authenticated by five signatures.

During a severe hailstorm at Vicksburg on the afternoon of Friday, May 11th, 1894, a remarkably large hailstone was found to have a solid nucleus, consisting of a piece of alabaster from one-half to three-quarters of an inch [? in length]. During the same storm at Bovina, eight miles E. of Vicksburg, a gopher turtle, 6 by 8 in., and entirely encased in ice, fell with the hail.

An examination of the weather map shows that these hail storms occurred on the S. side of a region of cold northerly winds, and were but a small portion of a series of similar storms; apparently some special local whirls or gusts carried heavy objects from the earth's surface up to the cloud region, where they were encased by successive layers of snow and ice, until they fell as hailstones. The fact that hailstones, as well as drops of water and flakes of snow, often contain nuclei that must have been carried up from the earth's surface, is entirely in accord with the general principle that ascending currents precede the formation of cloud and rain, and that solid nuclei are needed to initiate the ordinary precipitation of moisture.—Prof. CLEVELAND ABBE, in the U.S.A. *Monthly Weather Review*, May, 1894, p. 215.

From Mr. S. M. Blandford, temporarily in charge of the Weather Bureau office in Portland, Oregon, there was received too late for the

* This is a little above Hooghly, or Hugli, about 30 miles N. of Calcutta, and in Lat. $22^{\circ} 58' N.$, Lon. $88^{\circ} 27' E.$

June Review a report of the tornado which occurred June 3rd, 1894, passing northeastward through the counties of Harney, Grant and Union, in eastern Oregon. He says that the most novel feature was the hail. Our correspondent states that the formation was more in the nature of sheets of ice than simple hailstones. The sheets of ice averaged 3 to 4 in. square, and from three-fourths of an inch to $1\frac{1}{2}$ in. in thickness. They had a smooth surface, and in falling gave the impression of a vast field or sheet of ice suspended in the atmosphere, and suddenly broken into fragments about the size of the palm of the hand. During the progress of the tornado at Long Creek, a piano was taken up and carried about a hundred yards.—U.S.A. *Monthly Weather Review*, July, 1894, p. 293.

THE RECENT DROUGHT IN THE MIDLANDS.

To the Editor of the Meteorological Magazine.

SIR,—I have only glanced at the *Met. Mag.* just arrived, but read your remarks about our rainfall. With all due deference to your figures and remarks, we, living here, seem to think that you have omitted one very serious consideration.

You take the Barkby fall. On comparing my rainfall here with that, we certainly have not been blessed with so much. But, omitting this, you seem to take no notice of the *actual amount of each fall*. If the ground is dry, a small fall (as far as the Reservoir is concerned) will do no good. Now, taking from October last year up to the present time, we have had but *one* fall over $\cdot70$ in., and that was in February, and was snow. In fact, that was the only snow we had all the winter. Then we have had but *one* fall over $\cdot60$ in. (in June); *none others over half-an-inch*. By examining the annexed table, you will see that out of the 174 days on which rain or dew fell, no fewer than 118 produced less than $\cdot10$ in. each time. The *total* amount appears good, but when it comes in such dribblets, it cannot run into the Reservoir. The dry mud all round the water has large cracks, which swallow up all small contributions, and it is only a heavy rain which will do much good, and this we have not had. Again, though our rainfall appears to be respectable, it has come in such a manner as to be practically of little value (as far as the Reservoir is concerned). Taking a few examples:—On December 20th we had $\cdot33$ in. of sleet; the next “heavy” fall was on January 17th, when $\cdot10$ in. fell; the total fall for the intervening 28 days was *only* $\cdot55$ in. The next “heavy” fall was on February 16th, when $\cdot17$ in. fell; the total fall for the intervening 29 days was $\cdot59$ in. Thus, during 59 days of the three winter months, we had only $1\cdot38$ in. March 13th, $\cdot15$ in., not a drop for the next 20 days; then on April 3rd we had $\cdot31$ in. June 15th, $\cdot30$ in.; July 10th, $\cdot38$ in.; for the intervening 24 days only $\cdot22$ in. August 25th, $\cdot48$ in.; September 25th, $\cdot32$ in.; for the intervening 30 days only $\cdot41$ in. Since September 25th up to the present time, an interval of 23 days, we have had but $\cdot25$ in.

Amount of Rain per diem at Thurcaston.

		Under .10in.	.10 to .20 "	.20 " .30 "	.30 " .40 "	.40 " .50 "	.50 " .60 "	.60 " .70 "	.70 " .80 "	Total Days.
		days.	days.	days.	days.	days.	days.	days.	days.	
1893	October.	6	2	2	1	1	—	—	—	12
	Nov.	9	1	2	2	—	—	—	—	14
	Dec.	15	—	1	2	—	—	—	—	18
	January.	19	1	—	—	—	—	—	—	20
1894	Feb.	12	3	—	—	—	—	—	1	16
	March ...	8	2	—	—	—	—	—	—	10
	April ...	7	4	—	2	—	—	—	—	13
	May	11	1	3	—	1	—	—	—	16
	June	5	3	1	1	—	—	1	—	11
	July.....	10	2	2	3	—	—	—	—	17
	August..	10	3	3	1	1	—	—	—	18
	Sept.....	6	2	—	1	—	—	—	—	9
			118	24	14	13	3	—	1	1	174

Yours very sincerely,

T. A. PRESTON.

Thurcaston Rectory, Leicester, October 17th, 1894.

[Mr. Preston's letters are generally so interesting that one regrets their rarity—but this time we really must say a few words in our own defence—not because he disproves one word that we wrote, but because the opening sentence implies that he contemplated doing so.

He seems not to admire our taking the Barkby record, but it was essential to take a long one—and the Thurcaston record does not go back 10 years, whereas the Barkby one goes back a quarter of a century.

In the second paragraph he goes carefully (and we agree with him), into *one* of the reasons for the water trouble at Leicester, but if he will look at p. 133 he will find that we wrote "we are not here discussing why Leicester is short of water, but whether there has been in the Midland Counties anything like the drought which we had in the South of England in 1893," and we found no evidence of such a drought.

Mr. Preston gives away his case by saying "The *total* amount appears good," and the addition, "but when it comes in such dribblets it cannot run into the Reservoir" opens the very question which we had excluded, because the subject of the water supply of Leicester would be foreign to the province of the *Meteorological Magazine*.

The facts shown by Mr. Preston's table are decidedly important, and we are glad that it is put upon record that at a station with a mean annual rainfall of about 28 inches, it is possible to have 12 consecutive months with no fall exceeding 0.80 in. and only two exceeding half-an-inch.—ED.]

LUNAR RAINBOW.

To the Editor of the Meteorological Magazine.

SIR,—A perfect lunar rainbow was visible here on October 15th, at 6.15 p.m. The moon had just risen over a heavy cloud bank, and threw a primary bow on a retreating shower. The colours were very distinct, but not so bright as in a sun bow. The legs subtended an angle of 75° , and one leg was visible between me and a house 200 yards distant, it appeared to be less than half that distance; the other leg could not be traced to the ground.

J. P. MACLEAR.

Cranleigh, Surrey.

ON COLD BEFORE AND AFTER THE NEW YEAR.

To the Editor of the Meteorological Magazine.

SIR,—How is cold before the New Year related to that after it? If we have a great deal of cold in the end of the year, are we likely to be compensated by mildness in the early months of the next year, or is it the opposite?

I have recently sought an answer to this in the number of frost days at Greenwich in the 53 winter seasons 1841–2 to 1893–4 (not considering intensity of frost), and the following analysis may be found interesting.

The average number of frost days in the fourth *quarter* (October to December) in those years is 18 (exactly, 17·9), with a variation from 2 to 38. On the other hand, the average number in the first *third of the year* (January to April) is 37 (37·2), or just about double, with a variation from 13 to 67.

Considering now the fourth quarter with reference to its average, there were in those 53 seasons—

24 cases above average.
26 „ below „
3 „ average.

The 24 cases above average were followed by first thirds thus—

16 above average.
7 below „
1 average.

The 26 cases below average were followed by first thirds thus—

19 below average.
6 above „
1 average.

The 3 average fourth quarters were followed, 2 by first thirds above average, and one by a first third below average. From this it appears that an excess of frost days in the last quarter is more likely to be followed by excess of frost days in the first third, and a deficiency in the former case by a deficiency in the latter.

Here is another analysis, with similar results :—

Suppose we form three groups of the fourth quarters, viz. : (a) one containing all cases of 12 frost days or less (13 cases); (b) one with

all cases over 12 to 20 (20 cases); (c) one with all cases over 20 (20 cases). Then—

The cases of group (a) were followed by first thirds whose numbers yield the average.....	33·3
The cases of group (b), &c.	36·4
The cases of group (c), &c.	40·5

These facts seem to agree with the “wise saw,” “An early winter, a surly winter.”—Yours faithfully, A. B. M.

WHIRLWINDS OR SQUALLS ON OCTOBER 24TH & 26TH.

WALPOLE ST. PETER, KING'S LYNN, NORFOLK.—A phenomenon was witnessed in the Marshland District on October 24th. A storm of a severe nature broke over the district about 3.30 p.m. Mr. R. A. Wilkin, solicitor, of King's Lynn, had been attending an inquest at Walpole St. Peter, and on his way home encountered a whirlwind. The carriage in which he was riding was overthrown into the dyke by the side of the road. The vehicle was so fixed in the dyke that Mr. Wilkin had to get out of the window and was somewhat cut and upset by the shock. The driver was found under the horse's feet; he was kicked, but not seriously. The wind uprooted several trees on Mr. Neep's land and a straw stack was blown over. On Mr. John Boon's land adjacent, seven barley and wheat stacks were scattered all over the neighbourhood, and between twenty and thirty men had been employed to gather up and re-stack the corn. The produce on a number of allotments was so mixed up that great difficulty was experienced by the several allotment-holders in identifying their property. Although confined in a limited area the whirlwind did considerable damage.—*Spalding Guardian*.

STRETTON RECTORY, OAKHAM, RUTLAND.—SIR,—You may think it worth while to insert the following account of an unusual hurricane which passed over this village on the evening of Friday, October 26th. It had been blowing somewhat hard all the afternoon, but about 7.30 p.m. there came a sudden rush of wind, which can best be described as the roar of an express train. Its course was, speaking roughly, from S. to N., and it only lasted some three or four minutes. The effects, however, were most extraordinary. It passed through a stackyard in the village, stripping the thatch off one rick, and leaving the rest undisturbed, thus showing that the hurricane was confined to a narrow limit. It next seized upon the roof of a shed on the premises belonging to Mr. Hart. The roof was composed of sheets of corrugated iron, fastened to strong joists, with a heavy oak post resting on the top of it, to make it more secure. The wind lifted up the whole roof. The joists were dropped on the far side of a wall, which formed the back of the shed. The oak post fell in the adjoining paddock about 100 yards from where it had been placed. Of the sheets of iron, one is now resting in the branches of a tree close by, the remainder were dropped at various intervals on each side of the road leading to Stocken, while that which took the longest flight of all, was found in the grounds near Stocken Hall, having made an aerial voyage of quite 1½ miles. In addition to this, many trees have been either uprooted or have had their tops wrenched off. This, however, has often occurred before, but I doubt whether such an occurrence as that which I have described as happening to the shed, has ever been heard of in this country. How far the gale extended, I know not. I am only describing what came under my own observation.—Yours faithfully, T. O. HALL.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MAY, 1894.

STATIONS. <i>(Those in italics are South of the Equator.)</i>	Absolute.				Average.				Absolute.		Total Rain.		Aver. Cloud.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
England, London	71·5	15	33·0	21	61·0	42·4	43·0	77	116·9	25·0	1·85	16	5·9
Malta.....	77·5	28	51·7	3	71·8	58·5	57·2	75	142·2	46·3	·02	1	5·1
<i>Cape of Good Hope</i> .....	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>Mauritius</i>	80·3	5	58·8	28	77·0	66·6	64·0	79	125·3	48·7	4·41	16	5·9
Calcutta.....	105·1	17	71·6	11	95·5	79·7	78·2	75	157·0	68·9	3·00	5	3·8
Bombay.....	92·5	31	79·3	2	90·9	81·1	75·0	71	141·0	73·7	·00	0	2·2
Ceylon, Colombo	89·2	4	75·2	19	87·4	79·3	73·8	77	152·0	72·7	3·00	18	4·8
<i>Melbourne</i>	68·9	16	37·2	27	60·1	45·9	46·8	79	117·5	30·8	1·63	10	6·5
<i>Adelaide</i>	70·5	11	41·5	2	64·1	48·1	47·2	74	132·0	33·6	1·66	14	5·8
<i>Sydney</i>	68·7	1	43·7	31	63·1	50·2	48·6	84	115·0	32·5	1·62	13	3·2
<i>Wellington</i>	63·3	15	38·0	21	59·6	48·2	45·6	74	110·0	25·0	4·33	17	4·8
<i>Auckland</i>	67·0	1a	43·5	31	62·7	51·1	49·8	77	130·0	41·0	5·80	22	7·1
Jamaica, Kingston.....	89·3	26	69·4	3, 5	85·3	72·4	71·1	80	...	...	10·65	12	6·2
Grenada.....	88·0	11b	72·4	17	84·9	74·9	68·9	79	152·0	...	1·99	13	3·5
Trinidad .....	...	...	...	...	...	...	...	...	...	...	...	...	...
Toronto	75·6	1	35·1	29	61·6	43·4	43·8	73	...	29·0	9·37	21	6·0
New Brunswick, Fredericton	80·9	2	31·3	14	63·2	40·8	43·4	69	...	...	·90	9	7·0
Manitoba, Winnipeg ...	80·8	31	28·6	27	65·8	40·2	...	...	...	...	·58	7	6·0
British Columbia, Esquimalt.....	81·7	25	33·7	9	59·0	44·1	46·4	85	...	...	2·71	19	7·0

a And 3, 4. b And 15.

REMARKS.

MALTA.—Adopted mean temp. 64°·2; mean hourly velocity of wind 11·0 miles; cloud 1·6 above average. Thunderstorm on 7th. J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·3 below, of dew point 0°·2 below, and rainfall ·36 in. above, their respective averages. Mean hourly velocity of wind 7·9 miles, or 1·9 miles below average; prevailing direction, S.E. to E.S.E. T and L on 15th and 24th, and T on 16th, 21st, and 25th. C. MELDRUM, F.R.S.

Melbourne.—Dense fog on the 9th and 19th. Lunar halos on the 15th and 17th. L on the 16th and 30th. T and L on 17th. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean temp. 56°·1, or 1°·6 below the average of 37 years. Rainfall over the southern parts of the Colony fair, and well distributed over the month, but only scanty rains over the more northern portions. C. TODD, F.R.S.

Sydney.—Temperature 1°·8 below, humidity 9·4 above, and rainfall 3·58 in. below, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Light showers during the early part of the month; wind N.W., and strong on 3rd and 4th; fine during the middle; strong N.W. wind on 21st, 22nd, and 23rd, with rain, and showery for the remainder of the month, and strong S.W. gale from night of 28th to end. Mean temperature 1°·9 above, and rainfall ·65 in. below, the average. R. B. GORE.

Auckland.—A rainy and showery month, only nine days being quite free from rain, with an exceptional fall of 1·54 in. on the 16th. Mean temperature below the average. Rainfall much above, and the highest in the month since 1883. T. F. CHEESEMAN.

JAMAICA.—Mean hourly velocity of wind 4·2 miles. Heavy "seasons" all over the island, the means being 79 per cent. over the average. One station had four, six stations had three times its average fall. Six stations had over 30, and 23 stations had between 20 and 25 inches of rain. R. JOHNSTONE.

SUPPLEMENTARY TABLE OF RAINFALL,
OCTOBER, 1894.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			
II.	Dorking, Abinger Hall.	5·50	XI.	Rhayader, Nantgwilt..	7·73
„	Birchington, Thor	3·28	„	Lake Vyrnwy	7·50
„	Hailsham	4·35	„	Corwen, Rhug	3·33
„	Ryde, Thornbrough	4·92	„	Carnarvon, Cocksida ...	5·88
„	Emsworth, Redlands ...	5·48	„	I. of Man, Douglas	6·34
„	Alton, Ashdell.....	5·07	XII.	Stoneykirk, Ardwell Ho.	4·66
III.	Oxford, Magdalen Col...	3·26	„	New Galloway, Glenlee	6·33
„	Banbury, Bloxham	3·54	„	Melrose, Abbey Gate ...	3·64
„	Northampton, Sedgebrook	2·75	XIII.	N. Esk Res. [Penicuick]	2·80
„	Alconbury	2·02	„	Edinburgh, Blacket Pl..	2·79
„	Wisbech, Bank House..	2·76	XIV.	Glasgow, Queen's Park.	2·68
IV.	Southend	3·05	XV.	Inverary, Newtown	3·25
„	Harlow, Sheering	2·88	„	Islay, Gruinart School..	1·22
„	Colchester, Lexden	2·12	XVI.	Dollar.....	2·19
„	Rendlesham Hall	1·54	„	Balquhidder, Stronvar..	4·61
„	Diss	2·46	„	Ballinluig	3·32
„	Swaffham	2·84	„	Dalnaspidal H.R.S. ...	3·79
V.	Salisbury, Alderbury...	3·46	XVII.	Keith H.R.S.	3·57
„	Bishop's Cannings	3·92	„	Forres H.R.S.	1·77
„	Blandford, Whatcombe.	4·14	XVIII.	Fearn, Lower Pitkerrie.	2·27
„	Ashburton, Holne Vic....	8·52	„	Loch Shiel, Glenaladale	3·39
„	Okehampton, Oaklands.	6·83	„	N. Uist, Loch Maddy ...	3·01
„	Hartland Abbey	6·10	„	Invergarry	1·35
„	Lynmouth, Glenthorne.	5·60	„	Aviemore H.R.S.	1·62
„	Probus, Lamellyn	5·70	„	Loch Ness, Drumnadrochit	1·96
„	Wellington, Sunnyside..	4·33	XIX.	Invershin	1·35
„	Wincanton, Stowell Rec.	4·23	„	Scourie	2·44
VI.	Clifton, Pembroke Road	3·76	„	Watten H.R.S.	3·01
„	Ross, The Graig	4·96	XX.	Dunmanway, Coolkelure	6·92
„	Wem, Clive Vicarage ...	3·27	„	Fermoy, Gas Works ...	6·08
„	Cheadle, The Heath Ho.	3·55	„	Killaruey, Woodlawn ...	6·53
„	Worcester, Diglis Lock	2·19	„	Tipperary, Henry Street	4·33
„	Coventry, Coundon	3·64	„	Limerick, Kilcornan ...	3·00
VII.	Ketton Hall [Stamford]	2·54	„	Ennis	4·00
„	Grantham, Stainby	2·99	„	Miltown Malbay.....	4·81
„	Horncastle, Bucknall ...	2·97	XXI.	Gorey, Courtown House	6·00
„	Worksop, Hodsck Priory	3·36	„	Athlone, Twyford	4·21
VIII.	Neston, Hinderton	3·16	„	Mullingar, Belvedere ...	3·34
„	Lancaster, Rose Bank..	...	„	Longford, Currygrane...	1·68
„	Broughton-in-Furness..	6·64	XXII.	Galway, Queen's Coll... ..	...
IX.	Ripon, Mickley	4·67	„	Crossmolina, Enniscoe..	6·03
„	Scarborough, South Cliff	4·74	„	Collooney, Markree Obs.	3·43
„	East Layton [Darlington]	5·45	„	Ballinamore, Lawderdale	4·37
„	Middleton, Mickleton..	5·01	XXIII.	Lough Sheelin, Arley ..	3·43
X.	Haltwhistle, Unthank..	3·21	„	Warrenpoint	8·43
„	Bamburgh	4·28	„	Seaforde	10·07
„	Keswick, The Beeches...	5·66	„	Belfast, Springfield	7·26
XI.	Llanfrechfa Grange	6·34	„	Bushmills, Dundarave...	2·70
„	Llandover y	6·55	„	Stewartstown	5·83
„	Castle Malgwyn	6·87	„	Buncrana	3·30
„	Builth, Abergwessin Vic.	8·52	„	Lough Swilly, Carrablagh	2·44

OCTOBER, 1894.

Div.	STATIONS. <small>[The Roman numerals denote the division of the Annual Tables to which each station belongs.]</small>	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			
		inches.	inches.	in.									
I.	London (Camden Square) ...	4.45	+ 1.56	1.35	30	17	62.1	2b	31.2	17	1	4	
II.	Maidstone (Hunton Court)...	4.47	+ 1.01	1.71	30	18	...	...	...	...	...	...	...
	Strathfield Turgiss	4.58	+ 1.74	.99	30	23	64.2	11	28.4	17	2	5	
III.	Hitchin	2.30	— .77	.44	24	19	61.0	13	29.0	21	2	...	
	Winslow (Addington)	3.07	— .02	.70	30	22	64.0	12	26.0	22	1	2	
IV.	Bury St. Edmunds (Westley)	2.22	— 1.05	.55	24	19	59.0	7	33.0	22	0	...	
	Norwich (Brundall)	2.85	...	.43	28	25	64.5	7	31.2	22	1	9	
V.	Weymouth (Langton Herring)	3.82	+ .28	.65	20	13	66.0	11	36.0	17	0	...	
"	Torquay (Cary Green)	7.76	...	1.42	19	14	64.5	11	36.0	19	0	1	
"	Polapit Tamar [Launceston].	5.11	+ .18	1.01	26	15	68.0	9	38.0	16	0	7	
VI.	Stroud (Upfield)	4.21	+ 1.18	1.23	30	20	69.0	11	34.0	21	0	...	
"	Church Stretton (Woolstaston)	3.93	+ .16	1.05	26	18	63.0	11	30.0	22	1	5	
"	Tenbury (Orleton)	4.05	+ .84	.83	26	18	65.0	13	27.0	22	2	5	
VII.	Leicester (Barkby)	2.21	— .94	.48	26	19	63.0	11c	19.0	21	3	12	
"	Boston	2.41	— .70	.58	27	17	65.0	7, 11	30.0	22	1	...	
"	Hesley Hall (Tickhill).....	3.18	+ .08	1.00	20	19	65.0	1	24.0	23	4	...	
VIII.	Manchester (Plymouth Grove)	...	...	...	...	...	...	...	...	...	...	...
IX.	Wetherby (Ribston Hall) ...	2.34	— .79	.46	24	16	...	...	...	...	...	...
"	Skipton (Arnccliffe) .....	...	...	...	...	...	...	...	...	...	...	...
"	Hull (Pearson Park)	5.26	+ 1.61	1.56	20	21	61.0	1, 7	26.0	23	4	6	
X.	Newcastle (Town Moor)	4.78	+ 1.66	.65	20	21	...	...	...	...	...	...
"	Borrowdale (Seathwaite).....	13.84	+ 3.25	4.11	24	18	...	...	...	...	...	...
XI.	Cardiff (Ely)	5.72	+ 1.18	1.41	24	16	...	...	...	...	...	...
"	Haverfordwest	6.26	+ 1.11	1.64	23	16	66.0	6	29.9	3	3	8	
"	Aberystwith (Gogerddan) ...	5.64	+ .29	.98	27	15	66.0	7, 9	24.0	14	11	...	
"	Llandudno	4.88	+ 1.49	1.08	20	17	62.5	9	32.0	22	1	...	
XII.	Cargen [Dumfries]	4.45	+ 1.19	1.28	23	10	63.4	11	21.0	22	5	...	
"	Jedburgh (Sunnyside).....	2.96	+ .31	.54	26	16	65.0	13	20.0	23	6	...	
XIV.	Colmonell	5.14	...	1.48	31	11	65.0	12	22.0	21	7	...	
XV.	Lochgilthead (Kilmory)	2.94	— 1.85	.45	28	12	...	...	24.0	18	9	...	
"	Mull (Quinish)	2.43	— 2.86	.79	9	13	...	...	...	...	...	...
XVI.	Loch Leven Sluices	4.60	+ 1.64	1.10	24	10	...	...	...	...	...	...
"	Dundee (Eastern Necropolis)	3.55	+ 1.31	.90	23	19	62.1	10	26.2	19	5	...	
XVII.	Braemar	3.02	— .59	.87	31	16	62.0	2	17.8	23	14	22	
"	Aberdeen (Cranford)	3.08	...	.55	31	22	65.0	2	26.0	22	7	...	
XVIII.	Strathconan [Beaulj]	1.42	— 3.23	.45	19a	7	...	...	...	...	...	...
"	Glencarron Lodge	3.16	...	1.27	12	19	59.9	2	25.8	19	...	...
"	Cawdor [Nairn]	2.17	— .56	.59	18	15	...	...	...	...	...	...
XIX.	Dunrobin	2.27	— 1.04	.50	19	13	62.0	2	31.0	23d	3	...	
"	S. Ronaldsay (Roeberry).....	3.31	— .42	.66	24	20	60.0	2	34.0	17	0	...	
XX.	Darrynane Abbey	5.18	...	1.56	23	13	...	...	...	...	...	...
"	Waterford (Brook Lodge) ...	5.67	+ 1.85	1.43	23	15	65.0	11	32.0	15e	2	...	
"	O'Briensbridge (Ross)	2.26	...	.59	27	11	...	...	...	...	...	...
XXI.	Carlow (Browne's Hill)	4.80	+ 1.51	1.38	23	16	...	...	...	...	...	...
"	Dublin (Fitz William Square)	3.97	+ .59	1.04	23	20	62.8	31	36.0	22	0	4	
XXII.	Ballinasloe	4.23	+ 1.24	.80	23	15	61.0	1	27.0	15	5	...	
"	Clifden (Kylemore)	7.25	...	1.60	24	15	...	...	...	...	...	...
XXIII.	Waringstown	5.51	+ 2.80	1.58	23	19	65.0	13	26.0	21	9	13	
"	Londonderry (Creggan Res.) ..	2.90	— .77	.64	23	17	...	...	...	...	...	...
"	Omagh (Edenfel)	3.91	+ .81	1.35	23	16	63.0	12	22.0	21	6	8	

a And 26. b And 11, 13. c And 12, 13. d And 27. e And 28.

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

METEOROLOGICAL NOTES ON OCTOBER, 1894.

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

ENGLAND.

CAMDEN SQUARE.—The min. temp. in shade for September was $36^{\circ}7$ on 28th, not as printed $39^{\circ}3$ on 29th.

STRATHFIELD TURGIS.—The early portion of the month was mild and fair; from the 14th to the 17th a sharp snap of frost occurred, and a heavy gale on the 24th. Thence to the end of the month constant heavy rains and floods. T on 24th. The river Loddon flooded on 31st. Swallows last seen on 12th.

ADDINGTON.—A very dull, unsettled month, only one or two bright days. The 1st, 8th, 9th and 13th were foggy, and sharp frost occurred on the morning of the 22nd. High wind on the 24th, 25th and 26th. Three sharp claps of T and flashes of L about midday on 24th, and much L the same night, also on the night of the 25th. The rains at the end of the month caused the brook to overflow the meadow; the only flood for a long time. The last night of the month very mild, the min. temp. being 52° .

BURY ST. EDMUNDS.—A month of low temp., almost without frost, and little sunshine. The first ten days very misty, distant T on 28th.

NORWICH, BRUNDALL.—Rainfall very near the average, but the number of rainy days large. Temp. about 1° above the average. An unusual preponderance of northerly winds (N. W. to E.) viz., 52 days between August 21st and October 21st. L on 7th, 19th and 29th. Fog on 9th. H on 14th. Gale from S. W. in night of 25th.

LANGTON HERRING.—For the 25 days ending October 19th, the rainfall was only $\cdot 02$ in., but on all of the last 12 days of the month heavy R fell, and the weather was very mild and damp. Mean temp. $50^{\circ}9$, or 1° above the average of 23 years. There was a sudden fall of temp. on the 15th, when the min. was 13° lower than on the previous day; the cold period lasted to the 24th, when the min. was 11° above that of the 23rd. From the 24th to 27th inclusive was very stormy. T and L on 20th, 21st, 24th, 25th and 26th. Fog on the 9th.

TORQUAY, CARY GREEN.—Rainfall $3\cdot 57$ in. above the average. Mean temp. $52^{\circ}3$, or $1^{\circ}9$ above the average. Amount of sunshine 90 hours 45 minutes, being 27 hours 15 minutes below the average; five sunless days.

POLAPIT TAMAR.—The early part of the month was fine and bright, but the last 12 days were remarkable for the quantity of R that fell. Only $\cdot 13$ in. fell before the 20th, but on and after that date $4\cdot 98$ in. fell. This wet period was accompanied throughout by very strong winds or gales.

WOOLSTASTON.—The first three weeks were fine, but the latter part of the month was wild and boisterous, with constant R. Heavy gales on the 23rd and 24th. Mean temp. $47^{\circ}6$.

TENBURY, ORLETON.—The first half of the month was fairly dry, but from the 23rd to the end there was almost incessant R, more than $3\cdot 50$ in. falling in the last nine days. Temp. about $1^{\circ}0$ above the average. Fog very frequent. T on 27th; L on 29th.

LEICESTER, BARKBY.—A wet, warm month, especially at the end, the R being most acceptable. Mean temp. $47^{\circ}6$. T on 26th. In these parts a wet day is now regarded as a *fine* day.

SEATHWAITE.—In the last nine days of the month $12\cdot 48$ in. of R fell, the amounts exceeding an inch on six days.

WALES.

HAVERFORDWEST.—The month at the commencement was a continuation of the cold which prevailed during the last five days of September, the grass temp. on the 3rd falling to $25^{\circ}6$. Some R fell during the second week, and the temp. rose. Fine autumnal weather, with dense fog, air calm, and temp.

high for October, then prevailed; the wind, which had blown persistently from the N. and N.E., backed to S.E. at the end of the third week, and a rainy period commenced, and 5·32 in. of R fell in the last nine days.

ABERYSTWITH, GOGERDDAN.—Very stormy throughout the month, with strong winds from the S.

SCOTLAND.

CARGEN.—Until the 23rd of the month the meteorological conditions were almost exactly the same as prevailed from August 15th through September. Little R fell (·30 in.), light easterly winds prevailed, and a high bar. Foggy weather was more frequent, and there was considerably less sunshine than in the former period. From the 15th August to the 23rd of this month—69 days—only seven-tenths of an inch of R fell. The only occasion on which we have had a drought to be compared with this during the last 34 years was in 1868, when from the 26th May to the 6th August—73 days—1·02 in. of R fell. The R for the last nine days of the month amounted to 4·15 in. The mean temp., 45°·7, is 2°·2 below the average, and the duration of sunshine 50 hours below it. Light easterly winds prevailed for 20 days.

JEDBURGH.—The weather up to the middle of the month was comparatively mild with little or no wind, which retarded the ingathering of the corn. After that the temp. fell decidedly and R was frequent with much wind. The cereal crops have attained fully an average, but in higher districts there is still much grain on the fields.

COLMONELL.—Rainfall slightly above the average.

MULL, QUINISH.—A most beautiful month, the high temp. and freedom from gales making it seem a continuation of summer.

BRAEMAR.—With the exception of the first week, the weather has been very calm, dull, and muggy, consequently the crops are still unsecured and in bad condition. Duration of sunshine 82 hours 10 minutes.

ROEBERRY.—A very fine month upon the whole. Mean temp 47°·1.

IRELAND.

DARRYNANE ABBEY.—Fine and fairly warm to the 16th. Very cold, with frost at night from 17th to 23rd; wet and mild after. Heavy R and gale on the 24th.

WATERFORD, BROOK LODGE.—The fine weather that commenced after the TS on August 25th broke up with another heavy storm on the 20th of this month, and a quantity of L on the 21st. Heavy S.W. gale on the 24th. Mean temp. 49°·5.

O'BRIENSBRIDGE, ROSS.—After three weeks of very fine autumnal weather, R and heavy gales from S.W. closed the month; on the whole a most favourable one.

DUBLIN.—The first half of the month was quiet, fine, and, for the most part, dry. Until the 18th very little R fell, but from that day onward to the close large quantities were measured almost daily. Mean temp. 49°·7, exactly the average. There was a TS on the 20th. High winds were noted on 9 days, but attained the force of a gale only on the 24th. Fogs on 9 days. H on the 19th and 20th.

WARINGSTOWN.—Heavy floods in the latter half of the month.

EDENFEL.—The drought and settled fine weather which set in on August 27th did not break up till October 20th. In that long period of 53 days only ·77 in. of R fell, ·45 in. of which fell on October 9th; a quite unprecedented record. The activity of the elements, however, from the 20th to the close more than made up the lee way and resulted in a R nearly an inch above the average for the month.

SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

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THE FLOODS OF NOVEMBER, 1894.

I AM in a little difficulty in deciding as to the best mode of dealing with this subject, and think that, on the whole, this article had better begin with a brief historical statement. All my readers are probably aware that after a very dry September and first two-thirds of October a wet period set in over the southern half of England and part of Wales, which period lasted until about the middle of November, and that floods, disastrous in some places, resulted from this wet three weeks. Whether or not the flood was worst in the valley of the Thames, or in Cornwall, has yet to be determined, but it was a very high one on the Thames, and Mr. Sowerby Wallis and I went to various places on its banks to fix its height relatively to previous floods, with the object of giving a full account of it. Subsequently at the Council Meeting of the Royal Meteorological Society, a strong desire was expressed that the work should be done in connection with, and the results presented to, that Society. Mr. Chatterton, M.I.C.E., undertook to work up the engineering part of the report, and I promised to tabulate the rainfall, and supply all the old records in my possession as to the height of previous floods. To deal properly with the Thames alone will take some months, and I can say little as to the final form which the work will take, as we are in communication with the officers of the Thames Conservancy, and details are not settled.

One branch of the question is disposed of; Mr. H. Southall, F.R.Met.Soc., of Ross, Herefordshire, has promised a paper on the floods in the Severn, Wye and Usk, and as he has long been an assiduous observer of the levels of those rivers, his paper, which will be read at the Royal Meteorological Society on December 19th, is sure to be useful and important.

It may sound rather wild to say that I cannot give here a thousandth part of the information already collected, but that is far within the mark.

The first step was to obtain the newspaper accounts of the flood; because however satirical some persons might be as to "penny-a-liners," long experience has taught me that much very valuable information appears in local newspapers *and nowhere else*. The

newspaper cuttings (rejecting duplicates) already mounted and classified would, if joined up in one continuous column, be 600 ft. long, nearly $\frac{1}{4}$ th of a mile.

The rainfall observers in the area affected must number nearly 1,000.

As the result of two communications inserted in *The Times* I received numerous letters giving local details.

An assistant has been going through files of old newspapers at the British Museum, and extracted many pages of notes of the heights of floods in this and the previous century.

The Thames Conservancy Board have promised to place their records at our disposal.

I wrote to the Engineer or Borough Surveyor of each town up the Thames as far as the City of Oxford, and these gentlemen are sending in valuable maps and reports.

It is evident that it will take much time to reduce all this matter to proper form. On the present occasion, therefore, I give merely two pages of rain returns from the districts chiefly affected, and a selection from the letters with which I have been favoured, arranged in the order adopted in *British Rainfall*.

Before doing so I wish to reprint two paragraphs from an article in the *Meteorological Magazine* for January, 1877—and just as necessary now as they were 17 years ago.—G. J. SYMONS.

FLOODS, AND A PLEA FOR FLOOD MARKS.

“We have put at head of this article ‘A Plea for Flood Marks,’ and we beg of our readers to do all in their power (1) to discover and protect all existing records of the height of bygone floods; (2) wherever practicable, to have their relation to Ordnance datum accurately determined, and, when that has been done, to send us for publication a note of the results; (3) to have new marks of the level of the 1877 floods cut wherever practicable, if possible, determining their height above Ordnance datum, and reporting the details to us for publication. A mere horizontal line or, better still, a mark like this $X \text{---} \frac{1877}{\text{---}} X$ is all that is necessary.”

“It may be thought that in making this suggestion we are passing beyond our own province, into that of Engineers. Limits are always hard to fix, and if there existed any published details of the class we indicate we should not interfere. But although the records of the floods of continental rivers are kept with accuracy and published extensively, we do not know where to obtain similar data for English rivers and floods. We have had to create an organization for the registration of rainfall,—shall we be obliged to supplement it by a Chronicle of Floods?”

SUNBURY VICARAGE.—This house was, as in Mr. Cowe's report of the 1795 flood, dry and comfortable. In 1852 we had some two to three feet of water in our wine cellar. This year a very little came

into the coal cellar. In 1852, on the road to the station, it was necessary to take a punt near Hawke House. This year it was not so. Hence I think we may take it there was less inconvenience from land springs this year than in 1852, probably owing to the short rainfall in 1893 and the preceding years. Some persons think that the pumping from wells by the East London Water Works, on the confines of this Parish and Hanworth, has lowered our springs and emptied our ponds. I do not give much credence to this idea, for I cannot think that the cone of exhaustion could extend as far as it is credited to do; and my experience, during extended walks both on this side of the Thames and in Surrey, is that all ponds have been very empty the last two or three years. As to the height of the flood, Drew, the river keeper, tells me there is a mark of the 1821 flood on the old lock house where he resides, and that the present flood at its highest was 3 to 4 inches above it. He has no mark of 1852. Mrs. Clark at the ferry tells me that she distinctly remembers that the 1852 flood did not go above a certain step on some stairs which run up her house; this flood rose at least a foot above that. In 1852 we had to take cart at Walton Bridge to get to the Sunbury and Shepperton road. We had to take a punt at Gurston Bridge, Upper Halliford (this was necessary this year, and I should imagine this is from a back flow from the Thames, as the stream only rises at Staines, and is dammed back at Littleton to form a lake, which did not flood), at the junction of the Sunbury and Halliford road and the lower road from Sunbury to Shepperton. We took punt to the Vicarage corner—as far as my memory serves me. I am distinctly under the impression that the water in that year (1852) did not flow very far up the first-named road, whereas this year it was flooded for quite 100 yards, when the water found its way into a low-lying paddock belonging to the Hedges family, then into the gardens of several adjoining cottages, across a drift road into one of our glebe fields, and partly turning northwards up the road, it flowed into a large disused gravel-pit and flooded it. This pit was flooded in 1852, but I think from land-springs. When I crossed the river on Saturday to see the river keeper, I came in contact with an officer of the Thames Conservancy, who was doing his utmost to stop a very considerable blow just above our lock, in the embankment between the cut to the lock and the main river, which has almost demolished the very extensive boathouse belonging to E. Clark and Sons.—
F. H. VIGNE.

TWICKENHAM, MANOR ROAD.—The flood here was the highest known within the memory of the inhabitants, being somewhat in excess of the flood of 20 years ago. As you are aware, we are in the tidal part of the river, with a rise and fall of a few feet every tide. On the 15th inst. the water in the Thames, which had been increasing for some time previously, began to overflow the banks, and at high tide that day (about 4 p.m.) was level with our esplanade wall, 15·25 ft. above Ordnance datum. It continued to increase from

*Rainfall in Southern and Central England and in Wales, October 11th
to November 14th, 1894.*

Div.	County.	Station.	Oct. 20th to Nov. 10th.	November				Nov. 11th to Nov. 14th.
				11th.	12th.	13th.	14th.	
I.	Middlesex ...	London, Camden Square	4·51	·43	·62	·11	·66	1·82
"	"	Muswell Hill	4·09	·46	·72	·16	·71	2·05
"	"	Pinner Hill	4·04	·13	·40	1·00	·19	1·72
II.	Surrey	Haslemere, Hazelhurst.....	6·62	·84	·83	·65	1·34	3·66
"	"	Abinger Hall	6·32	·62	·64	·58	1·18	3·02
"	"	Farnham, Seale	4·32	·49	·82	·38	1·04	2·73
"	"	Wallington	5·56	·37	1·01	·22	1·11	2·71
"	Kent	Tenterden	3·97	1·12	·34	·21	·81	2·48
"	"	Hythe	4·72	·63	·29	·11	·72	1·75
"	"	Seven Oaks, Riverhead.....	4·19	·73	·74	·11	·96	2·54
"	"	Keston Tower	5·76	·45	1·23	·11	1·06	2·85
"	"	Birchington, Thor	2·66	·91	·27	·02	·60	1·80
"	"	Sheppey, Leysdown	3·51	·52	·45	·07	·54	1·58
"	Sussex.....	Steyning	6·02	2·16	·87	·13	·97	4·13
"	"	Hailsham	4·97	1·15	·52	·21	1·06	2·94
"	"	Ditchling	5·45	1·63	·35	·18	·85	3·01
"	"	Crowborough Observatory	5·98	1·72	·61	·29	1·09	3·71
"	Hants	Osborne, Newbarn Cottage	6·29	2·13	·71	·44	1·43	4·71
"	"	Emsworth, Redlands.....	6·96	1·49	·59	·49	1·31	3·88
"	"	Alton, Ashdell	6·53	·78	·97	·80	1·27	3·82
"	"	Whitchurch, Longparish	5·51	·69	1·05	·66	1·37	3·77
"	"	Strathfield Turgiss.....	5·06	·52	1·25	·41	1·19	3·37
"	Berks	Newbury, Welford Park	5·04	·56	1·66	·74	1·34	4·30
"	"	Lamborne.....	5·00	·73	1·47	·89	1·40	4·49
III.	Hertford.....	Broxbourne, Stafford House	3·83	·42	·62	·18	1·05	2·27
"	"	Berkhamstead, Rosebank.....	3·86	·50	1·62	·56	1·02	3·70
"	"	Hitchin, Wratten	2·55	·42	1·37	·25	1·07	3·11
"	"	Wendover, Halton Gardens.....	4·08	·54	1·22	·47	1·33	3·56
"	Bucks	Addington Manor	3·72	·29	1·01	·53	1·02	2·85
"	Oxford	Henley-on-Thames.....	4·90	·49	1·11	·40	1·18	3·18
"	"	Abingdon, Culham.....	4·07	·50	1·39	1·00	1·28	4·17
"	"	Watlington, Pyrton Manor	4·17	·52	1·26	·47	1·51	3·76
"	"	Steeple Aston, The Grange	3·64	·26	1·19	·91	·63	2·99
"	"	Banbury, Bloxham Grove.....	3·91	·27	1·09	·80	·42	2·58
"	Northants ..	Pitsford, Sedgebrook.....	2·94	·16	1·14	·48	·53	2·31
"	Hunts	Alconbury	2·31	·14	·94	·09	·62	1·79
IV.	Essex	Saffron Walden, Newport	2·37	·35	·51	·11	·79	1·76
"	Suffolk	Rendlesham Hall	1·51	·38	·67	·28	·34	1·67
"	Norfolk	Diss	2·10	·26	1·26	·02	·56	2·10
"	"	Swaffham	3·00	·25	1·03	·04	1·44	2·76
V.	Wilts	Salisbury, Alderbury	4·93	·81	1·11	·72	1·24	3·88
"	"	Bishops Cannings	5·14	·80	1·65	·70	1·70	4·85
"	"	Marlborough, Mildenhall.....	4·60	·54	1·85	·51	1·49	4·39
"	"	New Swindon	5·06	·62	1·55	·91	·93	4·01
"	Dorset.....	Portland	5·57	2·07	1·06	·83	1·17	5·13
"	"	Weymouth, Langton Herring...	6·11	1·50	·97	·59	1·13	4·19
"	"	Maiden Newton	8·21	1·29	1·45	1·12	1·20	5·06
"	"	Blandford, Whatcombe.....	6·51	1·27	1·00	·94	1·40	4·61

Rainfall in Southern and Central England and in Wales, October 11th to November 14th, 1894—(continued).

Div.	County.	Station.	Oct. 20th to Nov. 10th.	November.				Nov. 11th to Nov. 14th.
				11th.	12th.	13th.	14th.	
V.	Devon	Torquay, Cary Green	8·68	2·03	·93	1·35	·46	4·77
"	"	Ashburton, Druid House	12·68	2·32	1·45	2·65	·44	6·86
"	"	Tavistock, Rose Villa	8·20	1·68	1·77	2·04	·50	5·99
"	"	Polapit Tamar [Launceston]	8·00	1·60	1·02	1·11	·42	4·15
"	"	Okehampton, Oaklands	9·77	1·20	1·50	1·26	·67	4·63
"	"	Hartland Abbey	8·50	·84	1·35	1·28	·45	3·92
"	"	Lynmouth, Glenthorne	8·59	·53	1·54	1·74	·62	4·43
"	Cornwall	Penzance, St. Clare	8·10	2·56	·38	·88	·44	4·26
"	"	St. Ives, Phillack Rectory	7·05	2·00	·70	1·52	·31	4·53
"	"	Redruth, Trewirgie	9·00	2·26	·56	1·50	·46	4·78
"	"	Probus, Lamellyn	8·38	1·34	1·22	1·52	·48	4·56
"	"	St. Agnes	8·26	2·28	·82	1·30	·40	4·80
"	"	Bodmin, Lanhydrock	8·99	1·78	1·42	1·41	·35	4·96
"	Somerset	Wellington, Sunnyside	6·18	1·10	1·20	1·12	·62	4·04
"	"	Stowell Rectory	6·69	1·13	1·10	·65	1·06	3·94
"	"	Wells (<i>Garden</i>)	6·04	·78	1·03	·65	·55	3·01
VI.	Gloucester	Clifton, Pembroke Road	5·33	·53	1·64	·53	·64	3·34
"	"	Almondsbury	5·64	·50	1·34	1·06	·56	3·46
"	"	Lechlade	5·16	·30	1·30	·66	1·10	3·36
"	"	Cirencester, Further Barton	6·59	·37	1·13	1·17	·58	3·25
"	"	Stroud, Upfield	5·29	·40	·96	·91	·44	2·71
"	"	Great Barrington	5·10	·28	1·11	1·00	·78	3·17
"	"	Moreton-in-Marsh, Longborough	4·39	·16	1·30	1·03	·58	3·07
"	Hereford	Ross, The Graig	5·53	·19	·62	·83	·31	1·95
"	Salop	Church Stretton, Woolstaston	4·49	·05	·71	·96	·10	1·82
"	Stafford	Cheadle, Heath House	3·67	·03	·48	·60	·25	1·36
"	Worcester	Tenbury, Orleton	4·69	·06	·92	·82	·21	2·01
"	Warwick	Coventry, Coundon	3·66	·11	·89	·85	·39	2·24
VII.	Leicester	Barkby	2·14	·04	·67	·36	·38	1·45
"	Lincoln	Horncastle, Hemingby	2·79	·05	·54	·47	·37	1·43
"	Notts	Hesley Hall [Tickhill]	2·59	·03	·43	·23	·13	·82
"	Derby	Derby	2·26	·04	·62	·45	·31	1·42
VIII.	Cheshire	Frodsham, Dunsdale	3·59	·01	·01	·61	·05	·68
XI.	Monmouth	Llanfrechfa Grange	7·93	·58	·47	1·64	·32	3·01
"	"	Llanvihangel Court	7·33	·21	1·32	1·28	·28	3·09
"	Glamorgan	Cardiff, Ely	7·35	·40	·76	·91	·42	2·49
"	Carmarthen	Llandovery	8·82	·48	·77	1·96	·25	3·46
"	Pembroke	Haverfordwest	7·61	·33	·70	1·65	·20	2·88
"	"	Castle Malgwyn	9·02	·16	·10	1·70	·13	2·09
"	Cardigan	Aberystwith, Gogerddan	6·25	·15	·21	1·39	·18	1·93
"	Radnor	New Radnor, Ednol	8·10	·15	·78	1·44	·22	2·59
"	Montgomery	Lake Vyrnwy	9·87	·21	·83	1·83	·13	3·00
"	Merioneth	Corwen, Rhug Gardens	4·07	·27	·09	·81	·08	1·25
"	Carnarvon	Carnarvon, Cocksidia	8·11	...	·40	1·25	·04	1·69
"	"	Llandudno, Warwick House	5·08	·01	·04	·79	·02	·86

the 15th to the 18th, there being, of course, a slight rise and fall with every tide, but during the whole of that time the water level did not go below the 15·25 ft., except a little on the 15th. The maximum height was reached at the time of high water in the evening of the 18th, when it was about 19·00 ft. above Ordnance datum. The difference between high and low water on that occasion was 1 ft. 3 in.—An old mark is cut here, giving the height of a flood that occurred in March, 1774, and that mark is 2 ft. 9½ in. above the mark I made of the highest water on the 18th. From the 18th the waters fell subject to a rise and fall for each tide, and after the 22nd inst. did not again come over the esplanade, 15·25 ft. The river Colne, which passes this district, also overflowed its banks, and from the 15th to the 22nd a great extent of the low-lying land in this district was under water. Some of our roads also were under water, and large quantities got into our sewers. There is a half-tidal weir with sluices at Richmond, but as the sluices were open the whole time of the flooding, I do not think it made any difference to this district.—G. B. LAFFAN.

HASLEMERE, HAZELHURST.—The rainfall here at the end of October was unusually great, and may be worth recording. I greatly regret, however, that my absence from home during the day prevented any record of the rate at which the rain fell.

Oct. 24.....	1·34 in.	Oct. 28.....	0·43 in.
„ 25.....	0·11 „	„ 29.....	0·30 „
„ 26.....	1·13 „	„ 30.....	1·06 „
„ 27.....	0·25 „		
		Total.....	4·62 in.

I have never before known three falls of over an inch within seven days. Hazelhurst is on the southern flank of Hindhead, and 550 feet above sea level. From the deep channels cut on the higher ground, the rain would appear to have been still heavier there.—T. P. NEWMAN.

CHIDDINGFOLD.—On October 24th, between 8.30 a.m. and 0.15 p.m., or 3¾ hours, 1·22 in. of R fell. In the 24 hours 1·64 in. fell. Moderate S.W. gale in the day, with increase of force, and heavy squalls at night.—A. F. PARBURY.

TENTERDEN.—The floods at Smallhythe (November 16th) are not considered so high by 18 inches as those of 1877. I believe they were worse in 1880 than this year, and of course in 1865, but from Snargate, Romney Marsh, my man reported the worst flood for years on 14th, and that would be before the whole of that day's fall had run down.—J. ELLIS MACE.

SIDCUP, HATHERLEY ROAD.—On the morning of October 31st I measured 3·56 in. of R. Whenever I have an unusual fall I make a mark with a pencil as I empty each half-inch into a jug, and then verify the amount by measuring a second time. I do not think my rain-gauge had been tampered with, as it is in direct view of my house. On the morning of the 31st, when the rainfall was over, the

South Eastern Railway at New Eltham was more flooded than by the heavy rains of the middle of November. The R commenced about 6.30 a.m., and continued steadily all day, and in the evening and night came down in torrents.—L. BURRELL.

CHICHESTER, WESTGATE.—There was a fall of 2.68 in. of R between 6 p.m. on Sunday, November 11th, and 9 a.m. on Monday, 12th.—N. TYACKE.

COMPTON [PETERSFIELD].—From October 21st to November 17th, rain fell more or less heavily on each day, and the amount for the four weeks came to exactly 12 inches. The greatest falls occurred on Oct. 25th, 1.23 in.; 27th, 1.07 in.; 31st, 1.09 in.; Nov. 12th, 1.61 in.; 15th, 1.49 in. The copious rains of July, September, and October have caused the springs in the chalk to rise earlier than usual and in much greater volume. My well (155 ft. deep) rose, between October 15th and November 15th, from 15 ft. to 51 ft., a rise of 36 ft. in the month.—H. MARMADUKE LANGDALE.

DITCHLING.—The rainfall here from October 20th to November 16th was 9.16 in. R was recorded on each day with the exception of November 8th.—F. H. PHILLIPS.

CROWBOROUGH, THE OBSERVATORY.—I was surprised to see by Monday's Weather Chart that only .29 in. of rain fell in London on November 11th, while here it amounted to 1.72 in., and from 6 p.m. on Sunday, 11th, to 6 p.m. on Monday, 12th, 2.33 in. From October 20th to November 15th inclusive I have registered 10.28 in. Rain fell every day during the period. We have not had such a soaking since 1865.—C. LEESON PRINCE.

EAST GRINSTEAD, HALSFORD.—Between 7 p.m. on November 11th and 8 a.m. on November 16th, 3.78 in. of R fell.—W. V. K. STENNING.

OSBORNE.—The rainfall registered here at 9 a.m. November 12th was 2.13 inches, that amount having fallen from about 5 p.m. on 11th, when the rain commenced, up to 9 a.m. on 12th. This is the greatest amount recorded at Osborne on any day since the commencement of observations in 1857, the greatest previous amount having been 2.05 in. on 26th September, 1859.—R. SCOTT.

SONNING MILLS.—A very curious coincidence has occurred in the dates of the highest point reached by the water at Sonning Lock in the three great floods on the Thames, of which an authentic account has been kept. I can find no other records of a big flood since 1809. The three great floods took place in 1852, 1875, and 1894, and the highest point reached in 1852 was on November 17th; in 1875 the highest point was on November 16th; in 1894 the highest point was on November 16th. It certainly seems curious that the water on each occasion should have reached its highest point almost on the same day of same month. The present flood was 9 inches higher than in 1875, and 11 inches higher than in 1852. It is useless to compare the floods of 1809 and 1821 with this one; the conditions and state of river are so different. In the olden time no dredging was done, and no new weirs built. I enclose the heights of various floods from

1852 until now, giving you the greatest height the water reached above our high water mark at Sonning Lock :—

	Height Above High Water Mark.			Height Above High Water Mark.	
	ft.	in.		ft.	in.
1852. November 17th ...	3	3	1880. November 1st	2	4
1875. November 16th ...	3	5	1881. February 12th	2	6
1876. December 31st	2	6	1881. December 20th.....	2	7
1877. January 6th	3	1½	1882. October 28th	3	3½
1877. November 30th ...	1	8	1883. February 13th	3	3½
1878. February 16th	1	1½	1886. November 15th ...	1	0
1879. January 5th	2	6	1891. October 24th	3	2
1879. August 26th	2	6	1894. *November 16th ...	4	2

* This is the highest flood on record at Sonning, and was 9 inches above the 1875 flood.

—ILTID WITHERINGTON.

SLOUGH, UPTON.—A civil engineer resident in the district reports the flood here as 13 inches above that of 1877–8, and 4 inches above the “Duke of Wellington flood” of 1852.

Since midnight Friday, November 16th there has not been a drop of water in the mains at Slough. The engines of the water company being submerged. Only houses with “fire storage” for hydrants have any reserve. The flood is said to have culminated at a quarter before 2 p.m. on Saturday. Communication cut off between Slough and Datchet, and Slough and Eton, except by boat (or train viâ Windsor). Three feet of water over Datchet Road at Upton end and four and five feet at Datchet end.—R. BENTLEY.

BOURNE END, THE WHARF.—The flood was from 6 to 8 inches higher than in 1852 ; we had 4 ft. 6 in. of water in our dressing-room, and as near as I can tell it was 3 ft. 6 in. above the towing-path on the opposite side of the river. It is the highest flood that has been known by anyone living about here. Traffic was stopped on the Marlow branch owing to the depth of water on the metals.—E. TOWNSEND.

NEWPORT PAGNELL.—The rainfall for the first fortnight of November has been very exceptional. We have had 4·08 in. On the 11th and 12th I registered 1·28 in. continuous fall, and on 13th and 14th 1·50 in. also continuous. The consequence is that the Ouse has been flooded more than in the memory of any one I have met with. I have noted the rainfall here for 30 years, but have had no such experience. Scores of houses in Newport Pagnell have had flood water in them.—R. LITTLEBOY.

HENLEY ON THAMES.—In the recent floods in the Thames valley the water rose to within 12½ inches of the great flood of 1809, and 14 inches more than the flood of 1852. On the night of Friday, November 17th, the water rose 1 foot, and began subsiding on the 18th, and reached the river bounds on the 22nd.—R. PRATT.

ABINGDON, CULHAM VICARAGE.—The flood this year was at its height about here—I take Clifton Hampden Bridge, which is between here and Wittenham—at about 10 a.m. on November 16th, from that time until 4 p.m. it does not seem to have made any appreciable altera-

tion, though the man at the toll-house tells me that it might have risen possibly half an inch during that part of the day; at 4 p.m., he tells me, it was at a standstill, and shortly afterwards began to fall. On the morning of the 17th it had fallen considerably; it rose very rapidly from 9 p.m., Wednesday, 14th, to 9 p.m., Thursday, 15th, after that the rise was not great. I can tell you the exact hour at which the 1875 flood was at its height, which, with us at Wittenham, was 4 p.m. on November 15th. I don't know the hour of the 1852, though I know it was sometime in the daytime of the same date. There was a very violent storm between 9.30 a.m. and 11 a.m. on the 14th, which passed by here, and which seems to have been very heavy at Molton, the rain coming down in sheets. There is no doubt that the amount of water coming down the Ock at Abingdon, and which flooded the Ock Street at Abingdon in a way that was never known, and the water coming down the Thame stream below us, and which was very great, raised the flood about here enormously. I am told that at Little Wittenham the flood exceeded the 1809 flood. This is about 3 miles below Clifton Bridge, and 4 miles below Long Wittenham on the river. There was a very rapid rise and a very rapid fall as one might suppose; the rainfall of 1852 and 1875, which are the ones of which I have a record, having been nothing like the quantity in so short a time, in those years the rainfall was much more continuous and one very heavy fall.—F. C. CLUTTERBUCK.

AMESBURY, FIGHELDEAN.—It began to rain here on Sunday, November 11th, at five minutes to 6 p.m., and rained till 6.35 p.m. on Monday, 12th, during which time 2.37 in. fell. There was hardly any break in the R, except about midnight on Sunday and about 2 p.m. on Monday. There was a shower on Monday night, bringing the total for the two days up to 2.40 in. On Tuesday, the 13th, .96 in. fell, and on the 14th 1.65 in. The Avon rose as high as in the flood of February, 1883.—G. KNOWLES.

SWANAGE, THE BANK.—We have had R for 28 consecutive days, October 20th to November 16th 10.98 in., (2.06 in. falling on 11th), while the preceding 26 days were without any R, except .09 in. on October 16th. Only about 20 houses were flooded for a few hours on the 12th while the tide was at its height. We had 8.36 in. of R in the first 22 days of October, 1891.—J. ANDREWS.

POOLE, PARKSTONE.—Our absolute *anti-drought* ceased on the 16th, having lasted 28 days (October 20th to November 16th), and given us 10.93 in. of R. Being high and sandy, we have escaped floods.—R. H. BARNES.

HAZELBURY BRYAN RECTORY.—This (November 20th) is the first day I have not registered any rainfall since October 19th, 16.32 in. having fallen in the 30 days ending with November 18th. It is now more than 30 years since I commenced registering the rainfall in response to a letter of yours in the *Times* newspaper. I was then in the north of England. From that time on until now I have kept up my observations; but I never, as far as I can remember, knew

an unbroken series of 30 wet days in succession, or anything approaching to it. The rainfall of the last 30 days exceeds the whole rainfall of the first six months of 1893 by 1·13 in. The falls of an-inch in 24 hours are :—

Oct. 26th	1·15 in.	}	Nov. 12th	1·92 in.
„ 28th	1·00 „		„ 13th	1·53 „
Nov. 7th.....	1·01 „		„ 14th	1·87 „
„ 11th	1·31 „			

—R. F. WHEELER.

ROUSDON [LYME REGIS].—In the floods of November 12th in the Axe Valley the water was 4 inches over the rails at the level crossing at Colyford Station.—C. E. PEEK.

PENZANCE, ST. CLARE.—R on November 11th, 2·56 in. My highest record for 24 hours during the last 30 years was 2·07 in., and only four times have I measured more than two inches.—P. W. HEDGELAND.

ST. AGNES.—From 2 p.m. on Sunday, November 11th, to 2 p.m. on 12th, 3·03 in. of R fell. This is the largest quantity known to have fallen here in 24 hours. The wind was S.W., blowing a gale, and veered to N.W. at noon.—J. OPIE.

LOSTWITHIEL, LANWITAN.—I send you a record of rainfall from St. Ives taken from the *Western Morning News* :—“The rainfall of November 11th was phenomenal, nearly 5 inches having fallen during a few hours.” The rainfall here was—November 11th, 1·86 in. ; 12th, ·88 in. ; 13th, 1·76 in.—M. FOSTER.

DOWLAIS, GWERNLLWYN.—In the 24 days ending November 15th, 15·57 in. of R fell, 3·34 in. falling on 12th, 13th, and 14th.—R. C. HARRISON.

REVIEWS.

Sanitary Series, No. 1. Meteorology Practical and Applied, by JOHN WILLIAM MOORE, B.A., M.D. (Dub.), F.R.C.P.I., F.R.Met.Soc., &c. London, F. J. Rebman, 1894, 8vo. viii.-445 pages, 76 engravings and plates.

DR. MOORE'S well-known devotion to Meteorology, his very modest preface, and the notice on the title page—“Sanitary Series No. 1”—place a reviewer in a somewhat difficult position. The author begins by saying, “The writing of this book has been to me a labour of love. Should the reader derive some pleasure as well as information from the perusal of its pages, the task set before me will not have been undertaken and completed in vain.” We are certain that this wish will be amply satisfied. But there are other points to be considered. This book is “Sanitary Series No. 1,” and on page vi. Dr. Moore calls it a “popular yet scientific Text-book of Meteorology ;” this puts its claims much higher ; and from pages vi. and vii. we gather that Dr. Moore looks for many readers among his professional brethren and among medical officers of

health. We must, therefore, regard the book from that standpoint, and then we begin to see that it has a lack of balance. For example—more than a seventh of the whole book is devoted to an account of the history and present state of the United States Weather Bureau, occupying, with the appendix, more than 69 consecutive pages, while the work of the English Meteorological Office is dismissed in less than one-fifth of that space, and that of the Royal Meteorological Society and of the Scottish Meteorological Society seems to have only *six lines*. This notice of the United States Weather Bureau is actually longer than Part IV. (which we regard as the best in the book) dealing with “The Influence of Season and Weather on Disease,” by a thoroughly skilled physician. There is in it only one point about which we are in doubt. Dr. Moore accepts (as most of his medical brethren have done) Dr. Edward Ballard’s views as to the importance of records of the temperature of the soil at the depth of 4 ft. It may be; but we have already shown* that the dates of maximum and of minimum temperature of the soil are retarded in regular sequence about five days for each increase of one foot in depth; therefore, to say that any disease occurs a fortnight after the soil temperature at 4 ft. reaches any given point, is very much the same as saying that it does so 34 days after the air temperature has reached another given point.

We have already intimated that the book is pleasantly written and instructive; among matters upon which we differ with the author are on page 28, where he states that the service of Daily Weather Charts was inaugurated by Admiral FitzRoy in 1861, whereas the Admiral acted in consequence of a letter from M. Le Verrier (who had already started) to Sir G. B. Airy.

At the top of page 99 a few words have dropped out, the result being rather comic, although everyone can see what the Dr. means when he says (the italics are ours), “A thermometer consists of a capillary glass tube of uniform bore hermetically sealed at one end, and *blown at the other into a bulb filled with mercury or spirit.*”

On the same page under the (to us new) term “curing” the author refers to the old plan of storing thermometers for a year or so in order to lessen the error from the displacement of the zero point, but does not mention that by Denton’s method this can now be done in as many days as it used to take months.

On page 103 he advises a vigorous treatment of Phillips’s Maximum thermometer, which, though all very well for refractory specimens, would put first-class ones *hors de combat*.

On page 183 when speaking of atmometers (or as we should, perhaps incorrectly, prefer to say evaporators), Dr. Moore says “A manifest fault in these instruments is the exposure of the water in

* *Met. Mag.* xxvi. (1891) p. 130.

the evaporation dish to gusts of wind at all seasons and to frosts in winter." We do not understand wherein is the "fault;" surely an evaporator is to represent a natural water surface, and, if so, should neither be shielded from wind nor frost.

On page 149 Mr. Rogers Field appears as Assoc.I.C.E., he has been a full member for 17 years.

On page 230 it would have been as well to point out that Yeates's rain gauge is merely Crosley's modified to record electrically.

At foot of page 253 Dr. Moore gives an amusingly severe illustration of a very common error—happily dying out; he writes 4' instead of 4^m; 4' means four minutes of arc, the $\frac{1}{5400}$ th of a circle, whereas what he wished to express was four minutes of time.

The foot-note on page 302 contains a curious slip which, at first, we could not make out. The work quoted contains xviii. & 261 = 279 pages, but the note says "16 pp.," it should have said "p. 16," which is quite another thing.

On page 303 the last sentence should either have been enlarged or printed as a foot note to the word "pipe" in the sixth line as it is, it may be supposed to contradict the previous sentence.

On page 374 we are sure that Dr. Moore will be glad to erase the word "Assistant" after the name of Dr. E. W. Hope, of Liverpool.

There is an amusing sentence which if the Anti-Tobacco Society is in existence may be useful to its members. On page 207 Dr. Moore says:—

"The number of dust particles in the atmosphere is immense.

"To take a single instance: Mr. Aitken states that a cigarette smoker sends 4,000,000,000 particles, more or less, into the air with every puff he makes."

We have finished our criticisms, and have to sum up the whole matter. Within the last few years we have had in English, and taking them in chronological order: Scott's *Elementary Meteorology* (International Scientific Series); Giberne's *The Ocean of Air*; the articles on Meteorology in Churchill's *Handbook of Hygiene* (Vol I.); Marriott's *Hints for Observers*; Waldo's *Modern Meteorology* (Contemporary Science Series); Dickson's *Meteorology* (University Extension Series); and Davis's *Elementary Meteorology*. It is such an *embarras de richesse* as never before fell to the lot of English-speaking meteorologists; we have already given notices of most of them in these pages, each has its weak points, and each—including Dr. Moore's—will teach the reader more than he can recollect.

We are glad to be able to add that the index is remarkably good, quite a feature in the book, and at present we have not detected a single error in it.

SUPPLEMENTARY TABLE OF RAINFALL,
NOVEMBER, 1894.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			
II.	Dorking, Abinger Hall.	5·01	XI.	Rhayader, Nantgwillt..	8·22
„	Birchington, Thor	2·86	„	Lake Vyrnwy	6·90
„	Hailsham	4·54	„	Corwen, Rhug	3·26
„	Ryde, Thornbrough	7·08	„	Carnarvon, Cocksidia ...	6·00
„	Emsworth, Redlands ...	5·93	„	I. of Man, Douglas	4·40
„	Alton, Ashdell	6·04	XII.	Stoneykirk, Ardwell Ho.	2·04
III.	Oxford, Magdalen Col...	4·76	„	New Galloway, Glenlee	8·06
„	Banbury, Bloxham	3·66	„	Melrose, Abbey Gate ...	2·60
„	Northampton, Sedgebrook	3·18	XIII.	N. Esk Res. [Penicuick]	2·55
„	Alconbury	2·87	„	Edinburgh, Blacket Pl..	1·43
„	Wisbech, Bank House..	2·85	XIV.	Glasgow, Queen's Park.	3·96
IV.	Southend	2·34	XV.	Inverary, Newtown	8·26
„	Harlow, Sheering	2·65	„	Islay, Gruinart School..	2·86
„	Colchester, Lexden.....	2·97	XVI.	Dollar.....	3·26
„	Rendlesham Hall	2·64	„	Balquhidder, Stronvar..	8·62
„	Diss	2·91	„	Ballinluig	2·61
„	Swaffham	4·26	„	Dalnaspidal H.R.S. ...	6·56
V.	Salisbury, Alderbury ...	5·93	XVII.	Keith H.R.S.	·60
„	Bishop's Cannings	6·75	„	Forres H.R.S.	·29
„	Blandford, Whatcombe.	7·67	XVIII.	Fearn, Lower Pitkerrie.	...
„	Ashburton, Holne Vic. ...	8·11	„	Loch Shiel, Glenaladale	16·59
„	Okehampton, Oaklands.	8·24	„	N. Uist, Loch Maddy ...	7·36
„	Hartland Abbey	7·68	„	Invergarry	9·06
„	Lynmouth, Glenthorne.	8·31	„	Aviemore H.R.S.	1·31
„	Probus, Lamellyn	8·38	„	Loch Ness, Drumnadrochit	2·19
„	Wellington, Sunnyside..	6·43	XIX.	Invershin	·72
„	Wincanton, Stowell Rec.	6·83	„	Scourie	4·15
VI.	Clifton, Pembroke Road	5·73	„	Watten H.R.S.	·94
„	Ross, The Graig	3·29	XX.	Dunmanway, Coolkelure	9·46
„	Wem, Clive Vicarage ...	2·50	„	Fermoy, Gas Works ...	4·71
„	Cheadle, The Heath Ho.	2·26	„	Killarney, Woodlawn ...	10·10
„	Worcester, Diglis Lock	3·02	„	Tipperary, Henry Street	4·37
„	Coventry, Coundon	3·18	„	Limerick, Kilcornan ...	3·74
VII.	Ketton Hall [Stamford]	3·13	„	Ennis .....	...
„	Grantham, Stainby	2·53	„	Milton Malbay.....	4·61
„	Horncastle, Bucknall ...	2·09	XXI.	Gorey, Courtown House	4·22
„	Worksop, Hodsck Priory	1·29	„	Athlone, Twyford	3·49
VIII.	Neston, Hinderton	1·90	„	Mullingar, Belvedere ...	3·16
„	Lancaster, Rose Bank... ..	...	„	Longford, Currygrane... ..	1·43
„	Broughton-in-Furness..	7·50	XXII.	Galway, Queen's Coll... ..	...
IX.	Ripon, Mickley	1·69	„	Crossmolina, Enniscoe..	7·12
„	Scarborough, South Cliff	1·36	„	Collooney, Markree Obs.	3·66
„	East Layton [Darlington]	1·30	„	Ballinamore, Lawderdale	...
„	Middleton, Mickleton..	2·02	XXIII.	Lough Sheelin, Arley ..	2·61
X.	Haltwhistle, Unthank..	2·22	„	Warrenpoint	2·62
„	Bamburgh.....	·79	„	Seaforde	2·32
„	Keswick, The Beeches... ..	10·36	„	Belfast, Springfield	2·26
XI.	Llanfrechfa Grange	5·91	„	Bushmills, Dundarave... ..	2·25
„	Llandoverly	8·01	„	Stewartstown	2·37
„	Castle Malgwyn	6·01	„	Buncrana	3·88
„	Builth, Abergwessin Vic.	10·02	„	Lough Swilly, Carrablagh	4·78

NOVEMBER, 1894.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					TEMPERATURE.				No. of Nights below 32°.	
		Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours		Days on which ≥ 0.1 or more fell.	Max.		Min.			
				Dpth	Date		Deg.	Date	Deg.	Date		
		inches.	inches.	in.						In shade.	On grass.	
I.	London (Camden Square) ...	2.85	+ .19	.66	14	14	63.9	1	31.3	22	2	8
II.	Maidstone (Hunton Court)...	3.71	+ .78	.93	11	14	...	...	...	...	...	...
III.	Strathfield Turgiss	5.36	+ 2.64	1.25	12	19	62.3	1	28.3	22	5	11
IV.	Hitchin	4.33	+ 1.65	1.37	12	16	61.0	1	28.0	30	5	...
V.	Winslow (Addington)	4.36	+ 1.43	1.02	14	14	61.0	3	30.0	30	3	7
VI.	Bury St. Edmunds (Westley)	2.49	+ .06	.70	12	11	59.0	3	33.0	30	0	...
VII.	Norwich (Brundall)	2.59	...	.78	12	19	61.4	3	29.6	23	1	15
VIII.	Weymouth (Langton Herring)	7.10	+ 3.44	1.50	11	18	60.0	3	35.0	26	0	...
IX.	Torquay (Cary Green)	7.71	...	2.03	11	19	60.5	1	39.0	21b	0	0
X.	Polapit Tamar [Launceston]..	7.56	+ 3.22	1.60	11	20	62.5	4	37.0	21	0	5
XI.	Stroud (Upfield)	4.60	+ 1.27	.96	12	19	59.0	3	28.0	30	1	...
XII.	Church Stretton (Woolstaston)	3.26	+ .26	.96	13	18	59.5	2	34.0	26	0	5
XIII.	Tenbury (Orleton)	3.51	+ .37	.92	12	18	63.4	2	31.0	21c	6	10
XIV.	Leicester (Barkby)	1.97	+ .32	.67	12	14	66.0	1	23.0	29d	5	19
XV.	Boston	2.41	+ .21	.77	12	11	60.0	2	32.0	30	1	...
XVI.	Hesley Hall (Tickhill).....	.98	+ 1.04	.43	11	11	64.0	2	30.0	30	1	...
XVII.	Manchester (Plymouth Grove)	...	...	...	...	...	...	...	...	...	...	...
XVIII.	Wetherby (Ribston Hall) ...	1.40	+ .67	.46	14	15	...	...	...	...	...	...
XIX.	Skipton (Arncliffe)	5.82	+ .93	1.64	13	20	...	...	...	...	...	...
XX.	Hull (Pearson Park)	1.55	+ .46	.54	12	9	62.0	2	32.0	28	2	4
XXI.	Newcastle (Town Moor) .....	.71	+ 1.69	.20	12	10	...	...	...	...	...	...
XXII.	Borrowdale (Seathwaite).....	18.23	+ 3.44	3.58	1	23	...	...	...	...	...	...
XXIII.	Cardiff (Ely)	5.14	+ .23	.91	13	18	...	...	...	...	...	...
XXIV.	Haverfordwest	6.41	+ .55	1.65	13	22	58.9	3	29.0	26d	4	8
XXV.	Aberystwith (Gogerddan) ...	4.77	+ .34	1.39	13	21	59.0	2, 3	21.0	25d	8	...
XXVI.	Llandudno	2.71	+ .38	.79	13	22	63.8	1	33.8	26	0	...
XXVII.	Cargen [Dumfries]	6.33	+ 1.77	1.10	13	18	58.6	2	29.8	24	2	...
XXVIII.	Jedburgh (Sunnyside).....	2.15	+ .35	.60	1	12	57.0	1	28.0	24	5	...
XXIX.	Colmonell	4.94	...	.74	13	19	61.0	...	24.0	...	4	...
XXX.	Lochgilthead (Kilmory).....	6.97	+ .32	.65	13	26	...	...	29.0	23	3	...
XXXI.	Mull (Quinish)	9.17	+ 2.18	1.20	18	24	...	...	...	...	...	...
XXXII.	Loch Leven Sluices	3.30	+ .66	.40	2a	14	...	...	...	...	...	...
XXXIII.	Dundee (Eastern Necropolis)	1.35	+ 1.35	.45	13	14	58.7	2	28.9	27	3	...
XXXIV.	Braemar	2.10	+ 2.48	.58	13	18	54.7	1	21.0	24	4	16
XXXV.	Aberdeen (Cranford)	1.44	...	.30	18	17	60.0	2	25.0	23	8	...
XXXVI.	Strathconan [Beaully]	3.01	+ 3.55	.46	12	13	...	...	...	...	...	...
XXXVII.	Glencarron Lodge	8.68	...	.97	13	26	57.8	3	28.9	24	...	...
XXXVIII.	Cawdor [Nairn] .....	.64	+ 2.21	.16	13	11	...	...	...	...	...	...
XXXIX.	Dunrobin	1.22	+ 1.61	.27	9	10	56.0	8	31.0	24	1	...
XL.	S. Ronaldsay (Roeberry).....	1.50	+ 1.92	.31	9	19	54.0	1	38.0	14	0	...
XLI.	Darrynane Abbey	6.58	...	.93	13	22	...	...	...	...	...	...
XLII.	Waterford (Brook Lodge) ...	4.94	+ 1.27	1.28	17	16	60.0	9	29.0	27	6	...
XLIII.	O'Briensbridge (Ross)	5.18	...	1.65	17	22	...	...	...	...	...	...
XLIV.	Carlow (Browne's Hill)	3.54	+ .48	.74	13	17	...	...	...	...	...	...
XLV.	Dublin (Fitz William Square)	1.48	+ 1.35	.40	13	15	61.6	1	34.3	30	0	...
XLVI.	Ballinasloe	5.63	+ 1.72	1.61	17	25	58.0	1, 2	24.0	30	9	...
XLVII.	Cliffden (Kylemore)	11.35	...	1.60	16	23	...	...	...	...	...	...
XLVIII.	Waringstown	2.04	+ 1.06	.38	4	17	61.0	3	24.0	22	7	18
XLIX.	Londonderry (Creggan Res.)..	3.34	+ 1.18	.34	6	26	...	...	...	...	...	...
L.	Omagh (Edenfel)	3.28	+ .59	.50	17	21	61.0	1	25.0	23	5	1

a And 5, 8, 14. b And 27. c And 26, 30. d And 30.

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

METEOROLOGICAL NOTES ON NOVEMBER, 1894.

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

ENGLAND.

STRATHFIELD TURGISS.—The first three weeks were very wet, the last ten days fair and frosty with little or no wind. The 13th and 14th were very tempestuous with heavy and continuous R, the Kennet and Lodden overflowed in many places, low-lying villages were flooded, and traffic on the Great Western Railway was greatly interrupted.

ADDINGTON.—With one exception the largest November rainfall in 24 years, with large floods on 12th, 13th and 14th, the exception being November, 1888, with 4·79 in. of R on 21 days. This November will be noted for the unusually high max. temp. at the beginning, and the general mildness throughout. Almost entire absence of fog. The max. shade temp. (61°) is the highest on record for November.

BURY ST. EDMUNDS.—A month almost without frost and with very little mist. Bar. very low on 13th. Water still short in West Suffolk. Sharp TS on the 12th.

NORWICH, BRUNDALL.—The mildest November since 1881, the temp. in shade rising above 60° on each of the first three days, and falling below 32° on only one night. At the close of the month chrysanthemums, geraniums and calceolarias still in flower in the garden. Mean temp. 46°·1. Floods on the marshes on 13th. Gale on 14th.

LANGTON HERRING.—The rainfall was nearly twice the average, but no serious damage was done in this neighbourhood by the floods. In the 32 days ending on 20th 10·90 in. of R fell, the previous record for 32 days being 10·17 in. in December 1876 and January 1877. From 10th to 15th the weather was very stormy; the last ten days were cold and dry. L on 10th, 13th and 15th. Mean 9 a.m. temp. 2°·5 above the average.

TORQUAY, CARY GREEN.—Rainfall 3·73 in. above the average. Mean temp. 49°·5, or 3°·5 above the average. Duration of sunshine 74 hours, being 10 hours above the average; 10 sunless days.

POLAPIT TAMAR.—The total R for the month exceeds that of all previous Novembers since 1881 inclusive; prior to which the record here does not extend. On the 11th all rivers in the neighbourhood, particularly the Tamar, were higher than has ever been known within memory, and much damage was occasioned. From the 20th October to the 20th November (32 days) no less than 12·52 in. of R fell. This is a very abnormal amount when it is considered that about 37 in. is the annual average. The total amount for the last 11 months exceeds the annual average by 48 in. The last 10 days of the month were dry and generally dull accompanied by cold winds from an easterly direction.

WOOLSTASTON.—The first three weeks were very wet, the last week fine but cold. A heavy gale occurred on the 13th, followed by extensive floods.

TENBURY, ORLETON.—The month opened with very warm damp weather, the temp. of the first week being much more like September than November. During the night of the 30th October the ther. reached 60°, and on the 2nd of November 63°·4, this being one of the highest maxima ever recorded in November. The weather up till the 20th was very wet, and a great flood occurred on the Teme on the 14th. From the 20th to the end of the month it was dry. Mean temp. of month 3°·7 above the average; very little frost or fog.

LEICESTER, BARKBY.—The first half of the month was wet, the second half dry, and water was still scarce. A pleasant month for November. Mean temp. 44°·1.

SEATHWAITE.—On the 1st 3·58 in. of R fell, on the 13th 2·90 in., on the 4th 2·28 in., on the 19th 1·60 in., and on the 7th 1·44 in.; on 7 other days the fall exceeded 50 in.

WALES.

HAVERFORDWEST.—From the 23rd October to the 20th of this month, R fell almost continuously, the total in the 28 days amounting to 11·21 in. ; one of the wettest periods since January, 1849, when 11·00 in. fell. The weather was very mild and springlike, and very stormy from the 10th to the 15th. From the 24th to the end the air was drier and much colder, the temp. being low on several nights. A mild November.

ABERYSTWITH, GOGERDDAN.—Very stormy throughout. Very mild for the first three weeks, but very little sunshine.

SCOTLAND.

CARGEN.—The first half of the month was very wet and stormy, and on three days (4th, 7th, and 13th) the fall exceeded an inch. The mean temp. of the month ($45^{\circ}\cdot4$) was 4° above the average, notwithstanding some cold weather during the latter half. On only two occasions during the last 35 years has the mean temp. of November been so high, viz., 1877, when it was $45^{\circ}\cdot6$, and 1881, when it was $46^{\circ}\cdot6$. Westerly winds prevailed for 25 days ; the hours of sunshine were considerably below the average. H on 11th. Gale on 13th. The R of the past 11 months is 44·93 in., the average for the period being 38·89 in.

JEDBURGH.—In the early part of the month R was frequent, but after the middle it was small. The atmosphere was still, and towards the end of the month there were some frosty nights, but the days were warm. Labour was not interrupted.

COLMONELL.—Mean temp. $45^{\circ}\cdot4$. Gales on 13th and 17th.

BRAEMAR.—A fine, and on the whole, most favourable, month.

ABERDEEN, CRANFORD.—A wonderfully dry month.

ROEBERRY.—A very fine month upon the whole ; dry and quiet, with rainfall much below the average. Mean temp. $46^{\circ}\cdot6$. The driest November recorded in 27 years ; the next driest was in 1885, when 1·66 in. of R fell.

IRELAND.

DARRYNANE ABBEY.—The first three weeks were wet, mild, and stormy ; the last few days dry, cold, and fine, with slight ground frosts at night.

WATERFORD, BROOK LODGE.—The month was so mild that many flowers were blooming at the close, and peas were gathered as late as the 30th. S.W. gales on 7th and 17th. Heavy W. to S.W. gale on 14th. Large lunar halo on 12th.

O'BRIENSBRIDGE, ROSS.—Heavy and continued R for the first three weeks. Heavy gales from 14th to 20th. Dense fog on 27th and 28th. Slight frost on 29th. Sharp frost on 30th.

DUBLIN.—An open, generally favourable month. The first half was unsettled, squally, and showery ; the second half was mild, quiet, often cloudy, and foggy. Only once in the last 30 years has November been milder than in the present year—that was in 1881, when the mean temp. was as high as $50^{\circ}\cdot3$, or $5^{\circ}\cdot6$ above the average. Mean temp. $47^{\circ}\cdot8$, $3^{\circ}\cdot1$ above the average. High winds on 15 days, attaining the force of a gale on 5th and 13th. Foggy on six days. Solar halo on the 4th. Lunar halo on 5th and 11th. L on 15th. Aurora borealis on the 23rd.

EDENFEL.—Up to the 22nd the weather was mild, rainy, and unsettled, culminating in a gale on the 13th, but without any of the extremes of violence or amount of rainfall that have wrought such havoc in England. From the 16th a progressive improvement took place, with eight days of rainless weather from the 22nd to the end, and generally bright, pleasant skies, and no frost of consequence.

SYMONS'S
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CCCXLVIII.]

JANUARY, 1895.

[PRICE FOURPENCE,
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Francois Denza.

Naples,
June 7th, 1834.

Rome,
December 15th, 1894.

PEACEFULLY, suddenly, in the middle of his labours, yet having lived to see the completion of his crowning work—the establishment of the Observatory at the Vatican,—Padre Denza has passed away. Like his teacher (Padre Secchi) he has left a name which will not soon be forgotten. Far from robust in health, Padre Denza's exhaustless energy enabled him to turn out a very large amount of work, the books and pamphlets issued by him numbering nearly 100, while his kindness to all whom he could help was practically unbounded.

THE GALE OF SATURDAY, DECEMBER 22ND.

It has been arranged that Mr. Charles Harding will read a paper upon the above storm at the meeting of the Royal Meteorological Society on January 16th, and, therefore, as we have always opposed duplicate work as generally a waste of energy, we have sent on to him such data as we have received, and we intend, in the ordinary course, to summarize his paper in our next.

There was, however, one remarkable feature, respecting which a few particulars may be given here. Nearly 30 years ago—in *British Rainfall*, 1866, page 11—to an article on “The Detection of Sea-spray when mingled with Rain,” we appended the following foot-note:—“Dr. Davy, F.R.S., says: ‘I have been informed by a friend residing at Meltham Parsonage, and by another residing at Armitage Bridge, both places in the neighbourhood of Huddersfield, and about 80 miles from Scarborough, and 60 miles from Liverpool (the nearest ports of the opposite coasts), that after the great storm of January, 1839, salt was observed deposited on the leaves of the trees at both places; they were about 4 miles apart.’”

Liverpool has had another storm; not equal to that of 1839, but (as we can testify from personal experience) a very heavy one, and again the salt has been traced considerably more than half across England. However, we must not anticipate, but give our evidence:—

SALT-SPRAY AND SEVERE GALES.

To the Editor of the Meteorological Magazine.

SIR,—As evidence of the large amount of salt-spray carried inland from the sea during the severe gales, the following may be of interest:—Whilst staying in the neighbourhood of Garstang, Lancashire, I noticed, on December 23rd last (the day after the violent gale), that all objects—such as the twigs and branches of trees, plants, grass &c., tasted very strongly of salt. The following morning a fine drizzle set in, and about 9 a.m., when less than .01 in. of rain had fallen, I collected, by means of a teacup, rather over an ounce of water from the drops on the twigs and branches of apple trees. One fluid ounce of this water, which tasted strongly of brine, and had a specific gravity of 1.059, gave (on evaporation) 38 grains of *dry* salt. This is equal to 6,080 grains, or nearly 14 ounces per gallon.

The gale of December 22nd blew first from the S.W. and W., and afterwards veered to the N.W. The distance from the sea to the place where I collected the drops is about 13 miles from the former points (Lytham and Blackpool), and 7 miles from the latter (the coast near Pilling).

I may mention that during a walk on December 23rd I noticed that the stems of rushes and grass in Bleasdale, about 4 miles further from the sea, did not taste appreciably less salty.

I enclose herewith, for your inspection, *half* of the salt obtained from one ounce of water.—Yours sincerely,

ALBERT WILSON.

20, Merton Road, Bradford, December 31st, 1894.

We sent the little bottle of salt on to Prof. Meldola, F.R.S., who very kindly had it analysed, the result being that it was almost precisely identical with sea-salt, chiefly, of course, chloride of sodium, with magnesium, and decidedly more sulphates than are usually found in sea-salt. The actual quantity of chlorine found was 60.7 per cent. (calculated for the salt when dried till constant in weight), corresponding to 87.2 per cent. of sodium chloride. Here then, about 10 miles inland, we have dripping from the trees brine of nearly twice the usual specific gravity of sea-water; what weight of salt, or how much sea-water, per acre this represents we do not attempt to compute.

We now come to the other aspect of the case—extreme distance inland at which it was detected,—and here we are almost entirely dependent upon one of our most careful observers, who sent the following letter to a local paper:—

THE BRINE IN THE GALE.

To the Editor of The Yorkshire Post.

SIR,—During the severe gale last Saturday morning salt was deposited by the rain on the windows of this house, which face in a westerly direction. The amount was afterwards estimated

by an experienced chemist, and found to be about one-hundredth of a gramme per square foot of glass. Perhaps some of your readers would estimate how much was deposited over the country between here and the Irish Sea, a distance of about 45 miles.

I am, yours truly,
 CHARLES L. BROOK.

Harewood Lodge, Meltham, Yorkshire, December 24th.

This letter elicited reports as to the detection of salt from Settle (24), Sowerby Bridge (40), Bolton Abbey (42), Harrogate (50), East Ardsley, Wakefield (57), Bramhope (60), and Burton House, Masham (65) miles from the west coast. The above distances are only approximate, but roughly they cover an area of nearly 2,500 square miles, and reach eastward to Long., 1°30' W. Saline incrustation 25 miles inland is recorded on p. 169 of Vol. xxiii. of this *Magazine*, and there is a long article on "Sea-spray in London," on pp. 65-70 of Vol. xvii. It seems indisputable that sea-spray can be carried from 60 to 70 miles inland.

Since writing the above, we learn from two sources that objects near Birmingham were encrusted with salt. Birmingham is about 55 miles from the Bristol Channel, and nearly 100 from Cardigan Bay.

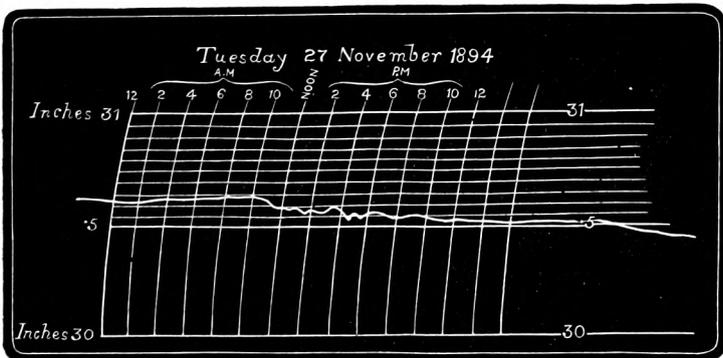
BAROMETRIC OSCILLATIONS IN CALM WEATHER.

To the Editor of the Meteorological Magazine.

SIR,—On the afternoon of Nov. 27th the barometer, as shown by the barograph trace, became very greatly disturbed; yet there was not the slightest perceptible effect upon the weather. The trace had been very steady for two or three days, with dull, calm, weather; and there was no observable change in this weather during the time the barometer was so much excited, except that such wind as there was changed from E. through S. to W., but there was almost a dead calm all the time. I send a fairly correct copy of the barograph trace, which shows a fall of .07 in. in about three-quarters of an hour, besides minor irregularities.

T. W. BACKHOUSE.

Sunderland, December 4th, 1894.



The hour lines are about 18 minutes in advance of G.M.T.

REVIEW.

Ostwald's 'Klassiker der exakten Wissenschaften' herausgegeben von Prof. Dr. A. von OETTINGEN.

- No. 53. **C. F. Gauss**, Die intensität der erdmagnetischen Kraft auf absolutes Maass zurückgeführt. In der Sitzung der Kgl. Gesellschaft der Wissenschaften zu Göttingen am 15. December 1832 vorgelesen. Herausg. v. E. DORN. (62 pages.)
- No. 57. **Fahrenheit, Réaumur, Celsius**, Abhandlungen über Thermometrie. (1724, 1730—1733, 1742.) Herausgegeben von A. J. v. OETTINGEN. With 17 engravings. (140 pages.)
- No. 59. **Otto von Guericke's** Neue "Magdeburgische" Versuche über den leeren Raum. (1672.) Aus dem Lateinischen übersetzt und mit Anmerkungen herausg. von FRIEDRICH DANNEMANN. With 15 engravings (116 pages.)

Leipzig: Wilhelm Engelmann, 1894, 8vo.

It would be hard to find an English publisher who would bring out a series of such capital little books as these, with red edges, rounded corners and durable cloth covers at prices ranging from 1s. to 2s. 4d. We do not know the relative number of persons in the world who speak English and who speak German, but we are quite certain that the Germans who will read and enjoy books of the above type must be tenfold or a hundredfold that of the Britishers (including India, Australia and Canada) and Americans, or else Herr Engelmann would not have reached No. 59 of this remarkable series. Questions of education, of culture, of social habits, and of politics are altogether foreign to these pages, but if Englishmen wish to hold their own they will certainly have to make some changes.

No. 53 is a translation of the celebrated memoir by Gauss "Intensitas vis magneticæ terrestris ad mensuram absolutam revocata," read by him before the Scientific Society of Göttingen, on December 15th, 1832. It has always been regarded as having been—not merely of the highest importance—a sort of foundation-stone to the study of terrestrial magnetism, determining as it does exactly with what force the earth pulls a compass needle, but also as leading to the accurate determination of many other physical constants.

No. 57 is of extreme interest to meteorologists; it contains the original papers which led to the introduction of the three leading thermometer scales, with reproductions of the original engravings. There are five papers by Fahrenheit, translated from the *Philosophical Transactions* for 1724; there are the Rules for the construction of Thermometers with comparable scales, and two other papers, by R. A. Ferchault de Réaumur, from the *Hist. et Mem. de l'Acad. de Paris*, 1730, 1731 and 1733; and there is Celsius's paper on "Two fixed points for Thermometers," from the *Abh. d. schweidischen Akad.*, 1742; lastly in this (as also in the two other works) there are

12 pages of "Remarks" upon points raised by the papers. If we ever have a fuller history of the thermometer than that given some years since by M. Renou, the compiler must not overlook this No. 57, upon which we wish that we had time to linger longer.

No. 58. This is a translation (with excellent—reduced—reproductions of the engravings) of the third book of Otto de Guericke's *Experimenta Nova (ut vocantur) Magdeburgica de Vacuo Spatio*, Amsterdam, 1672. Here we have not only full details of the first air-pump and of the Magdeburg hemispheres, but also perfect reproductions of the portrait, the title-page, the celebrated two-page plate of the 16 horses trying to separate the hemispheres, in fact all the most important portions of that epoch-making, and now rather scarce, book—and all for two shillings; why the pictures alone are worth that, even to those who cannot read German.

ROYAL METEOROLOGICAL SOCIETY.

THE opening meeting of the session was held on Wednesday evening, the 21st November, at the Institution of Civil Engineers, Westminster, Mr. R. Inwards, F.R.A.S., President, in the chair.

Dr. H. B. Guppy read a paper on "Suggestions as to the methods of determining the influence of Springs on the temperature of a River, as illustrated by the Thames and its tributaries." The methods suggested were:—1. Comparison of the curves of the monthly means of the temperatures of the air and of the water for the river under observation with those of a river beyond the controlling influence of springs. 2. Comparison of the monthly means of the temperature of the river under investigation with that of a river beyond the control of the springs. 3. Comparison of the range of the monthly means of the river temperature with that of the air in the shade. 4. Comparison of the daily range of water temperature at different stations along a river's course. 5. Comparison of sunrise observations made at different stations along a river's course. 6. Comparison of observations made at different stations along a river's course at the hour of maximum temperature. 7. Comparison of the results obtained from a single series of observations made in one day along the whole course of a small tributary like the Wandle, or along the upper course of a larger tributary, as the Kennet. 8. Determination of the distance from its sources at which the river begins to freeze.

Mr. Eric S. Bruce, F.R.Met.Soc., exhibited and described some lantern photographs showing the disastrous effects of the great gale of November 17th and 18th, 1893, upon trees in Perthshire, Scotland.

Mr. Alfred B. Wollaston gave an account of the formation of some waterspouts which he had observed in the Bay of Bengal.

THE monthly Meeting of this Society was held on Wednesday, December the 19th, at the Institution of Civil Engineers, Westminster, Mr. R. Inwards, F.R.A.S., President, in the chair.

Twenty-six new Fellows were elected.

Mr. R. H. Scott, F.R.S., gave an account of the proceedings of

the International Meteorological Committee, at Upsala, in August last, with special reference to their recommendations on the classification of clouds and the issue of a Cloud Atlas.

The classification adopted is as follows:—

- a. Separate or globular masses (most frequent in dry weather).
 - b. Forms which are widely extended, or completely cover the sky (in wet weather).
- A. UPPER CLOUDS, average altitude 9,000 m. (29,528 ft.).
 - a. 1. Cirrus.
 - b. 2. Cirro-stratus.
 - B. INTERMEDIATE CLOUDS, between 3,000 m. (9,842 ft.) and 7,000 m. (22,966 ft.).
 - a. } 3. Cirro-cumulus.
 - } 4. Alto-cumulus.
 - b. 5. Alto-stratus.
 - C. LOWER CLOUDS, between 1,000 m. (3,281 ft.) and 2,000 m. (6,562 ft.).
 - a. 6. Strato-cumulus.
 - b. 7. Nimbus.
 - D. CLOUDS OF DIURNAL ASCENDING CURRENTS.
 8. Cumulus; apex 1,800 m. (5,906ft.); base 1,400 m. (4,593ft.)
 9. Cumulo-nimbus; apex 3,000 m. (9,842 ft.) to 5,000 m. (16,405 ft.); base 1,400 m. (4,593 ft.)
 - E. HIGH FOGS, under 1,000 (3,281 ft.).
 10. Stratus.

DEFINITIONS.

1. CIRRUS (Ci.) *Detached clouds, delicate and fibrous looking, taking the form of feathers, generally of a white colour.*
 2. CIRRO-STRATUS (Ci-S.). *A thin, whitish sheet.*
 3. CIRRO-CUMULUS (Ci-Cu.). *Small globular masses or white flakes without shadows, or having very slight shadows, arranged in groups, and often in lines.*
 4. ALTO-CUMULUS (A-Cu.). *Largish globular masses, white or greyish, partially shaded, arranged in groups or lines, and often so closely packed that their edges appear confused.*
 5. ALTO-STRATUS (A-S.). *A thick sheet of a grey or bluish colour.*
 6. STRATO-CUMULUS (S-Cu.). *Large globular masses or rolls of dark cloud, frequently covering the whole sky, especially in winter.*
 7. NIMBUS (N.) RAIN-CLOUD. *A thick layer of dark clouds, without shape, and with ragged edge.*
 8. CUMULUS (Cu.) WOOLPACK CLOUDS. *Thick clouds, of which the upper surface is dome-shaped and exhibits protuberances, while the base is horizontal.*
 9. CUMULO-NIMBUS (Cu-N.). THE THUNDER-CLOUD; SHOWER-CLOUD. *Heavy masses of cloud, rising in the form of mountains, turrets, or anvils, generally having a sheet or screen of fibrous appearance above ("false Cirrus"), and underneath a mass of cloud similar to Nimbus.*
 10. STRATUS (S.). *A horizontal sheet of lifted fog.*
- Each definition was supplemented by a few lines of explanation

giving additional characteristics and variations, and the paper concluded with the instructions for observing clouds, in which the observer is instructed to estimate the density of Cirrus on a scale of 0 to 4.

Before the discussion of the paper Mr. Gaster exhibited and explained some very beautiful lantern photographs of typical cloud-forms, and expressed general concurrence with the recommendations of the Committee.

Captain Wilson Barker asked if the altitudes given for the different clouds referred to all latitudes, or only to Europe, and suggested that there would be some difficulty in judging the density of Cirrus. From his own observation he thought that some clouds developed upwards and some downwards, and the classification of the International Committee made no reference to this. He also considered it too limited, and preferred that given by the Rev. Clement Ley in his recent work.

The Hon. Rollo Russell asked whether the altitudes given indicated the extreme maxima and minima, or gave the range commonly observed.

Mr. Jackson spoke of the varied forms which clouds assume in different localities, and asked for an explanation of the variation of form between, say, the Highlands of Scotland and the Isle of Thanet.

Mr. Charles Harding spoke in appreciative terms of the classification, and thought it would be very helpful to sailors in cloud observations. One reason for which he valued it was that it did not introduce a great increase in Luke Howard's nomenclature. He was sorry to hear that Captain Wilson Barker preferred Mr. Ley's classification. The International Committee were men who spoke with great authority, and he would like their names to appear at the head of the paper.

Mr. J. G. Wood referred to the difficulty of taking photographs of cloud, and said that he thought that it would be very useful if instruction were given as to the best methods.

Mr. Gate Acres spoke on photographic details, and Mr. R. H. Scott briefly replied to the discussion.

Mr. H. Southall, F.R.Met.Soc., read a paper on "Floods in the West Midlands," in which he gave an interesting account of the great floods which have occurred in the rivers Severn, Wye, Usk, and Avon. He has collected a valuable record of the floods on the Wye at Ross, which he arranges in three classes, viz.: Primary, or highest of all, those of 14 ft. 6 in. and above; Secondary, those of 12 to 14½ ft.; and Tertiary, those of 10 to 12 ft. The dates of the floods above 14 ft. 6 in. are as follows: 1770, Nov. 16th and 18th; 1795, Feb. 11th and 12th; 1809, Jan. 27th; 1824, Nov. 24th; 1831, Feb. 10th; 1852, Feb. 8th and Nov. 12th. The height of the recent flood on Nov. 15th, 1894, was 14 ft. 3 in., which was higher than any flood since Nov., 1852. The flood on the Avon, at Bath, on Nov. 15th, 1894, is believed to have been the highest on record.

Mr. Symons urged the importance of permanently recording the height of floods, but owing to the late hour no discussion followed.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JUNE, 1894.

STATIONS. <i>(Those in italics are South of the Equator.)</i>	Absolute.				Average.				Absolute.		Total Rain.		Aver. Cloud.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
England, London	83·8	30	43·7	12	68·9	50·6	50·0	74	125·9	36·6	1·84	12	5·9
Malta.....	89·3	27	55·8	18	79·6	62·7	60·4	71	141·5	50·0	·00	0	2·0
<i>Cape of Good Hope</i> ...	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>Mauritius</i>	76·3	15	56·8	11	74·4	61·8	57·6	71	126·6	44·6	·76	10	4·3
Calcutta.....	96·9	2	72·4	8	90·1	78·2	78·6	84	156·6	72·1	10·23	18	7·1
Bombay.....	93·0	1	74·5	11	87·4	79·7	77·4	82	142·5	73·4	16·87	21	8·2
Ceylon, Colombo	86·7	9	73·8	...	85·0	77·0	75·5	80	152·0	70·0	11·32	24	8·0
<i>Melbourne</i>.....	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>Adelaide</i>	64·3	19	40·3	29	60·5	46·4	47·4	84	122·0	33·4	2·23	14	5·2
<i>Sydney</i>	65·9	2	42·3	30	61·3	48·2	44·4	83	111·0	29·8	1·42	10	3·8
<i>Wellington</i>	60·1	14	36·5	26	55·3	46·4	44·1	79	101·0	24·0	5·93	20	5·6
<i>Auckland</i>	65·0	4	37·5	26	60·0	48·9	47·0	75	119·0	30·0	4·12	21	6·1
Jamaica, Kingston.....	92·9	22	71·1	8	88·3	73·1	71·6	75	...	...	·70	6	3·9
Grenada.....	86·5	29	72·0	18 ^a	83·7	74·4	68·9	73	151·0	...	4·30	22	4·0
Trinidad	94·0	16	66·0	25	89·5	69·6	69·6	73	166·0	61·0	3·26	12	...
Toronto	90·7	26	57·9	7	76·4	56·9	57·6	75	...	31·0	1·08	15	5·1
New Brunswick, Fredericton .....	...	...	...	...	...	...	...	...	...	...	...	...	...
Manitoba, Winnipeg ...	92·2	14	32·0	5	82·2	54·2	...	...	...	...	2·40	11	4·8
British Columbia, Esquimalt.....	77·2	2	44·2	1	63·6	48·7	49·2	80	...	...	2·37	14	5·6

^a And 20, 24.

REMARKS.

MALTA.—Adopted mean temp. 70°·5; mean hourly velocity of wind 7·9 miles per hour. Temp. of sea rose to 74°·7. A passing shower gave a few drops of rain on 13th, but not enough to measure. J. F. DOBSON.

Mauritius.—Mean temp. of air 2°·2, of dew point 2°·9, and rainfall 1·24 in. below, their respective averages. Mean hourly velocity of wind 9·6 miles, or 1·8 miles below average; extremes, 27·6 on 28th, and 0·0 4th; prevailing direction, S.E. by S. to E.S.E. C. MELDRUM, F.R.S.

Adelaide.—Mean temp. above, and mean pressure slightly below, the average of 37 years. Rainfall over half-an-inch less than the average. Fair rains in the south, but still dry all over the north, especially over the interior. C. TODD, F.R.S.

Sydney.—Temp. 0°·4 above, humidity 4·7 above, and rainfall 4·07 in. below, their respective averages. Winter unusually fine, dry and mild. H. C. RUSSELL, F.R.S.

Wellington.—On the whole a wet month, with only a few fine days in the middle. Prevailing winds S.E. and N.W. Stormy on three days from the former, and two days from the latter, quarter. Mean temp. 1°·8 above the average. R. B. GORE.

Auckland.—A showery and unpleasant month, but with no storms of exceptional violence, or unusually heavy rainfall. Mean temp. slightly above the average; rainfall slightly below. T. F. CHEESEMAN.

JAMAICA.—Mean hourly velocity of wind 5·1 miles. Weather fair in Kingston, with only a sixth of the average rainfall. In every division the fall was deficient, the mean being less than one-half the average. For the half-year, however, the island rainfall was two inches in excess of the average, the deficiencies in January and June being more than counterbalanced by the excess in May. R. JOHNSTONE.

TRINIDAD.—Rainfall 4·78 in. below the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,
DECEMBER, 1894.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			
II.	Dorking, Abinger Hall.	2·43	XI.	Rhayader, Nantgwiltt..	6·56
„	Birchington, Thor	1·43	„	Lake Vyrnwy	7·51
„	Hailsham	2·40	„	Corwen, Rhug	2·14
„	Ryde, Thornbrough	2·51	„	Carnarvon, Cocksidia ...	3·91
„	Emsworth, Redlands ...	2·34	„	I. of Man, Douglas	5·75
„	Alton, Ashdell.....	3·29	XII.	Stoneykirk, Ardwell Ho.	2·88
III.	Oxford, Magdalen Col...	1·95	„	New Galloway, Glenlee	6·59
„	Banbury, Bloxham	2·41	„	Melrose, Abbey Gate ..	2·65
„	Northampton, Sedgebrook	1·92	XIII.	N. Esk Res. [Penicuick]	3·45
„	Alconbury	1·27	„	Edinburgh, Blacket Pl..	2·25
„	Wisbech, Bank House..	1·56	XIV.	Glasgow, Queen's Park.	2·97
IV.	Southend	1·75	XV.	Inverary, Newtown	6·35
„	Harlow, Sheering	2·70	„	Islay, Gruinart School..	1·56
„	Colchester, Lexden.....	1·55	XVI.	Dollar.....	3·39
„	Rendlesham Hall	2·44	„	Balquhider, Stronvar..	8·62
„	Diss	2·80	„	Ballinluig	3·18
„	Swaffham	3·05	„	Dalnaspidal H.R.S. ...	7·16
V.	Salisbury, Alderbury ...	2·68	XVII.	Keith H.R.S.	1·68
„	Bishop's Cannings	2·73	„	Forres H.R.S.	1·36
„	Blandford, Whatcombe .	3·74	XVIII.	Fearn, Lower Pitkerrie.	2·04
„	Ashburton, Holne Vic....	3·36	„	Loch Shiel, Glenaladale	11·57
„	Okehampton, Oaklands.	4·12	„	N. Uist. Loch Maddy ...	5·58
„	Hartland Abbey	4·31	„	Invergarry	8·21
„	Lynmouth, Glenthorne.	3·65	„	Aviemore H.R.S.	3·25
„	Probus, Lamellyn	4·29	„	Loch Ness, Drumnadrochit	4·97
„	Wellington, Sunnyside..	2·78	XIX.	Invershin	2·64
„	Wincanton, Stowell Rec.	3·16	„	Scourie	5·85
VI.	Clifton, Pembroke Road	2·97	„	Watten H.R.S.	2·14
„	Ross, The Graig	1·84	XX.	Dunmanway, Coolkelure	6·86
„	Wem, Clive Vicarage ...	2·49	„	Fermoy, Gas Works ...	2·76
„	Cheadle, The Heath Ho.	2·56	„	Killarney, Woodlawn ...	6·06
„	Worcester, Diglis Lock	1·85	„	Tipperary, Henry Street	3·38
„	Coventry, Coundon	2·68	„	Limerick, Kilcornan ...	2·16
VII.	Ketton Hall [Stamford]	1·97	„	Ennis .....	...
„	Grantham, Stainby	1·42	„	Miltown Malbay.....	3·90
„	Horncastle, Bucknall ...	1·94	XXI.	Gorey, Courtown House	3·01
„	Worksop, Hodsck Priory	1·39	„	Athlone, Twyford	3·28
VIII.	Neston, Hinderton	2·07	„	Mullingar, Belvedere ...	3·58
„	Lancaster, Rose Bank... ..	...	„	Longford, Currygrane...	3·09
„	Broughton-in-Furness..	6·77	XXII.	Galway, Queen's Coll... ..	...
IX.	Ripon, Mickleby	2·58	„	Crossmolina, Enniscoe..	6·72
„	Scarborough, South Cliff	...	„	Collooney, Markree Obs.	4·86
„	East Layton [Darlington]	1·88	„	Ballinamore, Lawderdale	4·01
„	Middleton, Mickleton..	3·03	XXIII.	Lough Sheelin, Arley ..	2·76
X.	Haltwhistle, Unthank..	2·87	„	Warrenpoint	4·02
„	Bamburgh	1·39	„	Seaforde	3·65
„	Keswick, The Beeches... ..	7·10	„	Belfast, Springfield	3·88
XI.	Llanfrehfa Grange	4·03	„	Bushmills, Dundarave...	4·68
„	Llandoverly	5·34	„	Stewartstown	3·01
„	Castle Malgwyn	3·63	„	Buncrana	4·18
„	Builth, Abergwessin Vic.	7·14	„	Lough Swilly, Carrablagh	4·80

DECEMBER, 1894.

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.		In shade.	On grass.
				Dpth	Date		Deg.	Date	Deg.	Date		
I.	London (Camden Square) ...	2·28	+ ·21	·93	14	16	52·1	17 ^c	26·3	31	7	14
II.	Maidstone (Hunton Court)...	1·36	— ·88	·27	7	14	...	...	...	...	...	...
III.	Strathfield Turgiss	2·61	+ ·60	·97	14	19	53·8	12	26·1	31	10	24
III.	Hitchin	1·52	— ·51	·60	14	16	51·0	17	26·0	30	13	...
IV.	Winslow (Addington)	2·09	— ·36	·48	14	18	53·0	13	25·0	1	11	17
IV.	Bury St. Edmunds (Westley)	2·29	+ ·05	·63	14	17	51·0	24	26·0	31	...	...
V.	Norwich (Brundall)	3·03	...	·58	14	19	51·2	18	28·4	6	7	23
V.	Weymouth (Langton Herring)	2·14	— ·96	·43	11	19	53·0	14	28·0	31	6	...
V.	Torquay (Cary Green) ...	2·21	...	·51	14	20	54·1	14 ^d	29·3	31	1	6
VI.	Polapit Tamar [Launceston].	3·61	— ·62	·47	14	23	55·0	2	31·5	31	1	8
VI.	Stroud (Upfield)	2·64	+ ·19	·50	14	18	57·0	13	27·0	5 ^j	11	...
VI.	Church Stretton (Woolstaston)	2·47	— ·58	·45	23	16	52·0	13	25·0	31	4	20
VI.	Tenbury (Orleton)	1·89	— ·48	·34	14	15	55·0	17	25·7	1	10	14
VII.	Leicester (Barkby)	2·26	+ ·12	·67	14	17	54·0	13	23·0	31	12	23
VII.	Boston	1·16	— ·69	·42	14	13	50·0	16	27·0	31	9	...
VII.	Hesley Hall [Tickhill]	1·29	— ·69	·27	14	13	53·0	13	25·0	2	12	...
VIII.	Manchester (Plymouth Grove)	2·79	— ·65	·40	17	20	53·0	13	26·0	31	9	10
IX.	Wetherby (Ribston Hall) ...	1·47	— ·97	·36	22 ^a	11	...	...	...	...	...	...
IX.	Skipton (Arcliffe)	7·90	+ 1·09	1·42	17	18	...	...	...	...	...	...
X.	Hull (Pearson Park)	2·58	+ ·31	·38	11	14	53·0	13 ^e	26·0	2	11	15
X.	Newcastle (Town Moor)	1·29	— 1·01	·28	14 ^b	11	...	...	...	...	...	...
X.	Borrowdale (Seathwaite)	13·42	— 1·39	2·32	21	20	...	...	...	...	...	...
XI.	Cardiff (Ely) .....	...	...	...	...	...	...	...	...	...	...	...
XI.	Haverfordwest	5·16	+ ·17	·70	30	25	54·0	12 ^f	22·9	4	5	7
XI.	Aberystwith (Gogerddan) ...	4·57	— ·31	·86	14	17	52·0	11 ^g	18·0	3	11	...
XI.	Llandudno	2·64	— ·32	·48	17	21	58·5	18	30·6	4	...	...
XII.	Cargen [Dumfries]	4·50	+ ·48	1·24	21	15	53·4	14	26·4	31	8	...
XII.	Jedburgh (Sunnyside)	1·90	— ·30	·52	21	15	53·0	13	23·0	3	13	...
XIV.	Colmonell	5·09	...	·81	21	18	54·0	13	20·0	3	5	...
XV.	Lochgilphead (Kilmory)	6·49	— ·88	·73	21	23	...	...	24·0	30	9	...
XV.	Mull (Quinish)	5·80	— 1·77	·80	22	21	...	...	...	...	...	...
XVI.	Loch Leven Sluices	3·10	— ·21	·70	22	13	...	...	...	...	...	...
XVII.	Dundee (Eastern Necropolis)	1·90	— ·18	·45	21	20	55·0	13	28·0	30	10	...
XVII.	Braemar	4·21	+ 1·74	·80	21	17	50·0	13	15·8	4	18	30
XVII.	Aberdeen (Cranford)	2·68	...	·52	30	20	54·0	12	25·0	1, 2	18	...
XVIII.	Strathconan [Beaul]	7·99	+ 2·22	1·95	13	15	...	...	...	...	...	...
XVIII.	Glencarron Lodge	12·99	...	1·59	21	25	57·0	11	24·1	12	...	...
XVIII.	Cawdor [Nairn]	2·47	+ ·01	·65	28	19	...	...	...	...	...	...
XIX.	Dunrobin	2·91	— ·46	·43	21	16	56·0	13	28·5	17	7	...
XIX.	S. Ronaldsay (Roeberry)	2·68	— ·98	·49	21	29	52·0	13	28·0	31	6	...
XX.	Darrynane Abbey	5·29	...	·89	9	26	...	...	...	...	...	...
XX.	Waterford (Brook Lodge) ...	3·35	— ·29	·68	9	16	53·5	13 ^h	27·0	31	3	...
XX.	O'Briensbridge (Ross)	5·48	...	·69	6	22	...	...	...	...	...	...
XXI.	Carlow (Browne's Hill)	2·50	— ·62	·48	21	16	...	...	...	...	...	...
XXI.	Dublin (Fitz William Square)	1·51	— ·65	·22	23	18	56·8	13	27·9	31	3	15
XXII.	Ballinasloe	3·56	+ ·14	·52	21	22	53·0	13	21·0	2	15	...
XXII.	Clifden (Kylemore)	10·58	...	2·14	9	26	...	...	...	...	...	...
XXIII.	Waringstown	2·66	— ·38	·36	21	21	55·0	13 ^k	22·0	3	15	21
XXIII.	Londonderry (Creggan Res.)	4·82	+ ·61	·77	29	28	...	...	...	...	...	...
XXIII.	Omagh (Edenfel)	3·95	+ ·27	·53	9	24	53·0	10	25·0	30	10	12

a And 29. b And 28. c And 18. d And 16. e And 14. f And 14, 25. g And 12, 13.
 h And 17. i And 31. j And 30, 31 k And 23.

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

METEOROLOGICAL NOTES ON DECEMBER, 1894.

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

ENGLAND.

STRATHFIELD TURGISS.—December commenced with a very cold snap, the grass min. falling to 22°·6, and after a very mild middle course, ended with another low temp, 19°·3 on the grass. Considerable disturbance on the 22nd, but not amounting to a gale. First wild primrose seen on 8th.

ADDINGTON.—A very open month, the most severe frosts (of almost equal intensity) occurring on the 1st and 31st. Very high wind on the 18th, 22nd, 28th and 29th. The first S of the season fell on the evening of the 29th, and on the morning of the 30th the north side of the Quainton Hills showed white, but little lay on the low lands. Only one foggy day—the 9th. Brook flooded on the 15th.

BURY ST. EDMUNDS.—A mild, windy month, with no winter till the 28th, then S and high winds; the S was much drifted on the morning of January 1st, 1895. Violent oscillation of the bar. from the 19th to the end of the month. Fog on 5th and 8th.

NORWICH, BRUNDALL.—Very mild, and hardly any frost. No S till 30th, on which day and the following there was a heavy fall, amounting to ·97 in. when melted. Violent S. to W. gale on 22nd, and a fresh gale on 29th. Solar halo on the morning of the 7th. The whole valley of the Yare like a vast lake on 23rd.

LANGTON HERRING.—The mean temp. at 9 a.m., 41°·8, is 2°·1 above the average. Owing to the mild weather of the last two months, the fields have quite a spring-like appearance. There was a thick fog on the 14th; a great storm on the night of the 21st and 22nd, and heavy gales on the 29th and 30th.

TORQUAY, CARY GREEN.—Rainfall 1·01 in. below the average. Mean temp. 45°·5, or 3°·9 above the average. Duration of sunshine 73 hours 10 min., being 15 hours 45 min. above the average; 10 sunless days.

POLAPIT TAMAR.—Generally a damp, unseasonable, warm month, with less than the usual amount of sunshine. S 2½ inches deep on 31st.

STROUD, UPFIELD.—T and L at 11.30 a.m. on 19th. W. to N.W. gale on 21st and 22nd.

WOOLSTASTON.—A mild and warm month till the last few days, when it became very cold; S falling on the 29th. Slight frosts on grass most nights. Mean temp. 40°·6. Gales on 21st, 22nd and 29th. A wild duck's nest with several eggs in it was found on 24th.

TENBURY, ORLETON.—An unusually warm month—in fact, with two exceptions, the warmest month of December in the last 20 years. Great gales on the 22nd and 29th. S on the 29th, covering the ground to a depth of 2½ inches on the 30th. Fog on 7 days. Temp. 2°·8 above the average.

LEICESTER, BARKBY.—A fine month, the first and last weeks being the coldest. Mean temp. 39°·8. Very strong winds on the 21st, 28th and 29th. First S on 29th, very slight.

WALES.

HAVERFORDWEST.—December commenced cold, notably the first four days, the exposed ther. on the 4th falling to 19°; it continued cold to the 10th; a very wet and mild period then set in, which lasted to the 18th, when the air again became colder, and stormy, broken weather set in, which culminated in a fierce gale, commencing from S.W., and veering to W. and N. From the 21st until the 26th continuous R fell, and another strong gale followed on 29th, with H showers, and S fell heavily at night, the ground being covered to a depth of 2 inches on 31st.

ABERYSTWITH, GOGERDDAN.—Strong gales from the N.W. on the 22nd and 29th, with H storms and T.

SCOTLAND.

CARGEN.—A very unsettled month, corresponding very closely to December, 1893. Severe gales were experienced on the 13th, 21st–22nd, and 28th–29th. The one on the night of the 21st and forenoon of the 22nd was the most disastrous since the gales of December, 1883, and January, 1884. Great damage was done throughout the district, the greatest occurring between 10 and 11 a.m. on the 22nd, the squalls amounting to almost hurricane violence. The mean temp. of the month, $40^{\circ}6$, is $2^{\circ}2$ above the average, and the fluctuations of temp. were very marked. The min. temp. on the 13th was $50^{\circ}6$; the nearest to this high min. in December during 35 years was $49^{\circ}2$ on 7th December, 1865, and $49^{\circ}1$ on 3rd December, 1873. Rhododendrons were in flower towards the end of the month. The fluctuations of the bar. were very marked, the difference between 9 a.m. and 9 p.m. on 22nd being 1.168 in. N. and N.W. winds prevailed for 22 days. Sunshine 10 hours below the average.

JEDBURGH.—The weather was mild for the season; though there were a number of frosty days, frost never continued long, and out-door work was not stayed. With the exception of the 29th, there was no S, and then only a slight shower, which hardly covered the ground. High wind on 21st and 28th.

COLMONELL.—Rainfall slightly above the average. Very strong gale at night on 21st and morning of 22nd. Strong gales on 28th and 29th.

ABERDEEN, CRANFORD.—Terrific gale of wind, doing much damage, on 22nd.

ROEBERRY.—The first part of the month was fine, the latter part cold and stormy. On the morning of the 22nd, after a coarse night of wind and rain from the S., preceded by a few hours' calm, a heavy gale broke from the northward. Mean temp. $41^{\circ}8$.

IRELAND.

DARRYNANE ABBEY.—A very mild month, with some heavy gales. H, mixed with S, on 29th. Gales on 18th, 22nd, and 29th.

WATERFORD, BROOK LODGE.—A few light showers of S on the last two days of the month. Mean temp. $43^{\circ}9$.

O'BRIENSBRIDGE, ROSS.—An average rainfall for the season was attended by unusually high temp. until the 28th. The storm of 21st, so destructive elsewhere, passed over here with little injury; its greatest violence did not last more than one hour. With the storm of 28th also no serious loss occurred. S on 30th and 31st.

DUBLIN.—The earlier part of the month was characterised by anticyclonic conditions, and was quiet, chiefly fine, with a good deal of fog. From the 9th onward the distribution of atmospheric pressure was cyclonic, the depressions of 22nd and 29th being especially noticeable for the suddenness of their approach, and the havoc which they wrought. As in 1893, the month closed with a cold spell, with S, sleet, and H. Mean temp. $43^{\circ}9$, $2^{\circ}6$ above the average. Lunar halos appeared on 3, and solar halos on 2, days. High winds were noted on 12 days, and attained the force of a gale on 8. Foggy on 9 days. L on the 30th. Faint aurora on the 22nd.

CLIFDEN, KYLEMORE.—Very wet and stormy throughout. Severe gales from W. on 21st and 28th. S on 30th.

WARINGSTOWN.—A gale, unequalled since 1839, occurred on 22nd, doing great damage to buildings and trees.

EDENFEL.—With an average rainfall, the temp. of the month was remarkably mild, and there was little frost, and no snow even on the mountain tops till 29th. In other respects the last 10 days of the month left a mark that it will take many years to efface. No storm since that of January, 1839 has wrought such widespread havoc to buildings and to plantations as that of the night of Friday, 21st, and had its period of greatest violence lasted as long as in 1839, the damage to life and property would have been appalling. On the 29th another, but less violent, gale occurred after an extraordinary barometric fluctuation, between times, of from 28.70 in. to 30.90 in. (corrected).