

SYMONS'S

MONTHLY



METEOROLOGICAL
MAGAZINE.

VOLUME THE THIRTY-SECOND.

~~~~~  
1897.  
~~~~~

LONDON:
EDWARD STANFORD, COCKSPUR STREET, S.W.

1898.

W. H. ...
Printed by ...



INDEX.

	PAGE		PAGE
Abercromby, The Hon. Ralph	117	Hydrography, Austrian	155
Air Currents, Inclined	188	Icy Saints, The.....	59
Animals and Poultry killed in Storm of June 24th	87	Inclined Air Currents	188
April 27th Hailstorm in S. London	50	Index to Vols. I.-XXX. of the Meteorological Magazine.....	34, 111
Arctic Regions, Kite Work in	34	Indian and Australian Earthquakes	92
August, 1897, Damage by Rain and Thunderstorms in.. ..	124	July, Storm Rains in	103
August 4th, High Temperature in the night of	123	July 16th, Whirlwinds on	106
Australian and Indian Earthquakes, The Recent	92	June 24th, Thunder and Hail on ...	81
Austrian Hydrography	155	June 30th, Whirlwinds on.....	106
Belgium, Meteorology in	91	Kimberley, S. Africa, Sunshine at... ..	17
Berwickshire, Winters in	93	Kite-flying in Scotland	190
British Association at Toronto	143	Kites, Thermo-Hygrograph-Carrying	140
Buys-Ballot	119	Kite Work in the Arctic Regions... ..	34
Cape Colony, Heavy Rainfall at Port Elizabeth, May 5th, 1897	73	Lightning, Damage by.....	88, 124, 141
Casella, Louis Pascal	49	Low Temperatures, Water at Un- usually	1
Climate of the British Empire, 1896	120	Malta, Increased Cloudiness of	159
Climatological Tables for the British Empire...12, 28, 44, 60, 76, 96, 112, 128, 144, 160, 176, 192	120	March 3rd, 1897, The Gale of	23
Colorado, A Tornado at Este's Park	9	May 5th, 1897, Heavy Rainfall at Port Elizabeth	73
Daily Weather Map, The first... ..	33, 133	Meteoric Shower in November, The	167
Dakota, Electric Trees in	27	Meteorites, On the Worship of... ..	51
Damage by Lightning.....	88, 124, 141	Meteorological Exhibition, 1837- 1897.....	37
Dew, The Formation of	52	Meteorological Magazine, Index to Vols. I.-XXX.....	34, 111
Drought of Oct. and Nov., 1897... ..	149, 169	Meteorological Notes on the Months	15, 31, 47, 63, 79, 99, 115, 131, 147, 163, 179, 195
Earthquakes	25, 92	Meteorological Society, The Royal	5, 25, 36, 58, 75, 94, 173, 186
Earth Temperature, Frost, and Water Pipes	95	Meteorology in Belgium	91
Electrical Manifestations.....	27, 127	Meteorology in Schools	108
Errata in Meteor. Magazine, 1896... ..	111	Mountain Observatories, Objections to	107
Europe, Floods in Southern	108	Muswell Hill, Rainfall at	39
Exhibition of Meteorological In- struments, 1837-1897	37	Nile, Sand Storm on the.....	142
February, 1897, The Temperature of First Daily Weather Map, The... ..	33, 133	November 12th, 1897, Rain in the Lake District	165
Floods in Southern Europe	108	November 28th, 1897, Gale on	170, 181
Formation of Dew, The	52	November, Temperature Varia- tions in	168
Fromondus on the Weather 101, 117, 185	185	Obituary—Abercromby, The Hon. Ralph	117
Frost, Earth Temperatures and Water Pipes	95	„ Casella, Louis Pascal	49
Gale of March 3rd, 1897, The	23	„ Zambra, Joseph W.	181
Gale on November 28th, 1897	170, 181	Observatories, Objection to Moun- tain	107
Hail	50, 65, 68, 69, 88, 171	October and November, 1897, The Drought and Rainfall of.....	149, 169
Hail, Experiments to drive away... ..	141	Port Elizabeth, Heavy Rainfall at... ..	73
Hereford Earthquakes, The	25		
High Temperature on the Night of August 4th.....	123, 139		

	PAGE		PAGE
REVIEWS:—			
Hellmann, Prof. Dr. Neudrucke von Schriften und Karten. Berlin, 1896	10	Denning, W. F., F.R.A.S. The Great Meteoric Shower of November. 1897.....	158
No. 7. Evangelista Torricelli. Esperienza dell' Argento Vivo, Accademia del Cimento. Instrumenti per conoscere l'alterazionii dell' aria..	10	Richard, J. Instruments de Précision. No. 1 Météorologie. 1897	175
No. 8. E. Halley, A. von Humboldt, E. Loomis, U. J. Le Verrier, E. Renou. Meteorologische Karten, 1688, 1817, 1846, 1863, 1864	11	Mohn, H. Klima-Tabeller for Norge. Christiania 1896 & 1897	187
No. 9. Henry Gellibrand. A Discourse Mathematical on the Variation of the Magnetical Needle. London, 1635	11	Rain and Thunderstorms	103, 124
Russell, H. C., B.A., C.M.G., F.R.S. On Periodicity of Good and Bad Seasons	40	Rain in Lake District, Nov. 12th ...	165
Hepites, Stefan C. Buletinul Observatiunilor Meteorologice din Romania. Anul V., 1896. Bucuresti, 4to, 1897	42	Rainfall and Temperature, Monthly	14, 30, 46, 62, 78, 98, 114, 130, 146, 162, 178, 194
Vallot, J. Annales de l'Observatoire Météorologique du Mont Blanc. Tome II., 1896	42	Rainfall at Muswell Hill.....	39
Taylor, Capt. E. R., F.R. Met. Soc. Report and Results of Meteorological Observations made at Ardgillan, co. Dublin, during the year 1896.....	43	Rainfall of October and November, 1897, The.....	149, 169
Russell, Hon. F. A. R. The Atmosphere in relation to Human Life and Health. Smithsonian Institution, Washington. 1896	54	Rains, So-called Sulphur	138
Clayton, J. Effects of the Weather upon Vegetation: a Lecture. Bradford, 1897	56	Remarkable Hailstones.....	68, 171
Clayton, H. H. Blue Hill Meteorological Observatory, U.S.A. Discussion of the Cloud Observations. 1896	57	Saints, The Icy.....	59
Denison, N. The Great Lakes as a Sensitive Barometer. [Toronto, 1897.] 8vo, Excerpt Proc. Canadian Institute	74	Sand Storm on the Nile	142
Denison, N. A Probable Solution of the Secondary Undulations found upon Self Recording Tide Gauges. [Toronto, 1897.] 8vo, Excerpt Proc. Canadian Institute.....	74	Schools, Meteorology in	108
Archibald, E. Douglas. The Story of the Earth's Atmosphere. 1897	110	Scotland, Kite work in	190
Hydrographic Office, Washington, U.S.A. Illustrative Cloud Forms for the guidance of observers. 1897	110	Seaford, Hailstorm at, May 30th, 1897	65, 69
		Seismological Survey of the World	26, 137
		Storm Rains in July	103
		Storms of June 24th, The	81
		Sulphur-Rains, So-called	138
		Sunshine at Kimberley, S. Africa...	17
		Sunshine in Summer, Sunless Days and the Day Distribution of ...	137
		Supplementary Tables of Rainfall	13, 29, 45, 61, 77, 97, 113, 129, 145, 161, 177, 193
		Temperature, High, on night of August 4th.....	123, 139
		Temperature of February, 1897, The	21
		Temperature Variations in November	168
		Temperatures, Earth, & Water Pipes	95
		Temperatures, Water at Unusually Low	1
		Thermo-Hygrograph-Carrying Kite	140
		Thunder and Hail Storms... 50, 69, 81,	124
		Tides, The November Gale and.....	181
		Time, True	136
		Tornado at Este's Park, Colorado ..	9
		Toronto, British Association at.....	143
		True Time	136
		Victoria, Phenomenal Weather in...	27
		Water at Unusually Low Temperatures	1
		Weather, Fromondus on the 101, 117,	185
		Weather in Victoria, Phenomenal...	27
		Weather Map, The First Daily... 33,	133
		Wet Day in a Wet District, A	165
		Whirlwinds on June 30th & July 16th	106
		Winter Nights, Warm	190
		Winters in Berwickshire	93
		Worship of Meteorites, On the.....	51
		Zambra, Joseph Warren.....	181

SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CCCLXXIII.] FEBRUARY, 1897. [PRICE FOURPENCE,
or 5s. per ann. post free.

WATER AT UNUSUALLY LOW TEMPERATURES.

ON Monday, November 30th, the Observer at Camden Square, having finished the usual 9 a.m. Meteorological readings, reported that the water-supply for the wet bulb thermometer on the Glaisher screen (I.) was not frozen, though the air temperature was $29^{\circ}1$; and examination showed that the water was absolutely free from ice, though the muslin, and the wick from the edge of the water vessel to it, were frozen. There is on the same screen another hygrometer, the water supply for which was frozen into a solid mass of ice not adhering to the vessel. This second water-vessel, (II.) though more protected from radiation, was more exposed to the wind.

The night had been clear and cold, at 9 a.m. the sky was almost cloudless and the sun shining brightly, but there was a slight accumulation of London smoke in the air, not sufficient to justify the use of the word fog or foggy. The wind was very light from E. or E.N.E. These general conditions of weather continued practically unchanged until noon.

Our immediate impression was that the water in I. remained unfrozen owing to the stillness of the air, and that rapid congelation would take place on the slightest disturbance, but stirring the surface lightly with the point of a cedar pencil produced no result. An unmounted mercurial thermometer was then obtained, and at 9.15 a.m. a series of readings commenced. The temperature of the water was ascertained by immersing the bulb and about an inch of the stem of the thermometer and stirring for 15 or 20 seconds, then reading and again stirring for 15 or 20 seconds, and again reading; if the two readings were not identical, the process was repeated. The bulb of the thermometer was not withdrawn from the water during reading.*

Time	...	...	9.0	9.15	9.45	10.0	10.15	10.30	11.0	11.30
Dry bulb	...	...	$29^{\circ}1$	$29^{\circ}5$	$30^{\circ}9$	$31^{\circ}8$	$32^{\circ}2$	$33^{\circ}1$	$34^{\circ}6$	$35^{\circ}7$
Water in No. I...	...	...	—	$28^{\circ}1$	$29^{\circ}2$	$30^{\circ}0$	$30^{\circ}6$	$31^{\circ}1$	$32^{\circ}5$	$33^{\circ}4$

* This thermometer is by Casella, No. 19409, graduated on the stem about 15 years ago, bulb 0.23 inch diameter, taking up the true temperature in water in 15 seconds. It was compared with a Kew Standard in water, the error being at $34^{\circ}0 + 0^{\circ}6$. In a drained vessel of broken ice its error was $+ 0^{\circ}7$, and this correction has been applied to all its readings.

The minimum temperature occurred about 5.30 a.m., and was $25^{\circ}4$, and there appears to be justification for assuming that the water in I. fell to very nearly this temp. without the formation of ice.

It will be seen that the temperature rose gradually, but the other conditions as before described remained unchanged, until at 9.45 a.m. it was found that the muslin and wick were thawed, the temperature of the air being $30^{\circ}9$ and of the water $29^{\circ}2$.

At 10.30 a.m. the ice in vessel No. II. was beginning to thaw, and moisture was visible between the ice and the glass, but there was not sufficient to flow.

By 11 a.m. the temperature of the air had risen to $34^{\circ}6$, and of the water in No. I. to $32^{\circ}5$, not an atom of ice having been seen in or on the water during the whole time.

Three new unused stoppered glass bottles were obtained, and at 2 p.m. all the water from vessel No. I. was bottled, the remaining ice in No. II. was melted by placing the vessel in warm water in the open air, and the whole of its contents were put into the second bottle, while the third bottle was filled with water from the store of rain water kept for replenishing the vessels I. and II.

This store is an uncorked glass bottle kept standing in the observer's office, which is filled from time to time with the rain caught in a copper rain gauge (thoroughly oxidised) with a copper receiver.

These three bottles—marked "Liquid" (vessel I.), "Frozen" (vessel II.), and "Supply"—were handed to Mr. M. J. Salter, F.I.C., F.C.S., who kindly undertook their chemical examination. From his notes we have extracted the following.

"It seemed to me that the first thing was to try to freeze the sample marked "Liquid," and notice how it behaved. I therefore took an ordinary $6 \times \frac{3}{4}$ inch test tube which had been in use for general work, and after washing it as usual, and finally with distilled water, carefully wiped it dry and polished it inside with a clean cloth. I used this same test tube throughout all the experiments. From the irregular way the water-drops adhered to the glass, I infer that it was slightly greasy. It certainly was not catharised in Tomlinson's sense (*Journ. Chem. Soc.* xxii. 125). Into this I poured enough of the water to cover the stem of the thermometer (your Casella 19409) to about 40° , but in the first freezing experiment I found it inconvenient to have so much water, and therefore for all the others I worked with the surface somewhat below 25° , which allowed me to plunge the water column almost entirely below the surface of the freezing mixture. For the freezing mixture I used ice and salt, with no special precautions as to temperature. The thermometer had a slip of wood tied across it, which just kept its bulb from touching the *bottom* of the test tube (say about $\frac{1}{8}$ inch up). I now employed two methods of observation.

(1) As the falling temperature approached 33° I stirred the

water continuously with the thermometer, stopping every few seconds just long enough to get a reading.

(2) Leaving the thermometer hanging at rest in the water, I avoided disturbance as completely as possible, and simply watched the course of the mercury.

The following table will now speak for itself.

SAMPLE "LIQUID" (<i>Water from vessel No. I.</i>)			
	Method of observation.	Lowest reading.	
	Stirring.	26°·8	At this moment spicules of ice were seen to be adhering to the thermometer, and temp. rose suddenly to 32°·0.
Warmed to 52°	„	32°·0	Ice formed as soon as 32°·0 was reached.
„ „ 75°	„	24°·7	Then suddenly shot up to 32°·0, and most of the sample became solid.
„ „ 65°	Unstirred.	28°·8	Rose suddenly to 31°·9.
„ „ 75°	„	28°·7	„ „ „ 32°·0.
SAMPLE "FROZEN" (<i>Water from vessel No. II.</i>)			
	Unstirred.	31°·3	Then rose to 31°·8, and a crystal of ice seen.
Remelted.	Stirring.	26°·4	Solidified suddenly, with rise to 32°·0.
Warmed to 47°	„	27°·7	„ „ „ „ 32°·0.
SAMPLE "SUPPLY" (<i>Water from store.</i>)			
	Unstirred.	31°·1	At moment, when this reading obtained, it was found that nearly half the water was frozen.
Warmed to 55°	„	30°·1	Then rose to 31°·8, and most of it found to be solid.
„ „ 50°	„	31°·6	Then rose to 31°·8, and most of it found to be solid.

The above show that the solidification is extremely capricious and that this is not due to the presence of any substance in solution which produces an absolute lowering of the freezing point, but is rather to be attributed either to the absence of nuclei, or possibly to the presence of some substance such as tarry matter by which ordinary nuclei are rendered inert. I noticed later on that the samples showed a tendency to form films, as if there was present some substance which increased the surface tension. As far as can be judged from the somewhat negative character of the results with "Supply," it seems that the exposure to a smoky atmosphere in the open glass vessels on the Glaisher screen had increased the tendency to resist freezing.

I next took the specific gravity of the samples at 60° F., using a Sprengel sp. gr. tube, which holds 12·5575 grams of distilled water. This, having been made originally for taking the sp. gr. of oils and varnishes, has rather wide capillaries, so that it is scarcely fit for work of the highest refinement. The results I got, were, however—

"LIQUID".....	1·00023.
"FROZEN".....	1·00059.
"SUPPLY".....	1·00013.

These numbers are quite sufficient to show that the impurities present are not in sufficient quantity to affect the freezing point, even if the rise of the thermometer to $31^{\circ}\cdot 8$ — $32^{\circ}\cdot 0$, as soon as ice began to form did not indicate that 32° was the true freezing point.

The question at issue being one of temperature, refined determination of impurities appeared unnecessary, but—

- “LIQUID” showed—Ammonia in considerable quantity with Nessler.
- „ „ Sulphuric acid or a sulphate with barium chloride.
- „ „ Oxidisable organic matter (?sulphurous acid) with permanganate.
- „ „ Non-volatile matters, both organic and mineral, when evaporated on platinum foil.

Comparative observations with distilled water were also made.

A test-tube, with no special cleaning, was employed, and distilled water, neither specially pure, nor quite free from dust.

DISTILLED WATER.		
	Method of observation.	Lowest reading.
Warmed to 40° .	Unstirred.	$22^{\circ}\cdot 1$
	„	$25^{\circ}\cdot 3$

Then rose to $32^{\circ}\cdot 0$, and became solid.

Then rose suddenly to $32^{\circ}\cdot 0$, and whole mass became solid.

Fresh distilled water from same supply.

Unstirred.	$17^{\circ}\cdot 3$	Thermometer touched and found to be loose, instantly rose to $32^{\circ}\cdot 0$, and whole solidified.
------------	---------------------	--

Fresh distilled water from same supply.

Warmed to 45° .	Unstirred.	$12^{\circ}\cdot 3$	Then the whole froze with a sort of flash, and temp. rose to $31^{\circ}\cdot 8$.
--------------------------	------------	---------------------	--

Tube wiped carefully, and fresh distilled water from same supply.

Stirred.	$28^{\circ}\cdot 3$	Then rose to $32^{\circ}\cdot 1$, and changed to ice.
----------	---------------------	--

So far the report. Is it generally known that ordinary or distilled water in an open vessel can, with extreme ease, and without any precautions, be cooled nearly 20° F. below freezing point without solidifying? Is $12^{\circ}\cdot 3$ F. the lowest to which a mass can be cooled? We can trace no statement on the subject in any book on physics which we have consulted. Prof. Everett, in his translation of Deschanel, tells us that “Despretz has cooled water to -20° C. (-4° F.) in fine capillary tubes, without its freezing, and Dufour has obtained a similar result by suspending globules of water in a liquid of the same specific gravity, with which it would not mix, this liquid being one which had a very low freezing point.”

These cases are, however, quite different, the case before us is one of a wine-glassful of water—not of water in “capillary tubes,” or individual globules.

Prof. Atkinson, in his translation of Ganot, says, "The freezing point of pure water can be diminished by several degrees if the water be previously freed from air by boiling, and be then kept in a perfectly still place. In fact, it may be cooled to -15° C. (5° F.) and even lower, without freezing. But when it is slightly agitated the liquid at once solidifies."

In the case reported above, the water had not been "boiled," and far from being "still," had been repeatedly stirred with a black-lead pencil, and with a thermometer bulb.

Lastly, we referred to Larousse's *Grande Dictionnaire* with the following result:—

"A 0° C. l'eau prend l'état solide; on peut cependant, en la protégeant bien contre toute agitation, la refroidir jusqu'à -12° C. ($10^{\circ}4$ F.) sans qu'elle se congèle. La moindre secousse détermine alors la congélation immédiate de la masse et la température remonte à 0° C. (32° F.)."

Here again it is pointed out that the least shock will produce immediate congelation; but the water in vessel I. was not merely shaken, but stirred, without freezing, when several degrees below 32° F.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly Meeting of this Society was held on Wednesday evening, the 16th December, 1896 at the Institution of Civil Engineers, Mr. E. Mawley, F.R.H.S., President, in the chair.

Mr. R. H. Curtis read a paper entitled: "An Attempt to Determine the Velocity Equivalents of Wind-Forces estimated by Beaufort's Scale."

For such a comparison to be satisfactory, four conditions are essential:

- (1) The observations should be made at an exposed station, where it may reasonably be expected that the full range of wind-force would be experienced.
- (2) The station should be provided with an anemometer, the constants of which are known, and which should occupy a position entirely free from purely local disturbing influences.
- (3) The estimations of wind-force should be made by an observer of experience, stationed in the same locality as the anemometer, but acting independently of its indications.
- (4) There must be available a sufficiently long series of observations to yield reliable mean results.

Of all the records available those for Scilly appeared most nearly to fulfil the above requirements, and that station was adopted as the principal one. Fleetwood and Yarmouth being used as check stations, and also readings of the Dines's tube anemometer, at Holyhead. In all, 10,263 observations at Scilly were dealt with, and

12,098 at the other stations. The results of the Robinson Anemometers were corrected by the application of the factor appropriate to each instrument, and the readings were further checked by comparison with observations of the tube anemometer. The wind forces estimated by the observers were checked by comparison, with similar estimates made at neighbouring light-ships, or light-houses. The winds from different points of the compass being separately examined to see how far they yielded accordant results.

The values yielded by the Scilly observations are :—

Mean Velocity Equivalents, in miles and tenths, obtained from the observations made with the Robinson Anemometer at Scilly.

Estimated Force by Beaufort's Scale	0	1	2	3	4	5	6	7	8	9	10	11	12
Equivalent Velocity .....	...	3·9	6·7	9·3	13·5	19·8	26·0	31·7	36·9	43·0	51·5	63·1	...

While those finally adopted by the Author as the result of the whole discussion are :—

Velocity Equivalents for Estimated Forces by Beaufort's Scale.

Beaufort's Scale	0	1	2	3	4	5	6	7	8	9	10	11	12
Equivalent Velocity in miles per hour ...	2	4	7	10	14	19	25	31	37	44	53	64	77
Metres per sec.	0·9	1·8	3·1	4·5	6·3	8·5	11·2	13·9	16·5	19·7	23·7	28·6	34·4

The President remarked that to adopt the new factor for the Robinson's cup anemometer would make a great alteration from the values we were accustomed to see : 105 miles an hour would become 77 miles ; 87 miles, 64 ; 72 miles, 53, and so on.

Mr. Chatterton thought that Mr. Curtis had treated the 1887 results of the Wind Force Committee too politely. The Committee had worked on data based on a fallacious coefficient, and they now found that the exposure of the anemometers was also bad. He hoped that the day had gone by when results of useless observations would continue to be printed at the public expense.

Mr. Dines considered the practice of continuing to use a wrong factor—one that everybody who printed and who read the results knows to be wrong—was indefensible. In early years he had been surprised that the Scilly values were far below those for Holyhead ; but he afterwards found out that the Scilly instrument was not of the standard pattern, and that for it the factor 3 was practically correct.

Mr. Charles Harding believed that the Wind Force Committee had not arrived at an absolute decision as to what is best to be done, and he suggested that no alteration should be made before 1900. If a change were made now, another might be necessary a year or two

hence. He criticised Mr. Curtis's value of 2 miles an hour for force 0, or dead calm.

Mr. Symons exhibited a diagram showing some eight or ten different determinations of the equivalents of Beaufort scale, and remarked on the wide variation between them.

Mr. Gaster suggested that Mr. Symons's diagram illustrated the necessity for Mr. Curtis's paper. In a calm, light airs from various directions would all act on the anemometer, and cause revolution of the cups. He thought it was often forgotten that the extreme estimates of velocities of 100 or 120 miles an hour, were estimates in terms of West India hurricanes, which no canvas could stand. It must be remembered that the results based on factor 3 *are* printed, and the amount of confusion that would be caused by alteration would be very great.

Mr. Sowerby Wallis considered the paper a final settlement of what the Beaufort Scale means now; but he did not feel sure that it was the same when Admiral Beaufort invented it. Mr. Curtis's values show a steadily increasing increment of velocity for each value of the scale, while some of the earlier determinations—notably Sir H. James's—show a uniform increment. Would it be possible to get, on this point, the opinion of old salts who remembered sailing ships?

Mr. Brodie believed that finality, if not reached, was very nearly approached. In the paper, the Scilly values were treated as nearly perfect; but the observer is an old man, who would probably be soon superseded, and change of observer often results in change of the forces recorded. Estimation should be abolished altogether, by the use of a portable anemometer.

Mr. Ellis found that if Mr. Curtis's figures are taken to one place of decimals they run much better, and agree very closely with a mathematical formula which he had worked out, which gives for force 0, 1.6 miles. He asked whether Mr. Curtis considered the factor as constant for all velocities?

Capt. Carpenter doubted whether officers of the present day had any idea what sail a frigate could carry; but the state of the surface of the sea was a useful aid—the beginning of the formation of “white horses” indicated a wind of force 4. Some portable anemometer would be a great improvement on the use of the Beaufort Scale.

A paper by Dr. Leigh Canney on the “Winter Climate of Egypt” was read by the Secretary. The climate of Egypt during the winter is influenced by the Libyan desert, by the Mediterranean Sea, and by the extent of cultivated land. The author gave the results of a series of observations which he had carried on during the past three winters. The observations were started with the object of arriving at a comparative knowledge respecting the climates of the various stations now considered as health resorts in Egypt, and by a strictly comparable method to arrive at the precise differences between the climates of Upper and Lower Egypt, all previous observations having

failed in this respect. The stations at which observations were made were Cairo, Helouan, Mena House Hotel, Luxor, Assouan, the Valley of the Tombs of the Kings, and the crest of the Libyan Hills. As self-recording thermometers and hair hygrometers were used at each station, valuable data have been obtained on the diurnal variation of temperature and humidity.

Dr. Marcet considered the paper a very valuable one, but there were one or two points on which he would have liked more information—the treatment of the question of rainfall, for instance, being very slight. Solar radiation temp. also is very important, but difficult to observe, as the sun max. in vacuo seems to be unsatisfactory, but the shade temperatures given in the paper were no guide to the heat to which our soldiers were exposed in the last campaign. The slight fall of temp. at sunset at Luxor was interesting, and he (the speaker) had more than once observed an almost equal rise of temperature. The sensation of chilliness was not felt in Upper Egypt till about 4 hours after sunset, while in Lower Egypt it was felt much sooner.

Dr. Theodore Williams said that the traces exhibited seemed wonderfully uniform at the different stations, and also day after day. It was surprising to see that in the desert, where there is utter absence of vegetation, there is less range of temp. than in the cultivated regions. What struck him most with regard to humidity was, not the lowness of the values, but that in the night the percentage rose at times to 80, and the wonder was where the moisture came from. As regards rainfall in Upper Egypt, there is practically none to record. The position of the instruments on roofs was contrary to English ideas, but it was necessary to get up 40 or 50 ft. to get above the rise of the Nile.

The annual general meeting of this society was held on Wednesday January 20th, at the Institution of Civil Engineers, Great George-street, Westminster, Mr. E. Mawley, President, in the chair. The president delivered an address on "Shade Temperatures," in which he stated that of all meteorological observations there were none approaching in importance those made of the temperature of the air—generally known as shade temperature. Mr. Mawley traced the history of the different methods of exposing thermometers since the time that regular observations of the weather had been made in this country. For many years open screens were most favoured by meteorologists, that devised by Mr. J. Glaisher, F.R.S., and the late Astronomer Royal (Sir G. B. Airy, F.R.S.) being the pattern principally used. In 1864 Mr. T. Stevenson, C.E. invented an admirable form of closed screen with louvred sides, which was considered preferable to the open type of screen, and has now almost entirely superseded the Glaisher stand. In 1883 the Stevenson screen was considerably improved by a committee of the Royal Meteorological Society. Mr. Mawley then described his own experiments at Croydon and Berk-

hamstead with this improved screen, known as the Royal Meteorological Society's pattern. He advised the general adoption of this form of thermometer exposure, both in this country and on the Continent. He had recently made observations in the Stevenson screen, and also in the screens used in France and Germany, and the conclusion he had come to was that the results obtained in the Stevenson screen were not only the nearest to the true air temperatures, but also more likely to be independent of surrounding conditions than other patterns.

A TORNADO AT ESTE'S PARK, COLORADO.

WE have been favoured with the following description, and insert it with the object of ascertaining what foundation there is for the impression that tornadoes are creatures of the plains. Este's Park is (we see by Dr. Theodore Williams's Presidential Address to the Royal Meteorological Society, where it is fully described) 7,500 feet above sea level, so that the average reading of the barometer there must be about $22\frac{1}{2}$ inches or only three-quarters of that in the plains; evidently therefore to produce equal structural damage the velocity of the wind must be much greater. Hence we have three points on which information is desirable, (1) Is it a fact that Tornadoes rarely occur at high altitudes; or (2) Is their force less, and do they thereby escape notice? (3) Are they more rare because the conditions of heat and moisture necessary for their formation do not exist?

Extract from letter by Mr. H. C. Rogers, dated Este's Park, Colorado, Nov. 4th, 1896:—

The place where I am staying is in summer run as an hotel; now another man and I are the only visitors. During the last ten days the weather has not only been cold but made objectionable by a cold west wind. About 4 p.m. to-day a friend, Dr. James, called, and we three were sitting in a room which opens on to a verandah. Suddenly we heard the sound of a terrific rushing wind and the rattle of gravel and debris, the house swayed, the windows were darkened and then suddenly the room was more light than usual. The front of the house consists of two sides of a square, and it is firmly built with a verandah 8 feet deep all round the two sides. On going out we found that about 55 feet of the verandah had been carried away—a few yards, severed from the portion carried away, lay on the ground a heap of splinters, but by far the larger portion had been lifted over the wing of the house and deposited by the river 85 yards away. We have also heard that timbers were seen flying over the Post Office, distant about a quarter-of-a-mile, and they may have been part of our verandah. In seven windows facing the verandah not a pane of glass was broken. The outer door (a sort of door with wire gauze instead of panel) was ripped off its hinges, and is a mass of splinters. The whole performance, from the first sound of the whirl

until the business was over, could not have been more than five seconds. Just before this a strong blast of wind started up from the east, the opposite direction to that of the strong wind that has prevailed during the last few days—they apparently met near here and took the form of a cyclone. I do not think that it came from any considerable distance, nor do we think that it travelled far, for we could see no trees down or other signs of destruction. This is an extremely rare occurrence at an altitude where the atmosphere is so rarified, and nobody seems to have heard of such a tornado in these mountains before—although of course it is nothing to be compared to what happens at lower elevations out in the plains east of this place, such as occurred at St. Louis not many months ago.

REVIEWS.

Neudrucke von Schriften und Karten . . . herausg. von Prof. Dr. HELLMANN. Berlin: A. Asher & Co. 4to. 1896.

No. 7.—EVANGELISTA TORRICELLI. *Esperienza dell'Argento Vivo. Accademia del Cimento. Istrumenti per conoscer l'Alterazioni dell'Aria.*

THIS may be described as an essay on the invention and early history of the barometer, thermometer and hygrometer, and is perhaps the most important of this valuable series of works; not on account of the rarity of the works reproduced, for as we have ourselves five or six editions of the "Saggi" of the Accademia, including those of 1666 and of 1841, we can hardly regard it as very rare,* but because of the mass of information which Dr. Hellmann has inserted in the notes. Nothing but careful perusal can do justice to it; but, to take a very low indication of the information concentrated in it, we may mention that we find Dr. Hellmann quoting Greek, Latin, Dutch, English, French, German and Italian.

It is impossible within any ordinary limit to give a fair idea of the research epitomized in this book, the only conceivable complaint seems to us to be that it somewhat breaks down under its own wealth of confirmatory evidence, and gives the feeling of ones having been reading a dictionary rather than a book. No one without thoroughly mastering it must pretend to write the early history of the three instruments we have named, but we think that the "Einleitung" might with advantage have been relieved by some portions being transferred to the "Anmerkungen." As to these Remarks which occupy eight quarto pages, we know no other eight pages which contain so much useful information. Dr. Hellmann on

* A reference to the superb glass work of the Florentines in the middle of the 17th century, and an engraving of one of their thermometers, will be found on p. 91 of Vol. XI. (1876) of the *Met. Mag.*

p. 20 points out the desirability of an accurate comparison of the Florentine thermometer at the Royal Institution, with a standard; and we trust that that may soon be done.

No. 8.—E. HALLEY, A. VON HUMBOLDT, E. LOOMIS, U. J. LE VERRIER, E. RENOU. *Meteorologische Karten*, 1688, 1817, 1846, 1863, 1864.

SIX facsimile maps which Dr. Hellmann happily describes as milestones on the road of meteorological progress. Halley's Map of the Winds, Humboldt's first Isothermal Chart, Loomis's Storm Map, Early Isobaric Charts by Le Verrier (or possibly by Marié Davy?) and Renou's Map of the Mean Isobars for France—this is the interesting set reproduced in No. 8. And there is of course the usual introduction and bibliography by Dr. Hellmann of a quality which no living man can equal, and from which one always learns something. For instance, we recently reproduced the first weather map, sold in the 1851 Exhibition; Dr. Hellmann gives us a paragraph in Dutch from a work by Dr. Buijs Ballot which shows that it was through seeing these maps that he was led to publish analogous ones in the *Nederlandsch Meteorol. Jaarboek für 1852*.

On another page Dr. Hellmann mentions that he possesses the first of a series of a sort of synoptic weather maps for November, 1725, by an unknown author residing at an unknown place, which bear the title "Erster Entwurf einer Witterungs-Charte darinne die Witterung wie man sie an verschiedenen Oerthern Teutschlandes in einem District von etlichen 80 Meilen lang und 60 Meilen breit, im Monath Novembr., 1725, beobachtet, vorgestellt wird."

No. 9.—HENRY GELLIBRAND. *A Discourse Mathematical on the Variation of the Magneticall Needle*. London, 1635.

A FACSIMILE reproduction of the copy of the above rare tract belonging to Mr. Latimer Clark, F.R.S. The first comparisons between the true terrestrial meridian and the magnetic meridian were made by Burrowes at Limehouse, Oct. 16, 1580, when he found it about $11^{\circ} 16'$ E. On June 13, 1622, Mr. Gunter at the same place found it to be about $5^{\circ} 56'$ E., but it does not seem to have occurred to him that this difference showed any secular change, and therein lies the merit of Gellibrand's paper in that he not merely determined the variation at Deptford on June 12, 1634, to be only $4^{\circ} 4'$ E., but pointed out the decrease of about 7° in 54 years.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, AUGUST, 1896.

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	77·1	13	45·4	27	69·9	51·6	54·0	0-100 83	123·9	40·1	inches 1·92	14	5·8
Malta	104·8	11	59·4	31	86·6	71·0	66·2	68	152·0	52·9	·00	0	2·2
<i>Mauritius</i>	75·0	7	58·6	8	72·6	63·2	57·2	71	121·9	47·3	2·08	16	5·0
Calcutta	89·8	28	75·6	3	87·6	78·7	78·2	87	157·7	75·1	11·02	21	7·7
Bombay	86·1	25	75·0	11	83·6	76·6	75·4	86	142·8	72·3	20·77	29	8·8
Ceylon, Colombo	88·0	15	73·3	4	85·4	77·3	73·2	80	145·0	70·0	6·35	15	6·1
<i>Melbourne</i>	67·2	22	35·8	2	56·6	42·4	43·1	74	118·0	24·8	2·75	14	6·8
<i>Adelaide</i>	71·7	22	37·7	3	61·3	44·1	42·5	72	130·1	29·3	1·23	15	6·3
<i>Sydney</i>	67·7	23	40·5	1	59·2	45·7	43·9	81	117·7	29·8	1·78	12	3·4
<i>Wellington</i>	60·0	25	34·0	5b	53·7	42·0	40·0	75	116·0	21·0	3·63	17	4·6
<i>Auckland</i>	64·0	31	38·0	11	57·2	46·3	42·8	73	121·0	32·0	3·65	...	5·4
Jamaica, Kingston.....	91·8	19a	70·4	22	90·7	74·1	70·7	71	...	...	·40	5	...
Trinidad	91·0	19	68·0	9	88·4	71·7	74·2	84	176·0	67·0	7·66	20	...
Grenada.....	86·2	8	72·2	15	83·3	74·7	70·7	73	148·4	...	8·81	23	3·9
Toronto	89·9	4	42·3	20	79·2	56·6	57·9	70	107·0	37·0	1·13	9	4·7
New Brunswick, Fredericton	92·7	11	40·3	31	76·6	51·4	54·0	66	...	...	1·10	11	4·1
Manitoba, Winnipeg ...	84·6	7	32·0	31	74·8	48·0	...	...	...	...	1·51	11	4·7
British Columbia, Esquimalt	73·7	6	46·2	11	68·3	50·9	53·5	85	...	...	·57	5	6·3

a—and 23. b—and 6, 10.

REMARKS.

MALTA.—Adopted mean temp. 77°·7, or 0°·5 below the average. Mean hourly velocity of wind 9·4 miles. Average temp. of sea 79°·0. TS on 28th. Absolute max. the highest reading recorded in 13 years, while the absolute min. is the lowest for August. J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·3, dew point 2°·0, and rainfall ·19 in., below, their respective averages. Mean hourly velocity of wind 12·5 miles, or 0·2 above average; extremes, 28°·6 on 1st, and 2·3 on 10th and 11th; prevailing direction, E.S.E. T. F. CLAXTON.

CEYLON, COLOMBO.—Lightning was seen on the 18th, 19th and 26th.

Adelaide.—Mean temp. 1°·3, and rainfall 1·14 in., below the average for 39 years. The winter throughout South Australia has been very dry. C. TODD, F.R.S.

Sydney.—Rainfall 1·04 in. below, humidity 7°·7 above, and temperature 2°·5 below, their respective averages. This month was remarkable for the number of cloudless nights, hence dew was measured on 13 days amounting to ·065 in. The average max. is the lowest since 1861. H. C. RUSSELL, F.R.S.

Wellington.—The first part of the month was generally fine, with occasional showers and light winds, the middle showery, then fine weather until the end, when it was showery and unsettled. S on the hills during the latter part of the month. H on 8th and 17th. Fog on 6th. R. B. GORE.

Auckland.—Weather warm and mild during the greater portion of the month. Barometrical pressure and mean temp. both considerably above the average. Rainfall considerably below. T. F. CHEESEMAN.

TRINIDAD.—Rainfall 2·66 in. below the 30 years average.

J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,
JANUARY, 1897.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger Hall .	2·96	XI.	Lake Vyrnwy	1·81
„	Birchington, Thor	2·34	„	Corwen, Rhug	1·78
„	Hailsham	2·68	„	Criceith, Talarvor	1·60
„	Ryde, Thornbrough	2·87	„	I. of Man, Douglas	2·53
„	Emsworth, Redlands ...	2·87	XII.	Stoneykirk, Ardwell Ho.	1·65
„	Alton, Ashdell	2·28	„	New Galloway, Glenlee	2·99
III.	Oxford, Magdalen Col..	1·79	„	Lilliesleaf, Riddell	1·38
„	Banbury, Bloxham	2·00	XIII.	N. Esk Res. [Penicuik]	2·35
„	Northampton, Sedgebrook	2·49	„	Edinburgh, Blacket Pl.	·80
„	Duddington [Stanford]..	2·21	XIV.	Glasgow, Queen's Park..	1·22
„	Alconbury	1·94	XV.	Inverary, Newtown	1·48
„	Wisbech, Bank House...	1·76	„	Oban, The Corran	1·15
IV.	Southend	2·29	„	Islay, Gruinart School ...	1·09
„	Harlow, Sheering	2·27	XVI.	Dollar	1·88
„	Colchester, Lexden	2·09	„	Balquhidder, Stronvar...	2·54
„	Rendlesham Hall	2·34	„	Ballinluig	1·68
„	Rushall Vicarage	1·87	„	Dalnaspidal H.R.S.	3·03
„	Swaffham	1·62	XVII.	Keith H.R.S.	·64
V.	Salisbury, Alderbury ...	2·42	„	Forres H.R.S.	1·22
„	Bishop's Cannings	2·18	XVIII.	Fearn, Lower Pitkerrie..	·96
„	Blandford, Whatcombe .	2·49	„	N. Uist, Loch Maddy ...	2·18
„	Ashburton, Holne Vic...	4·09	„	Invergarry	1·35
„	Okehampton, Oaklands.	3·27	„	Aviemore H.R.S.	1·72
„	Hartland Abbey	2·08	„	Loch Ness, Drumnadrochit	1·66
„	Lynmouth, Glenthorne.	2·78	XIX.	Invershin	1·66
„	Probus, Lamellyn	4·15	„	Scourie	1·78
„	Wellington, The Avenue	2·22	„	Watten H.R.S.	1·45
„	Wincanton	1·99	XX.	Dunmanway, Coolkelure	5·73
VI.	Clifton, Pembroke Road	1·90	„	Cork, Wellesley Terrace	4·00
„	Ross, The Graig	2·42	„	Killarney, Woodlawn ...	3·72
„	Wem, Clive Vicarage ...	2·27	„	Caher, Duneske	2·67
„	Cheadle, The Heath Ho.	1·85	„	Ballingarry, Hazelfort...	2·04
„	Worcester, Diglis Lock	1·93	„	Limerick, Kilcornan ...	1·74
„	Coventry, Kingswood ...	2·43	„	Broadford, Hurdlestown	1·50
VII.	Grantham, Stainby	2·66	„	Miltown Malbay	2·57
„	Horncastle, Bucknall ...	2·25	XXI.	Gorey, Courtown House	2·93
„	Worksop, Hodsck Priory	2·37	„	Athlone, Twyford	1·92
„	Neston, Hinderton	1·25	„	Mullingar, Belvedere ...	2·40
VIII.	Southport, Hesketh Park	·97	„	Longford, Currygrane...	1·85
„	Broughton-in-Furness ...	1·54	XXII.	Woodlawn	2·19
IX.	Ripon, Mickley	1·73	„	Crossmolina, Enniscooe ..	2·70
„	Melmerby, Baldersby ...	1·75	„	Collooney, Markree Obs.	2·12
„	Scarborough, Obs.	2·66	„	Ballinamore, Lawderdale	2·03
„	Middleton, Mickleton ...	1·31	XXIII.	Lough Sheelin, Arley...	1·60
X.	Haltwhistle, Unthank...	1·11	„	Warrenpoint	2·79
„	Bamburgh	1·86	„	Seaforde	2·22
„	Keswick, The Bank	1·20	„	Belfast, Springfield	2·11
XI.	Llanfrechfa Grange	2·53	„	Bushmills, Dundarave..	1·86
„	Llandoverly	2·24	„	Stewartstown	1·38
„	Castle Malgwyn	3·03	„	Killybegs	2·43
„	Builth, Abergwesyn Vic.	2·66	„	Lough Swilly, Carrablagh	1·21
„	Rhayader, Nantgwilt ...	2·70			

JANUARY, 1897.

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.		
												In shade.	On ground.
I.	London (Camden Square) ...	2.05	+ .43	.83	8	20	47.0	10	23.4	18	15	22
II.	Maidstone (Hunton Court)...	2.22	+ .67	.50	7	12	...	...	...	...	...	...
III.	Strathfieldsaye	2.44	...	.57	8	12	...	...	...	...	...	...
III.	Hitchin	2.25	+ .71	.78	8	18	44.0	6	23.0	23c	25	...
IV.	Winslow (Addington)	2.04	+ .23	.57	8	20	48.0	7	17.0	18	21	25
IV.	Bury St. Edmunds (Westley)	1.99	+ .52	.43	16	16	47.0	1	22.0	24	21	25
V.	Norwich (Brundall)	2.44	...	.49	16	26	45.0	1, 10	22.0	26	21	24
V.	Weymouth (LangtonHerring)	1.95	-.39	.54	7	15	49.0	10	22.5	24	15	...
V.	Torquay (Cary Green)	2.48	...	.73	7	16	50.1	11	24.0	24	11	19
VI.	Polapit Tamar [Launceston]..	3.06	+ .04	.67	29	15	51.3	10	18.5	18	18	20
VI.	Stroud (Upfield)	2.40	+ .20	.43	8	15	47.0	7	21.0	23	21	...
VI.	ChurchStretton(Woolstaston)	2.29	+ .13	.41	8	20	43.5	7	21.0	23d	24	30
VI.	Tenbury (Orleton)	2.15	+ .01	.47	8	18	47.5	7	21.3	18	15	24
VII.	Leicester (Barkby)	1.44	-.32	.26	7	20	44.0	1	12.0	17	24	30
VII.	Boston	1.91	+ .52	.43	8	18	47.0	6	22.0	26	20	...
VII.	Hesley Hall [Tickhill].....	2.39	+ .62	.66	7	21	43.0	1	20.0	24	24	...
VIII.	Manchester(PlymouthGrove)	1.00	-1.46	.30	4	10	43.0	5, 6	18.0	23	21	22
IX.	Wetherby (Ribston Hall) ...	.87	-1.02	.32	8	8	...	...	...	...	...	...
IX.	Skipton (Arncliffe)	2.40	-3.24	.47	4	15	...	...	...	...	...	...
X.	Hull (Pearson Park)	1.85	+ .08	.30	7, 14	19	49.0	1	21.0	26	22	24
X.	Newcastle (Town Moor)	2.09	+ .28	.63	7	20	...	...	...	...	...	...
X.	Borrowdale (Seathwaite).....	2.20	-9.98	.55	3	11	...	...	...	...	...	...
XI.	Cardiff (Ely)	2.26	-1.03	.45	31	15	...	...	...	...	...	...
XI.	Haverfordwest	3.40	-1.02	.67	3	19	50.9	1	19.6	17	12	18
XI.	Aberystwith (Gogerddan) ...	1.38	-2.15	.25	26a	10	48.0	7	11.0	16e	25	...
XII.	Llandudno	1.45	-.83	.32	30	16	50.2	1	24.4	22	...	...
XII.	Cargen [Dumfries]	1.24	-2.53	.36	7	8	47.4	1	16.0	18f	19	...
XII.	Jedburgh (Sunnyside) .....	...	...	...	...	...	...	...	...	...	...	...
XIV.	Colmonell	1.70	...	.45	29	9	48.0	3	18.0	23	...	...
XV.	Lochgilphead (Kilmory).....	1.80	-4.34	.30	25	12	...	...	20.0	14	21	...
XV.	Mull (Quinish)	1.56	-4.11	.80	4	10	...	...	...	...	...	...
XVI.	Loch Leven Sluices	1.90	-1.00	.50	8	9	...	...	...	...	...	...
XVI.	Dundee (Eastern Necropolis)	1.75	-.22	.40	30	16	48.1	1	22.3	25	21	...
XVII.	Braemar	1.76	-.93	.22	9	20	48.3	7	13.4	23	24	30
XVII.	Aberdeen (Cranford)	3.18	...	.94	30	27	44.0	1, 2	20.0	16	21	...
XVII.	Cawdor (Budgate)	1.58	-.59	.65	30	11	...	...	...	...	...	...
XVIII.	Strathconan [Beaully]	1.70	-3.18	.65	8	5	...	...	...	...	...	...
XVIII.	Glencarron Lodge.....	2.05	...	.40	24	17	49.3	2	19.1	17	24	...
XIX.	Dunrobin	1.36	-1.10	.50	30	8	48.8	3	23.8	25	20	...
XIX.	S. Ronaldsay (Roeberry).....	1.43	-1.52	.21	26	22	46.0	2	24.0	25	20	...
XX.	Darrynane Abbey.....	3.17	...	.56	29	22	...	...	...	...	...	...
XX.	Waterford (Brook Lodge) ...	3.44	-.12	.60	6	16	50.0	3	20.0	18	16	...
XX.	O'Briensbridge (Ross)	1.74	...	.57	31	13	...	...	...	...	...	...
XXI.	Carlow (Browne's Hill)	2.55	-.35	.46	5	18	...	...	...	...	...	...
XXI.	Dublin (FitzWilliam Square)	2.69	+ .83	.58	6	17	51.3	3	25.0	17	13	21
XXII.	Ballinasloe	2.01	-1.07	.41	29b	16	48.0	2	23.0	16	15	...
XXII.	Clifden (Kylemore)	4.64	...	1.18	29	17	...	...	...	...	...	...
XXIII.	Waringstown	2.26	-.39	.57	29	15	48.0	2	16.0	16	23	26
XXIII.	Londonderry (Creggan Rea.)	1.61	-1.81	.41	29	19	...	...	...	...	...	...
XXIII.	Omagh (Edenfel)	1.55	-1.47	.44	29	15	48.0	2	17.0	16	18	27

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

a—and 31. b—and 31. c—and 26. d—and 24. e—and 17. f—and 24.

METEOROLOGICAL NOTES ON JANUARY, 1897.

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.

HITCHIN.—A very cold month. There have not been such S drifts, or so many roads blocked, since April, 1876.

ADDINGTON.—Rain and S on a good many days. The 23rd was a very wild day, a high wind blowing the S of the previous night into great drifts, blocking some of the roads in the district. From the 16th to the end the temp. was low, the average max. being only 35°, and the average min. of the same time 25°. Foggy on three days.

BURY ST. EDMUNDS, WESTLEY.—The month was mild till the 16th, then much S and wintery weather till the end. The snow was heavily drifted in some places, and a snow plough was very useful. S on 8 days.

NORWICH, BRUNDALL.—A rough, wintery month, with much snow during the second half. Strong gales with blinding S storms occurred on the 22nd and 23rd, and the drifts exceeded any in these parts since January, 1881. Mean temp. about 3° below average. Range of temp. unusually small. Winter aconite in flower on 1st, snowdrop on 9th, and crocus on 14th; all unusually early. Aurora on 2nd; fog on 5th; H on 14th. S on the ground from 17th to 31st inclusive.

WEYMOUTH, LANGTON HERRING.—With the exception of the 2nd, the first fourteen days were mild. From the 4th to the 12th there was a good deal of wet and fog. On the 15th the weather became much colder, and remained cold to the end of the month. The mean temp. at 9 a.m. (35°·8) is 2°·8 below the average of 25 years. Very little snow fell, and it never quite covered the ground. Fogs on 4 days.

TORQUAY, CARY GREEN.—Rainfall ·76 in. below the average. Mean temp. 39°·0, or 2°·6 below the average. Duration of sunshine 59 hours 55 minutes, being 7 hours 35 minutes below the average; twelve sunless days.

POLAPIT TAMAR [LAUNCESTON].—A cold, seasonable month, and, though rather wet during the first week and the last four days, the total rainfall is less than the average. Thick fog till 10.30 a.m. on 11th. Squally, with S, about 4.30 p.m. on 22nd, and S for 20 minutes at 2.30 p.m. on 23rd.

STROUD, UPFIELD.—Severe S storm from N.W. on 22nd, when about three-quarters of an inch fell; S also on 9th, 21st, 25th, 27th, 30th, and 31st.

WOOLSTASTON.—A severe month, with continued frost. S fell lightly on 9 days, but there was no heavy fall. Mean temp. 32°·7.

TENBURY, ORLETON.—A very cold, dismal month, with a mean temp. more than 3°·5 below the average of 36 years. No intense cold, but a succession of slight night frosts, with cloudy days. From the 4th to the 13th neither sun, moon, nor stars were ever visible. S on 9 days.

LEICESTER, BARKBY.—A cold month, especially so during the latter half. Very little sunshine. About 4 inches of S. Mean temp. 33°·1.

MANCHESTER, PLYMOUTH GROVE.—Mean temp. 34°·0—the lowest for January since observations commenced in 1868, with the exception of 1871, 1879, and 1881; and the driest January since 1868, with the exception of 1880, 1881, and 1896. Slight falls of S on the 9th and 19th; S storm on the 22nd; and S on 24th, 25th, 26th, and 29th. Dense fog on the 11th, 18th, and 19th. The last ten days very wintery.

WALES.

HAVERFORDWEST.—January commenced fine, but on the 3rd it became gloomy, wet, and stormy, and continued so until the 13th, when the sky cleared, the wind veered to N.E., and a fine, bright, frosty period set in, which lasted until the 22nd, when S fell, and again on 25th, covering the Precelly range. Afterwards the wind shifted to N.W., with heavy S and H showers, and cold, precarious weather prevailed to the end.

ABERYSTWITH, GOGERDDAN.—S fell on the 26th, 27th, and 28th to a depth of about three inches.

SCOTLAND.

CARGEN [DUMFRIES].—Although no very sudden fluctuations of temp. occurred during the month, which was uniformly cold, there was considerable difference in the mean temp. of the last 19, as compared with the first 12, days. From 1st to 12th, when the thermometer was only once below freezing point, the mean temp. was $38^{\circ}4$; from 13th to 31st, when frost was registered on every day except 20th, the mean was $31^{\circ}8$. The mean for the month is $3^{\circ}5$ below the average of 38 years. The rainfall (of which upwards of .50 in. fell in the form of S) shews a great deficiency from the average, and is one of the lowest on record; only in the years 1880 and 1881 was less recorded. Owing to the continued frost, curlers had a merry time, but little progress was possible with farm work. S on 16th, $2\frac{1}{2}$ inches deep; on the 24th, 2 inches; and on the 29th, $2\frac{1}{2}$ inches.

COLMONELL.—Rainfall 2.99 in. below the average of 20 years. Mean temp. $1^{\circ}4$ below the average.

BRAEMAR.—A month of dreary, unsettled weather.

ABERDEEN, CRANFORD.—Gale of wind from the N. and a heavy snowstorm on the 26th, 27th, and 28th.

S. RONALDSAY, ROEBERRY.—A very good month, although cold, until the 24th, when a very severe S storm came on, which continued to the end of the month. Mean temp. $35^{\circ}5$; $2^{\circ}5$ below the average of 7 years.

IRELAND.

DARRYNANE ABBEY.—Rainfall below the average. Sharp frosts during the third week, with H, and a few flakes of S on 26th.

WATERFORD, BROOK LODGE.—S on 15th, 17th, 22nd and 23rd. Mean temp. $37^{\circ}9$.

O'BRIENSBRIDGE, ROSS.—R much under the average. Many fine and bright days in the middle of the month, with slight frosts.

DUBLIN.—Opening with a brilliantly fine day, January, 1897, proved a cold, changeable month. Between the 3rd and the 10th, inclusive, there was an abundant rainfall, with S.E. winds; the weather was open at this time, but after the 14th, frequent frosts occurred, and S fell from time to time. Mean temp. $38^{\circ}1$, or $3^{\circ}3$ below the average. Foggy on 9 days. High winds on 11 days, reaching the force of a gale on 4 days. S or sleet fell on 5 days, and H on 5 days.

CLIFDEN, KYLEMORE.—Stormy weather on 1st, 5th, 7th and 29th; strong east gale on 6th. S showers on 26th.

OMAGH, EDENFEL.—The polar, or easterly winds, which prevailed almost without intermission during the month, resulted in weather which may be called of sub-acute severity, for although it froze on 27 nights, sometimes severely, on no day was a temperature of freezing maintained throughout. There was a deficient rainfall, and little or no snow.

SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

CCCLXXIV.]

MARCH, 1897.

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

SUNSHINE AT KIMBERLEY, S. AFRICA.

THE numbers given below represent the results of three years' (1894-96) observations on the duration of sunshine, taken at the Meteorological Observatory maintained by the De Beers' Company at Kenilworth, near Kimberley. They may possibly interest your readers, since in magnitude they cannot be surpassed by many stations on the earth's surface. In fact one almost gets tired of the perpetual brightness of the sky, and longs for the too-much maligned "leaden" sky of England, of which, as will be seen from the tables, we get only a fortnight's experience in three years.

The quantities for each hour are expressed in minutes, only the monthly and yearly totals being reduced to hours. The number of rainy days, and the amount of rainfall, are put in for comparison. Under the heading "No. of days" will be seen two columns of numbers: the first of these gives the number of days on which a measurable quantity fell, the second all days on which any rain fell. The amounts of rain too small to measure are written .000, in accordance with the custom followed in Natal.

Of course three years is too short a period for fruitful discussion. It is, however, perhaps worth while to point out that if the sequences hold good for ten or twenty years, then the greater the rainfall the later the hour of maximum sunshine. Attention may be called also to the winter sunshine, particularly, for example, that of July, 1896, where between the hours of X. and XI. only eight minutes of cloudy sky were registered. Indeed for that same hour, the record is only broken for ten minutes from June 17th to August 6th (inclusive)—fifty days.

The instrument used is a Jordan Photographic Recorder, by Negretti & Zambra, of the twin semi-cylinder pattern. The record is measured after a development (for as near as possible fifteen minutes) in rain water—that is, when rain water can be obtained. When there is no rain water, river (Vaal) or spring water has to be used. I do not fancy that the different waters make any difference in the result. River and spring waters certainly bleach the charts

(Continued on page 20.)

Kimberley Sunshine, 1896. Taken with a Jordan Recorder (twin semi-cylinder pattern).

1896.	RAINFALL.												No. of days without Sunshine.	No. of days Inches.						
	V	VI	VII	VIII	IX	X	XI	NOON	I	II	III	IV			V	VI	VII	MONTH.		
Jan.	mins. 478	mins. 1374	mins. 1450	mins. 1583	mins. 1549	mins. 1565	mins. 1550	mins. 1521	mins. 1410	mins. 1336	mins. 1231	mins. 1113	mins. 967	mins. 421	hours. 292	mins. 28	11	14	1.48	
Feb.	184	1245	1335	1391	1343	1411	1370	1262	1191	1199	1270	1105	990	173	257	49	7	13	.98	
March	10	1033	1458	1444	1506	1534	1494	1436	1356	1220	1258	1024	578	9	256	0	14	18	2.74	
April	...	300	1290	1343	1433	1415	1409	1381	1483	1359	1256	1176	256	...	235	1	11	12	2.98	
May	...	...	1097	1450	1547	1613	1523	1574	1653	1623	1538	1168	13	...	246	39	7	9	2.25
June	...	...	862	1390	1405	1417	1358	1431	1438	1483	1349	740	...	...	214	33	6	8	.56
July	...	5	1323	1785	1840	1852	1831	1831	1850	1829	1747	1194	7	...	284	54	...	...	...
Aug.	...	131	1331	1545	1586	1711	1709	1661	1670	1621	1536	1182	95	...	262	58	4	4	.43	
Sept.	...	632	1613	1713	1710	1691	1690	1680	1633	1621	1650	1589	527	...	295	49	...	2	.00	
Oct.	45	1291	1597	1745	1750	1701	1620	1609	1562	1454	1394	1334	937	38	301	17	4	7	.25	
Nov.	342	1236	1351	1455	1516	1479	1382	1453	1450	1283	1311	1102	1055	272	278	7	10	11	.98	
Dec.	530	1181	1120	1254	1453	1425	1291	1206	1097	1026	986	939	828	301	243	57	16	17	8.42	
Totals...	1,589	8,428	15,827	18,098	18,638	18,814	18,227	18,045	17,793	17,054	16,526	13,666	6,253	1,214	3169	32	4	90	115	21.07

more; but rain water gives them a much cleaner and brighter appearance.

The exposure is good. The horizon is scarcely broken, save here and there by a "tailings" heap and a few inevitable gum trees. These last though are not of much account, since they tend to turn their leaves edgewise to the sun, and throw very little shadow.

No correction has been made for refraction, or for the want of actinic power in the sunlight when the sun is low and the atmosphere more or less dusty.

The rain-guage is an eight-inch, of the Meteorological Office pattern, mounted with its rim three feet above ground, the receiving chamber being protected from the rays of the sun by a stout wooden box.

Our position is—

Lon. 24° 27' E. Lat. 28° 42' S.

Altitude about 3,900 feet.

J. R. SUTTON, B.A.

The Kenilworth Observatory, Kimberley, S. Africa.

Mr. W. Ellis, F.R.S., has very kindly calculated the percentage of the possible duration, which the results given in the foregoing tables represent:—

Kimberley.—Percentage of Sunshine.

	1894.		1895.		1896.
January	66	.....	76	.....	69
February	52	.....	69	.....	68
March	68	.....	59	.....	68
April	81	.....	71	.....	69
May	73	.....	83	.....	75
June	84	.....	87	.....	69
July	85	.....	82	.....	88
August	82	.....	85	.....	77
September	79	.....	85	.....	83
October	74	.....	77	.....	76
November	79	.....	70	.....	69
December	72	.....	72	.....	57
The Year	74	.....	76	.....	72

THE TEMPERATURE OF FEBRUARY, 1897.

THE weather of the latter part of February, 1897, was marked by unusual and almost unprecedented mildness, and we have searched our own record at Camden Square, which now extends over nearly 40 years, for comparable periods in the past.

Taking the month as a whole we find nothing very exceptional:—

The mean 9 a.m. temp., 42°·6, has been exceeded in 6 years, the highest being 45°·8 in 1869.

The absolute max., 58°·0, has been exceeded in 7 years, the highest being 62°·5 in 1868,

The average max., 48°·4, has been exceeded in 8 years, the highest being 51°·7 in 1869.

The absolute min., 27°·9, has been exceeded in 6 years, the highest being 31°·4 in 1872.

The average min., 39°·0, has been exceeded in 3 years, the highest being 40°·6 in 1869.

From the above we see that the month, notwithstanding its being decidedly warm, shows no very exceptional value, though the average min. is as high only once in 13 years.

Turning now to the warm period towards the end of the month, we find that for ten consecutive days, from 18th to 27th, the absolute max. was 50° or higher, For 8 consecutive days, from 19th to 26th, the 9 a.m. and 9 p.m. temperatures were above 45°, and for the 8 days, 20th to 27th, the min. were above 40°, while for the 9 consecutive days, 19th to 27th, the mean temp. was 48°·2, and above 45° each day.

The following table gives the readings and the means for this period:—

TABLE I.—*Shade Temperature at Camden Square, London, February 19th to 27th, 1897.*

DATE.	9 A.M.	9 P.M.	MAX.*	MIN.	MEAN
					9 A.M. 9 P.M. M. and m.
19th	46°·4	48°·9	50°·1	39°·3	46°·2
20th	47°·2	46°·3	53°·7	46°·2	48°·4
21st	45°·6	46°·2	51°·6	43°·6	46°·7
22nd	50°·1	51°·8	57°·0	44°·6	50°·9
23rd	45°·1	46°·6	53°·4	44°·3	47°·4
24th	46°·7	46°·7	50°·0	45°·3	47°·2
25th	48°·4	50°·4	52°·2	46°·1	49°·3
26th	51°·9	48°·2	58°·0	48°·4	51°·6
27th	44°·8	42°·0	52°·8	43°·8	45°·8
Average ...	47°·4	47°·5	53°·2	44°·6	48°·2

* The Max. Temp. on the 18th was 53° 3.

The conditions shown in this table are far eclipsed by 1869, when from Jan. 28th to Feb. 17th—a period normally considerably colder—the mean temp. averaged $48^{\circ}3$; and during the whole 21 days there were only 3 with a mean below 45° ; the only element in which the 9 days of 1897 exceeds the 21 days of 1869 being the average min., $44^{\circ}6$ for the former and $43^{\circ}3$ for the latter.

This period of 1869 is so remarkable that we give the whole of the readings in Table II. :—

TABLE II.—*Shade Temperature at Camden Square, London, January 28th to February 17th, 1869.*

DATE.	9 A.M.	9 P.M.	MAX.	MIN.	MEAN 9 A.M. 9 P.M. M. and m.
Jan. 28...	47 ^o ·2	49 ^o ·5	53 ^o ·8	37 ^o ·6	47 ^o ·0
„ 29...	46·8	45·5	51·9	46·2	47·6
„ 30...	44·0	49·5	52·7	40·4	46·7
„ 31...	52·6	53·1	56·3	43·0	51·2
Feb. 1...	52·8	49·0	55·1	51·2	52·0
„ 2...	44·0	40·8	49·2	42·4	44·1
„ 3...	48·4	51·2	55·0	33·9	47·1
„ 4...	53·0	49·8	57·2	43·5	50·9
„ 5...	50·2	48·2	60·8	45·8	51·3
„ 6...	48·2	46·2	57·8	42·8	48·8
„ 7...	52·3	50·0	53·7	42·5	49·6
„ 8...	53·2	53·0	54·0	48·8	52·2
„ 9...	49·8	46·5	50·8	47·6	48·7
„ 10...	50·5	51·8	55·7	44·6	50·6
„ 11...	54·0	48·7	56·4	49·8	52·2
„ 12...	42·0	37·8	50·8	41·9	43·1
„ 13...	40·1	42·8	48·8	32·0	40·9
„ 14...	46·5	48·8	50·5	38·6	46·1
„ 15...	47·2	46·3	49·2	45·6	47·1
„ 16...	47·6	50·9	52·4	43·9	48·7
„ 17...	50·8	46·2	53·6	46·8	49·4
Average ...	48·6	47·9	53·6	43·3	48·3

Selecting the warmest 9 consecutive days in Feb. 1869 and comparing them with the 1897 means at the foot of Table I., we have—

		9 a.m.	9 p.m.	Max.	Min.	Mean Temp.
1869.	Feb. 3-11.	51·1	49·5	55·7	44·4	50·2
1897.	Feb. 19-27.	47·4	47·5	53·2	44·6	48·2
Excess	1869. ...	3·7	2·0	2·5	—	2·0
in	1897. ...	—	—	—	0·2	—

showing higher values in 1869, except in the one element of min. temp. where the difference is trifling.

In the whole of the 40 Februaries over which the observations extend, we have been able to find only 5 instances of 9 warmest days in which any one component (*i.e.*, 9 a.m., 9 p.m., max. or min.)

of the mean temp. exceeded the corresponding value for 1897. These are set out in Table III., which is self-explanatory. It shows that although no year but 1869 can show a warmer nine-day period in February than 1897, one or two run it very close, notably 1877.

TABLE III.—*Warm Nine-day Periods in February.*

YEAR.	PERIOD.	9 A.M.	9 P.M.	MAX.	MIN.	MEAN.	No. of Components higher than in 1897.
1867	12th - 20th	47·4	47·6	52·7	42·9	47·6	1
1868	21st - 29th	47·8	45·6	53·9	41·9	47·3	2
1869	3rd - 11th	51·1	49·5	55·7	44·4	50·2	4
1876	15th - 23rd	48·2	47·0	52·8	43·0	47·8	1
1877	7th - 15th	48·8	47·4	53·8	42·3	48·1	2
1897	19th - 27th	47·4	47·5	53·2	44·6	48·2	...
No. of instances higher than 1897.	} ...	4	2	3	0	1	10

THE GALE OF MARCH 3RD, 1897.

THE damage caused by the above gale all along the south coast of England has been so fully described in the newspapers, that we do not think it necessary to dwell upon it—but the two following notes from old correspondents give details not to be found elsewhere.

To the Editor of the Meteorological Magazine.

SIR,—The gale on Ash Wednesday morning was sufficiently severe to attract your attention and investigation, so here are some notes from North Cadbury.

MARCH 2nd.—Wind rose suddenly at 3 p.m., and barometer, which had fallen slowly all morning, fell rapidly after 4 p.m.; by 10 p.m. it was down to 28·90 (aneroid).

MARCH 3rd.—4 a.m., at 28·83; 7 a.m., 28·84; rapid rise began about 8 a.m., and then the wind, which had been *strong* for the previous 17 hours, became *serious*; just before 9 it became *alarming*. S.W. overnight, it had slowly veered to due W. and there it stuck. It had rained off and on from the said 3 p.m., pretty continuously though, and now began to snow; at 9 a.m. I went out to measure the rain (·70 in.) under great difficulties from the fury of the wind. A large elm had fallen across a road into my paddock just before. I saw a thorn go while at the rain-gauge; another elm went immediately

after. Mrs. Boys saw the two elms go. I won't enumerate all the disasters, trees, chimneys, thatch, tiles, &c. But though there is no getting accurate time from anyone else, I am pretty sure that most of the damage was done, as in the Midland hurricane, in a very short time—between 9 and 9.15 a.m. It was *not* so bad as the Midland hurricane at Easton Mauduit, Northamptonshire, in 1895, but not far short of it. The general testimony of my farmers is “worst wind they ever knew.”

You may be interested to learn that 17 panes of glass (nearly a square yard) in the westernmost window of the S. side of the Church were *blown outwards*. Not a scrap of glass was inside. They were *not* exposed to the wind.

I cannot tell when this glass went. Can only infer that at the time of the great blasts (9—9.15) there was diminished pressure outside the building, and so the weakest glass went.—Yours very truly.

H. A. BOYS.

North Cadbury Rectory, Bath.

To the Editor of the Meteorological Magazine.

SIR,—A terrific W.N.W. gale blew from 6.30 to 7 a.m. this morning, causing much damage to roofs and trees. The barometer (corrected to 32° and sea level) fell from 29.852 in. at 8.15 a.m. yesterday (2nd) to 28.860 in. at 2.50 a.m. this morning (as much as 0.158 in. from 5 to 6 p.m., when it was 29.289 in.), and rose to 29.620 in. at 9.17 p.m. this evening. The temperature rose from 34°0 in the early morning of the 2nd to 49°2 last evening, fell to 37°2 between 9.17 and 11.40 a.m. to-day, and rose to 44°1 since. The dry and wet bulb thermometers read 40°6 and 39°1, with a light W. wind and cloudy sky at 9.17 a.m.; 48°9 and 48°0, with a S.S.W. gale and slight rain at 9.17 p.m. yesterday; 41°0 and 35°3, with a W.N.W. gale and clouds at 9.17 a.m., and 39°8 and 37°1, with a W.N.W. breeze and clear sky at 9.17 p.m. to day. A solar halo was seen from 10 to 11 a.m. yesterday; showers fell to 1.47 p.m., rain from 2.45 to 9.25 p.m. (heavy at times from 4 to 6 p.m.), and showers after 11.5 p.m. yesterday, with H. and S. to-day and L. about 1 a.m.; 1.00 in. fell in 12 hours ending 9.17 p.m. yesterday, 0.07 in. more up to 9.17 a.m. to-day, and 0.04 in. to 9 p.m. A heavy S. gale blew from 7 to 7.30 p.m. yesterday, which veered to S.W. and lulled at 10 p.m., but rose again in the early morning and veered to W.N.W. at 6.30 a.m., and blew very hard till 8 a.m. to-day.—Yours truly,

EDWIN E. GLYDE.

Rose Villa, Tavistock, March 3rd, 1897.

THE HEREFORD EARTHQUAKES.

WE have just found in a privately printed paper by H. Lawson, F.R.S., the following remarkable confirmation of our suggestion as to the frequency of Hereford earthquakes—

1841.—“An unusual phenomenon in this part of England occurred in Hereford on the morning of the 25th of January, when about 3 o'clock the shock of an earthquake was sensibly felt in Castle Street, Harley Court, the High-town and Bewell Street, and produced the emotion of fear in all those who felt it, *viz.*, eight persons. It was spoken of by them as causing an indescribable sensation, accompanied by the apparent tilting of the bed on which they were lying. The wind was still and about N.W.; and freshened about half an hour afterwards, when a considerable fall of snow followed. At the same hour in the neighbourhood of Carmarthen a very smart shock of an earthquake took place.”—H. LAWSON, F.R.S.

ROYAL METEOROLOGICAL SOCIETY.

At the meeting of this Society on Wednesday evening, Feb. 17th, Mr. Edward Mawley, F.R.H.S., President, read a report on the “Phenological Observations during the Past Year.” He showed that throughout the flowering season wild plants came into bloom much in advance of their usual time, and were, as a rule, earlier than in any year since 1893. The wealth of blossom on nearly all kinds of trees and shrubs was a noteworthy feature of the spring and early summer, while the abundance of wild fruits in the autumn was even more exceptional. From an agricultural and horticultural point of view the one great drawback of the year, which must otherwise have proved one of the most bountiful on record, was a drought that lasted almost without break—at all events, as far as vegetation is concerned—from March to September. The wheat crop proved the largest and best for many years, while there was a good yield of barley and potatoes. The small fruits were also good. With these exceptions, all the farm and garden crops were more or less indifferent, the crop of hay being particularly scanty.

The Hon. Rollo Russell gave the results of some observations on “Haze and Transparency,” which he had made at Haslemere, in Surrey. From these it appears that the clearest hours at a good distance from towns are from about noon to 3 p.m. The clearest winds at Haslemere are those from S. to N.W. inclusive, and especially W.S.W., W., and W.N.W.; the haziest are those between N. and E. On bright mornings, with a gentle breeze or calm, from autumn to spring, the haze of fog which has lain on the low ground, frequently covers the hills in the course of its ascent a few hours after sunrise. At any distance within 100 miles of London, or of the Black Country, observations requiring clear views are likely to be interfered with, when the wind blows from their direction, and should therefore be taken early.

SEISMOLOGICAL SURVEY OF THE WORLD.

WE have been requested to insert the following circular, so that this important undertaking may be generally known. The invitations for assistance have, we understand, been in many cases forwarded by the Foreign Office, and by the Colonial Office. Obviously, it is desirable that all parts of the earth should be represented, and it is not necessary or expedient that the observatories should be near one to another.—ED.

British Association for the Advancement of Science.

SEISMOLOGICAL COMMITTEE.

Lord KELVIN, F.R.S.
 Professor W. G. ADAMS, F.R.S.
 Dr. J. T. BOTTOMLEY, F.R.S.
 Sir F. J. BRAMWELL, Bt., F.R.S.
 Professor G. H. DARWIN, F.R.S.
 Mr. HORACE DARWIN.
 Major L. DARWIN.
 Dr. C. DAVISON, *Secretary*.
 Mr. G. F. DEACON.
 Professor J. A. EWING, F.R.S.

Professor C. G. KNOTT.
 Professor G. A. LEBOUR.
 Professor R. MELDOLA, F.R.S.
 Professor J. MILNE, F.R.S., *Sec.*
 Professor J. PERRY, F.R.S.
 Professor J. H. POYNTING, F.R.S.
 Dr. ISAAC ROBERTS, F.R.S.
 Mr. G. J. SYMONS, F.R.S., *Chairman*.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE,
 BURLINGTON HOUSE,
 LONDON, W.

SIR,—It has been established that the movements resulting from a large earthquake originating in any one portion of our globe can, with the aid of suitable instruments, be recorded at any other portion of the same; therefore, the Seismological Investigation Committee of the British Association are desirous of your co-operation in an endeavour to extend and systematize the observation of such disturbances.

Similar instruments should be used at all stations; and the one recommended by this Committee as being simple to work, and one that furnishes results sufficiently accurate for the main objects in view is indicated in the accompanying report (see pp. 2—4) by the letter M, a sketch of the same is shown on p. 7, whilst there is an example of one of its records on p. 49.

We desire to know whether you are disposed to purchase, and make observations with, one of these instruments, the cost of which, including photographic material to last one year, packed for shipment, is about £50. Should you reply in the affirmative, we shall be pleased to arrange with a competent maker for the construction of an instrument for you, and to furnish instructions respecting installation and working. In case an instrument be established at your observatory, we should ask that notes of disturbances having an earthquake character be sent to us for analysis and comparison with the records from other stations. From time to time the results of these examinations would be forwarded to your observatory.

The first object we have in view is to determine the velocity with which motion is propagated around or possibly *through* our earth. To attain this, all that we require from a given station are the times at which various phases of motion are recorded; for which purpose, for the present at least, we consider that an instrument recording a single component of horizontal motion to be sufficient. Other results which may be obtained from the proposed observations are numerous.

The foci of submarine disturbances, such for example as those which from time to time have interfered with telegraph cables, may possibly be determined, and a new light thrown upon changes taking place in ocean beds.

The records throw light upon certain classes of disturbances now and then noted in magnetometers, and other instruments susceptible to slight movements, whilst local changes of level, some of which may have a diurnal character, may, under certain conditions, become apparent.

Trusting that you will find it possible to co-operate in this endeavour to extend our knowledge of the earth on which we live,

We remain, Sir,

(On behalf of the Committee),

Your obedient servants,

G. J. SYMONS, *Chairman.*

C. DAVISON, } *Joint Honorary*
J. MILNE, } *Secretaries.*

It is requested that Replies be addressed to—

THE SEISMOLOGICAL COMMITTEE, BRITISH ASSOCIATION,

BURLINGTON HOUSE, LONDON, W.

PHENOMENAL WEATHER IN VICTORIA.

DR. ARGYLE, writing from Melbourne, on the 17th of January, to his uncle in Tamworth, says, "Our climate, at which we growl quite as much as you do in England, has gone quite mad, I think. The temperature on Thursday week was 101 deg. in the shade and terribly oppressive. On Saturday and Sunday there was a terrific storm, the thermometer dropped nearly 60 deg., and we had 4½ inches of rain in 48 hours. (This in January, usually our driest and hottest month.) To-day it has been hailing and is bitterly cold, but the sun has now come out, and I should not be surprised if it turned out hot again to-morrow. We also had an interesting phenomenon about a fortnight ago; there was a heavy fall of rain, which was full of a red dust, and the next morning the whole landscape was red. The "rain of blood," it was called, and really it looked like it. The funny thing was that it occurred on a public holiday and on a hot day, so that all the holiday-makers who were caught in it had their clothes stained a deep red, and as many people were dressed in white, you may guess what they looked like."—*Tamworth Herald*, 27th Feb., 1897.

ELECTRIC TREES IN DAKOTA.

ON January 4th, during the worst of the great wind and snowstorm at Huron, the air was heavily laden with electricity. The cottonwood trees in front of the Chicago and North-western offices presented a very strange and novel appearance. The trees were buried in snow almost to their tops, but at the end of each twig on every branch in sight was an electrical spark about as large as a common field Pea. On taking hold of a twig the spark extinguished, but on withdrawing the hand the spark reappeared. Dispatcher Wilson, who wore a glove with a hole in the thumb, took hold of a twig, and the spark transferred itself to his thumb and back to the twig when he let go. There was no shock experienced, says an American contemporary, in handling the twigs, and the light did not waver or tremble, but was quite steady. The trees looked as if a colony of fireflies had settled upon them for the purpose of an illumination.—*Journal of Horticulture*, March 4th.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, SEPTEMBER, 1896.

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	71·9	8	39·6	21	64·9	51·5	51·6	82 ⁰⁻¹⁰⁰	114·1	35·3	5·51	22	6·8
Malta	91·1	5 ^a	60·6	29	82·7	68·6	66·0	74	143·7	53·5	·00	0	3·3
<i>Mauritius</i>	79·0	28	60·2	15 ^b	76·3	64·7	60·1	73	126·7	48·8	1·15	8	4·7
Calcutta	93·0	10	72·7	30	88·3	77·8	76·8	83	157·9	71·8	9·05	10	8·3
Bombay	90·9	29	75·0	18	86·6	77·6	74·7	78	143·7	69·8	1·62	9	4·7
Ceylon, Colombo	89·2	26	72·8	10	86·9	77·1	73·6	81	149·0	69·8	10·99	23	6·6
<i>Melbourne</i>	75·8	11	36·8	30	61·4	44·0	43·4	71	132·2	28·1	1·93	12	5·6
<i>Adelaide</i>	80·4	15	40·7	17 ^c	67·1	46·2	45·0	68	135·0	28·7	·45	12	4·3
<i>Sydney</i>	78·0	13	44·6	26	64·9	51·0	44·2	70	130·9	35·3	·52	14	3·6
<i>Wellington</i>	63·5	7	37·0	30	57·9	46·4	44·6	76	125·0	29·0	4·57	18	4·9
<i>Auckland</i>	68·0	11	44·5	23	61·4	50·8	47·7	74	124·0	40·0	4·51	19	5·8
Jamaica, Kingston.....	92·9	8	72·1	22	89·1	74·8	72·9	76	...	...	2·92	12	...
Trinidad	92·0	14	68·0	8 ^d	88·6	72·1	73·9	83	168·0	66·0	6·46	15	...
Grenada	86·4	15	71·0	8	83·7	74·9	71·6	73	154·4	...	8·49	26	4·6
Toronto	86·3	11	27·6	23	66·5	48·0	51·5	79	96·0	21·8	5·09	15	5·5
New Brunswick, Fredericton	85·7	11	27·0	24	64·2	42·3	49·0	77	...	...	7·02	11	5·2
Manitoba, Winnipeg... British Columbia, Esquimalt	78·6	23	20·0	21	62·0	38·4	...	...	...	...	1·96	10	6·5
	69·9	4	37·7	26	61·1	44·5	48·4	86	...	...	1·52	5	8·8

a—and 21. b—and 22. c—and 20, 25. d—and 19.

REMARKS.

MALTA.—Adopted mean temp. 74°·7, or 0°·4 below the average. Mean hourly velocity of wind 8·6 miles. Average temp. of sea 77°·0. Thunderstorm on 14th. Lightning on 17th and 18th. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·1 above, of dew point 0°·2 above, and rainfall ·27 in. below, their respective averages. Mean hourly velocity of wind 11·3 miles, or 0·6 below average; extremes, 26°·2 on 6th, and 2·0 on 21st; prevailing direction, E. by S. T. F. CLAXTON.

CEYLON, COLOMBO.—Lightning was seen on the 6th, 9th 19th, 28th and 29th. Thunderstorms occurred on the 20th, 21st and 30th. A. E. WACKRILL.

Adelaide.—Mean temp. 0°·5 below the average for 39 years. A very dry month, the total rainfall being ·45 in., whilst the average is 1·79 in. A very severe drought over the whole of the colony especially during the past three months. C. TODD, F.R.S.

Sydney.—Rainfall 2·63 in. below, temperature 0°·7 below and humidity 0°·5 below, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Showery up to the 5th, then fine to the 16th and showery for the remainder of the month, with generally strong N.W. and S.E. winds and cold weather. Slight snow on 27th and snow on the hills on 30th. Hail on 27th, 29th and 30th. Mean temp. 1°·2 above, and rainfall ·31 in. above, their respective averages. R. B. GORE.

Auckland.—Beginning and close of the month stormy, wet and disagreeable; middle very fine, warm and dry. Mean temperature and rainfall much in excess of the average. T. F. CHEESEMAN.

TRINIDAD.—Rainfall 1·07 in. below the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,
FEBRUARY, 1897.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	3·04	XI.	Rhayader, Nantgwillt ...	4·19
II.	Dorking, Abinger Hall .	3·37	„	Lake Vyrnwy	6·14
„	Birchington, Thor	1·96	„	Corwen, Rhug	3·09
„	Hailsham	3·18	„	Criceith, Talarvor	3·48
„	Ryde, Thornbrough	3·51	„	I. of Man, Douglas	3·62
„	Emsworth, Redlands ...	3·38	XII.	Stoneykirk, Ardwell Ho.	2·37
„	Alton, Ashdell	3·65	„	New Galloway, Glenlee	4·44
III.	Oxford, Magdalen Col.	2·21	„	Lilliesleaf, Riddell	1·73
„	Banbury, Bloxham	2·77	XIII.	N. Esk Res. [Penicuik]	2·30
„	Northampton, Sedgebrook	2·94	„	Edinburgh, Blacket Pl..	1·42
„	Duddington [Stamford].	2·95	XIV.	Glasgow, Queen's Park..	2·85
„	Alconbury	2·37	XV.	Inverary, Newtown	7·12
„	Wisbech, Bank House...	2·26	„	Oban, The Corran	4·07
IV.	Southend	2·05	„	Islay, Gruinart School...	·91
„	Harlow, Sheering.....	1·04	XVI.	Dollar	2·60
„	Colchester, Lexden	2·33	„	Balquhider, Stronvar...	8·13
„	Rendlesham Hall	2·23	„	Ballinluig	1·99
„	Rushall Vicarage	2·17	„	Dalnaspidal H. R. S.	5·49
„	Swaffham	2·34	XVII.	Keith H. R. S.	·56
V.	Salisbury, Alderbury ...	3·42	„	Forres H. R. S. ...	·62
„	Bishop's Cannings	3·10	XVIII.	Fearn, Lower Pitkerrie..	·66
„	Blandford, Whatcombe .	4·11	„	N. Uist, Loch Maddy ...	4·28
„	Ashburton, Holne Vic...	3·76	„	Invergarry	6·50
„	Okehampton, Oaklands.	4·82	„	Aviemore H. R. S.	1·56
„	Hartland Abbey	5·45	„	Loch Ness, Drumnadrochit	2·42
„	Lynmouth, Glenthorne.	4·01	XIX.	Invershin	1·00
„	Probus, Lamellyn	4·81	„	Scourie	3·40
„	Wellington, The Avenue	4·25	„	Watten H. R. S.	·88
„	Wincanton.....	4·32	XX.	Dunmanway, Coolkelure	6·75
VI.	Clifton, Pembroke Road	3·59	„	Cork, Wellesley Terrace	2·74
„	Ross, The Graig	2·19	„	Killarney, Woodlawn ...	4·15
„	Wem, Clive Vicarage ...	2·07	„	Caher, Duneske .....	...
„	Cheadle, The Heath Ho.	3·14	„	Ballingarry, Hazelfort...	1·78
„	Worcester, Diglis Lock	2·34	„	Limerick, Kilcornan ...	1·22
„	Coventry, Kingswood ...	3·59	„	Broadford, Hurdlestown	1·62
VII.	Grantham, Stainby	3·92	„	Miltown Malbay	3·35
„	Horncastle, Bucknall ...	2·67	XXI.	Gorey, Courtown House	1·98
„	Worksop, Hodsck Priory	3·03	„	Athlone, Twyford	2·42
„	Neston, Hinderton	2·07	„	Mullingar, Belvedere ...	3·35
VIII.	Southport, Hesketh Park	2·51	„	Longford, Currygrane...	2·54
„	Broughton-in-Furness ...	3·51	XXII.	Woodlawn	2·86
IX.	Ripon, Mickley.....	2·70	„	Crossmolina, Enniscoe..	4·65
„	Melmerby, Baldersby ...	1·90	„	Collooney, Markree Obs.	3·30
„	Scarborough, Observat'y	1·92	„	Ballinamore, Lawderdale	3·20
„	Middleton, Mickleton ...	2·17	XXIII.	Lough Sheelin, Arley...	...
X.	Haltwhistle, Unthank...	2·85	„	Warrenpoint.....	2·16
„	Bamburgh	·88	„	Seaforde.....	2·53
„	Keswick, The Bank	4·49	„	Belfast, Springfield	2·47
XI.	Llanfrechfa Grange	3·72	„	Bushmills, Dundarave..	2·37
„	Llandoverly	4·78	„	Stewartstown	2·86
„	Castle Malgwyn	2·77	„	Killybegs	5·32
„	Builth, Abergwesyn Vic.	6·60	„	Lough Swilly, Carrablagh	3·31

FEBRUARY, 1897.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					TEMPERATURE.				No. of Nights below 32°.	In shade.	On grass.	
		Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours	Dpth	Date	Max.		Min.					
							Deg.	Date	Deg.	Date				
		inches.	inches.	in.										
I.	London (Camden Square) ...	2.75	+ .87	.59	4	14	58.0	26	27.9	8	2	9		
II.	Maidstone (Hunton Court) ...	2.32	+ .52	.85	1	10	...	...	...	...	...	...
III.	Strathfieldsaye ...	3.84	...	.78	4	15	...	...	...	...	...	...
IV.	Hitchin ...	2.34	+ .59	.46	5	16	56.0	26	28.0	7	7	...		
V.	Winslow (Addington) ...	2.60	+ .44	.46	5	13	57.0	22	29.0	8, 18	5	10		
VI.	Bury St. Edmunds (Westley) ...	2.33	+ .77	.58	5	14	56.0	26	28.0	3	...	...
VII.	Norwich (Brundall) ...	2.17	...	.58	5	18	57.8	26	27.4	3	6	12		
VIII.	Weymouth (Langton Herring) ...	4.43	+ 1.83	1.29	4	17	53.0	14b	32.0	1	1	...		
IX.	Torquay (Cary Green) ...	2.98	...	.79	4	15	56.4	20c	35.0	1, 17	0	2		
X.	Polapit Tamar [Launceston]..	3.94	+ .67	.75	1	18	53.4	23	30.0	15	3	3		
XI.	Stroud (Upfield) ...	2.94	+ .38	.54	19	17	56.0	22	33.0	1 & 2	0	...		
XII.	Church Stretton (Woolstaston) ...	2.39	— .06	.35	1	17	58.0	23	31.0	2e	8	15		
XIII.	Tenbury (Orleton) ...	2.21	— .27	.39	1	12	61.5	22	26.8	28	3	11		
XIV.	Leicester (Barkby) ...	2.78	+ .97	.96	5	18	57.0	26	24.0	27	11	18		
XV.	Boston ...	2.90	+ 1.22	.76	4	15	52.0	26	27.0	12	9	...		
XVI.	Hesley Hall [Tickhill] ...	2.68	+ 1.18	.86	5	17	57.0	26	25.0	12	11	...		
XVII.	Manchester (Plymouth Grove) ...	2.39	+ .34	.42	1	19	54.0	28	27.0	6	5	7		
XVIII.	Wetherby (Ribston Hall) ...	1.24	— .34	.60	6	4	...	...	...	...	...	...
XIX.	Skipton (Arncliffe) ...	5.81	+ 1.12	1.28	25	17	...	...	...	...	...	...
XX.	Hull (Pearson Park) ...	2.53	+ .73	.72	5	15	59.0	26	25.0	1	11	13		
XXI.	Newcastle (Town Moor) ...	1.13	— .27	.30	5	11	...	...	...	...	...	...
XXII.	Borrowdale (Seathwaite) ...	12.42	— .22	2.68	8	19	...	...	...	...	...	...
XXIII.	Cardiff (Ely) ...	4.79	+ 1.60	.65	4	22	...	...	...	...	...	...
XXIV.	Haverfordwest ...	3.52	— .60	.62	18	23	52.9	26	29.7	28	2	8		
XXV.	Aberystwith (Gogerddan) ...	4.96	+ 1.70	.58	19	21	51.0	10	...	...	...	...
XXVI.	Llandudno ...	2.37	+ .45	.30	1	20	55.0	26	34.5	1	0	...		
XXVII.	Cargen [Dumfries] ...	3.63	— .02	.78	24	14	57.6	22	25.0	12	8	...		
XXVIII.	Jedburgh (Sunnyside) ...	...	...	...	...	...	...	...	...	...	...	...
XXIX.	Colmonell ...	2.63	...	.51	28	18	56.0	19	26.0	11	...	...
XXX.	Lochgilthead (Kilmory) ...	4.02	— 1.17	.77	24	18	...	...	24.0	9	5	...		
XXXI.	Mull (Quinish) ...	3.30	— 2.17	.66	4	19	...	...	...	...	...	...
XXXII.	Loch Leven Sluces ...	2.40	— .35	1.00	26	11	...	...	...	...	...	...
XXXIII.	Dundee (Eastern Necropolis) ...	.85	— 1.25	.35	25	14	59.5	22	25.6	3	9	...		
XXXIV.	Braemar ...	1.52	— 1.84	.42	25	11	54.0	22	— 7.0	4	12	16		
XXXV.	Aberdeen (Cranford) ...	.60	...	.20	28	13	...	...	7.0	3	16	...		
XXXVI.	Cawdor (Budgate) ...	.98	— 1.25	.21	25	11	...	...	...	...	...	...
XXXVII.	Strathconan [Beaully] ...	3.95	— .76	1.07	26	10	...	...	...	...	...	...
XXXVIII.	Glencarron Lodge ...	6.32	...	1.37	25	21	52.5	19	17.9	4	12	...		
XXXIX.	Dunrobin ...	1.22	— .87	.32	20	11	56.0	23	20.0	4	10	...		
XL.	S. Ronaldsay (Roseberry) ...	1.50	— 1.14	.19	25	20	50.0	22d	21.0	3	12	...		
XLI.	Darrynane Abbey ...	4.12	...	.39	12	22	...	...	...	...	...	...
XLII.	Waterford (Brook Lodge) ...	2.13	— 1.95	.37	3	18	57.0	22	31.0	28	1	...		
XLIII.	O'Briensbridge (Ross) ...	2.73	...	.49	24	22	...	...	...	...	...	...
XLIV.	Carlow (Browne's Hill) ...	1.80	— 1.28	.21	28	16	...	...	...	...	...	...
XLV.	Dublin (Fitz William Square) ...	1.40	— .95	.27	2	16	59.7	19	35.0	1	0	4		
XLVI.	Ballinasloe ...	2.44	— .34	.46	1	22	54.0	25	31.0	25	2	...		
XLVII.	Clifden (Kylemore) ...	5.63	...	.94	24	22	...	...	...	...	...	...
XLVIII.	Waringstown ...	2.43	— .02	.34	4	18	57.0	25	28.0	11	5	12		
XLIX.	Londonderry (Creggan Res.) ...	2.97	— .06	.50	24	22	...	...	...	...	...	...
L.	Omagh (Edenfel) ...	3.42	+ .73	.64	8	19	54.0	25	30.0	11	3	8		

+ Shows that the fall was above the average ; — that it was below it.
a—and 24. b—and 26. c—and 22. d—and 23, 25 and 26. e—3 and 18.

METEOROLOGICAL NOTES ON FEBRUARY, 1897.

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.

ADDINGTON.—The heavy rainfall on the first five days of the month, helped by the rainfall of the last four days of January, caused very large and continuous floods, the meadows being covered with water to a very wide extent for a longer time than usual. A very thick fog on the 23rd; high wind on the 24th, 25th and 26th. Weather generally dull.

BURY ST. EDMUNDS, WESTLEY.—A mild month, the latter part very fine and favourable for agriculture. Vegetation forward.

NORWICH, BRUNDALL.—The earlier part of the month was rainy and sunless; the latter part bright, and some days were unusually warm for the season. A heavy fall of S occurred at night on 1st, the ground being covered for four days. Fog on 3rd. Floods on marshes on 7th. Gale from 4 a.m. to 6 a.m. on 21st; some gusts very violent.

WEYMOUTH, LANGTON HERRING.—The month was very mild throughout; from the 1st to the 13th no less than 3.69 in. of R fell. With the exception of 1881 and 1883, when 4.76 in. and 4.73 in. fell respectively, the wettest February in 23 years. The average temp. at 9 a.m., 43°·7, is 4°·5 above the average, and the highest since 1877, when it was 44°·0. February, 1897, and February, 1895, compared, show a striking difference:—

		Average, 9 a.m.		Min.		Max.
1897	.....	43°·8	.....	40°·5	.....	48°·2
1895	.....	27°·0	.....	23°·7	.....	33°·8

Fogs occurred on 10 days (some of them dense) in the first half of the month. February was without frost, the 32° registered on the 1st being the temp. of the evening of January 31st.

TORQUAY, CARY GREEN.—Rainfall .46 in. above the average; mean temp. 46°·6, or 3°·6, above the average. Duration of sunshine 52 hours, being 26 hours 45 minutes below the average; 11 sunless days.

POLAPIT TAMAR [LAUNGESTON].—A very wet and unseasonably warm month. Exactly seven inches of rain has fallen during the two months of the year, compared with 1.89 in. for the corresponding period of 1896.

STROUD, UPFIELD.—S.W. gale on 26th. Wind S.W. on 15 days, S.E. on 4 days, and N.W. on 7 days.

WOOLSTASTON.—A seasonable month, with no extremes of temp. S fell on the 2nd. Mean temp. 42°·3.

TENBURY, ORLETON.—The first five days were very wet and damp, with a large amount of fog; but afterwards the weather was fine, with a large percentage of sun. From the 13th to the end of the month the temp. reached 50° on every day, and the mean temp. of the month is more than 3°·5 above the average. S about two inches deep on 2nd.

LEICESTER, BARKBY.—Warmth above average. Very high winds during the last week. Mean temp. 41°·2.

WALES.

Haverfordwest.—One of the most gloomy, foggy and wet Februaries ever registered here, although the rainfall was never at any time large. There was very little frost and there were no gales of any magnitude. Lunar halos were

seen on the 14th and 16th. Fog occurred on 18 days and the wind blew mostly from southerly points. The readings of the bar. were remarkably high on the 15th, 16th, and 17th, and again on the 21st, 22nd, and 23rd. Highest 30·673 in. (cor. and red.) at 9 p.m. on the 22nd.

ABERYSTWITH, GOGERDDAN.—Very stormy throughout the month and very mild and sunless.

SCOTLAND.

CARGEN [DUMFRIES].—The month was characterized by constant atmospheric fluctuations. Bar. pressure is slightly above the average of 38 years while the temperature is 2° above the mean for that period. Exactly the contrary experience of last year, the first half of the month was very much colder than the last; the mean temp. of the first thirteen days being 36°·5 and from 14th to 28th 45°·5; the point reached by the maximum on the 22nd, 57°·6, has been exceeded only twice, 58°·4 being registered on 20th February, 1891, and 57°·9 on 23rd February, 1862. One inch of 8 fell on the 3rd. During the early hours of 21st a somewhat violent S. W. gale was experienced and a fresh breeze from the same quarter blew on the 25th. Though compared with last year vegetation is backward, a fair start has been made in spring growth, and pastures have a promising appearance, farm work, however, has been much retarded by the wet weather during the latter half of the month.

COLMONELL.—Rainfall 1·11 in. below, mean temp. 3°·8 above, the average of 20 years.

BRAEMAR.—With the exception of the extreme frost on 3rd and 4th, *viz.*, 2° and 7° below zero, an unusually fine month.

ABERDEEN, CRANFORD.—The last two weeks of the month were warm, the max. temp. ranging from 42° to 59°.

S. RONALDSAY, ROEBERRY.—The first half of the month was cold and windy, the last half mild and damp. Mean temp. 38°·2.

IRELAND.

DARRYNANE ABBEY.—A very mild month with much mist and fog.

O'BRIENSBRIDGE, ROSS.—The temperature of the month was much above the average.

DUBLIN.—Taken as a whole, this was one of the mildest Februaries on record in Dublin, there was scarcely any frost even on the ground, and the sky was often densely clouded. The first third of the month was gloomy and wet. Equatorial winds were prevalent during the greater part of the month. The mean temp. 46°·0 was 3°·7 above the average. Neither Hail, Sleet nor 8 fell. Foggy on 7 days. Cloud much above average. High winds were noted on 7 days and reached the force of a gale on the 18th, 20th, 24th, 25th and 26th. A lunar halo was seen on the 16th.

OMAGH, EDENFEL.—A seasonable February with as a rule dull, dark weather. Rainfall and temperature were both rather over the average and atmospheric pressure was very unsteady.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXV.]

APRIL, 1897.

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

THE FIRST DAILY WEATHER MAP.

IN our number for September, 1896, we gave a photographic reproduction of the first daily weather map ever published, and promised to give its history as soon as we had concluded our enquiries.

Perhaps it is rash even now to assume that these enquiries are complete, for completeness is rarely attainable, and the publication of this note may lead to some fresh facts being brought to our notice—if so, so much the better, and we will insert them in a subsequent number.

As far as we can trace the facts they are as follow :—

In 1849 the proprietors of the *Daily News* decided upon collecting and publishing daily reports of the direction and strength of the wind and of the state of the weather. The organization was entrusted to Mr. Glaisher, F.R.S., who received from the various companies a pass over nearly every railway in the country, which enabled him to fix the compass points and instruct the clerks at each station, and, either then or subsequently, to erect barometers at many of them, all, we believe, with the hearty co-operation of the Electric Telegraph Company, the cost being borne partly by Mr. Glaisher, partly by the *Daily News*. The issue of that journal for June 14th, 1849, contained the first fruits of this enterprise, in the shape of the earliest telegraphic Weather Report known to us.

During the subsequent two years the system was greatly developed; the Electric Telegraph Company was incorporated in 1846, and by 1851 had erected about 2,000 miles of wire, and during the great Exhibition of 1851, Mr. (now Sir George) Grove, as Secretary of the Society of Arts, decided upon issuing the information, collected by the Electric Telegraph Company, in the form of the Daily Weather Map, the lithographic production of which was entrusted to Mr. Trelawny Saunders, F.R.G.S., the first of which, for August 8th, 1851, was the one reproduced by us last September from a set kindly presented to us by H.M. Royal Commissioners of the 1851 Exhibition.

It is noteworthy that now, 46 years afterwards, all the persons chiefly concerned have assisted us in thus placing on apparently indisputable record, the history of the First Daily Weather Map.

INDEX TO VOLS. I.-XXX. OF THE *MET. MAG.*

THANKS greatly to the help of an old observer, who will not let me mention his name, the very heavy labour of preparing the Index is ended, and proofs are to be ready on April 24th.

Probably no one who ever compiled an index was satisfied with it when it was done, and I am not contented with mine. I think that many additional entries of subjects should be made from the Reviews—and of course in many thousand entries there must be mistakes.

I have always received so much help from my correspondents, that it has occurred to me that perhaps a few would not mind reading some portions of the proof, and suggesting additions and corrections. It will be easy to have a few extra proofs, and I will gladly send a copy to anyone who volunteers promptly.

G. J. SYMONS.

SCIENTIFIC KITE WORK IN THE ARCTIC REGIONS.

In the *Met. Mag.* for August, 1896, Mr. Laurence Rotch directed attention to the use of Kites in Scotland, in 1749, by Dr. Wilson.

In the *Met. Mag.* for February, 1895, we mentioned that Admiral Back is reported to have used a Kite to ascertain the temperature of the upper air in the Arctic Regions in 1836-7.

We now add the record of another earlier experiment made during the winter 1822-23. It forms a foot note to the excellent article on "Meteorology" contributed to the *Encyclopedia Metropolitana*, by Dr. G. Harvey, F.R.S.

"We are only acquainted with a single experimental observation, made with a view of discovering the decrement of temperature in high latitudes. This experiment was performed by the Rev. George Fisher, and the intrepid navigator, Captain Sir Edward Parry, at the Island of Igloodik, in lat. $69^{\circ} 21' N.$, and long. $81^{\circ} 42' W.$,

"A paper kite was hoisted, to which was attached an excellent register thermometer, in a horizontal position. Its height above the level of the frozen sea, upon which the experiment was made, was determined by two observers in the same vertical plane, taking its altitude at the same time above the distant horizon; and thence its height was computed. The greatest height observed was 379 ft., at which it was nearly stationary for a quarter of an hour, although it had probably been more than 400 ft. above the sea. The experiment was made under very favourable circumstances, the kite being sent up and caught in coming down, without the slightest agitation. 'The indices,' says Mr. Fisher, 'had not altered their position in the slightest degree, and they would have indicated any variation of temperature, had it existed, to less than a quarter of a degree, Fahrenheit.' The temperature at the time was -24° Fahrenheit.

"Dr. Young, in alluding to this interesting experiment, remarks that the law of decrease of temperature must be supposed to be very different in the Arctic regions from that which prevails in more moderate latitudes. The inference, however, is by far too sweeping, resting as it does on a single experiment. We may hope, however, that time will make known more perfectly many of the Physical conditions of the Polar regions."—*Meteorology*, by G. Harvey, F.R.S. in the *Encyclopedia Metropolitana*, 1834, p. 73.

THE COLDEST COUNTRY IN THE WORLD.

IN the new bulletin of the Royal Geographical Society of Irkutsk, Professor Sergus Kovalik gives an interesting account of "Life in the Coldest Country in the World." It is that of Werchojansk, in Siberia (Lon. 133° 51' E., Lat. 67° 34' N.), where the lowest temperature of -90 deg. Fah. has been observed, and the mean of January is -48 deg. Fah. It is inhabited by about 10,500 persons of the Jakut and Lamat races. In a large part of the region, according to Prof. Kovalik, the air is so dry and the winds are so rare that the intensity of the cold cannot be fully realised. In the most distant parts of the East there are sometimes terrible storms, which are most fatal to life in their consequences. During the summer time the temperature occasionally rises to 86 deg. Fah. in the shade, while it freezes at night. The latter part of this season is often marked by copious rains and extensive inundations, which invariably lay waste a vast acreage of land, and prove to be a serious obstacle to the cultivation of the soil. Vegetation is very scanty. There are practically no trees, only wide, open meadows. The people hunt fur-bearing animals, fish, and raise cattle and reindeer. It requires about eight cows to support a family, four being milked in the summer and two in the winter. The cattle are very small in size, and are fed with hay in winter. Occasionally they are allowed to go out when there is the slightest break in the weather, but their teats are always carefully covered up with felt. Milk is the principal food. This is sometimes supplemented with hares, which are quite abundant, but not very relishable. The houses are constructed of wood, covered with clay, and as a rule consist of only one room, in which the people and animals live together. The upper and wealthier classes are better provided with lodging and food. As a race they are exceedingly courteous and very hospitable, and they are excessively punctilious concerning points of honour, such as the place at table and the proper place at festivals.—*Echo*.

We may supplement this by a few Werchojansk figures from Dr. Wild's *Temperatur-verhältnisse des Russischen Reiches* :—

	Monthly Mean Temperature.												
	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	Nov.	Dec.	Year.
1869	-56.4	-54.8	-29.4	6.8	31.3	56.1	59.7	53.4	36.1	7.0	-29.4	-46.8	2.8
1871	..	..	..	..	..	..	..	..	..	..	-47.6	-53.7	..
1872	-55.8	-51.2	-28.5	..	..	..	..	..	..	..	..	..	..
Mean	-56.1	-53.0	-28.9	6.8	31.3	56.1	59.7	53.4	36.1	7.0	-38.5	-50.3	2.0
	Absolute Monthly Maxima.												
	-18.6	- 8.5	2.8	41.4	55.8	84.2	84.0	86.2	53.4	36.5	- 1.3	- 8.0	86.2
	Absolute Monthly Minima.												
	-76.0	-79.4	-67.4	-25.2	-4.0	41.2	42.4	35.6	19.2	-29.9	-56.4	-81.8	-81.8

In 1883 verified thermometers and a Stevenson screen were sent to this interesting station, and the mean temperatures from 1883 to 1887 were as follows :—

1883	..	..	..	..	..	..	..	..	..	..	-37.1	-59.4	..
1884	-64.5	-52.8	-43.2	2.7	31.1	51.3	..	..	..	..	..	-49.9	..
1885	-63.0	-50.8	-19.8	-1.7	28.0	48.4	60.1	43.5	29.1	- 2.4	-47.6	-63.0	- 3.3
1886	-64.1	-47.2	-37.3	4.5	27.7	37.9	..	..	..	- 6.5	-36.0	-58.9	..
1887	-62.9	-54.4	-21.6	9.0	40.6	59.9	53.6	..	..	..	..	..	..
Mean	-63.6	-51.3	-30.5	3.6	31.8	49.3	56.8	43.5	29.1	- 4.4	-40.2	-57.8	- 2.7

Habituated to temperatures like these, the Lamats would find the winter climate of the North Pole quite mild.

ROYAL METEOROLOGICAL SOCIETY.

DIAMOND JUBILEE MEETING AND EXHIBITION.

At the Ordinary Meeting held on Wednesday evening, March 17th, a lecture was delivered by Mr. G. J. Symons, F.R.S., on "Meteorological Observations in 1837 and 1897." It might be thought, he said, that by merely sorting out the meteorological instruments invented prior to 1837 we should at once have a statement of what were in use at that date, but that notion was quite wrong. For example, dry and wet bulb thermometers, used synchronously as a hygrometer, were employed by Professor Boeckmann, of Carlsruhe, in 1802; they were again used (probably reinvented) by the Rev. Mr. Gordon, of Kinfauns, Perth, in 1817; and after another 19 years were brought out as a novelty by Mr. J. A. Mason in 1836; yet Mr. Symons did not know of one single station at which a dry and wet bulb hygrometer was in regular use in 1837. Therefore, the mere dates of inventions were of no help in determining the usual equipment of a meteorological station in the first year of the Queen's reign. For more than half of the period with which the paper dealt, he had not merely been collecting records of rainfall for current years, but had been searching for old records, and thus he had gradually accumulated returns for bygone years, far more numerous than those known to any one living at that time, since in 1837 postage, printing, and intercourse generally were very different from what they are now. It occurred to him that a list of the observers at work in 1837 would bring to his mind many facts that otherwise he would not think of, and the further idea arose of tabulating the rainfall for that year. This table contained perfect records from 91 stations in England, 5 in Wales, 60 in Scotland, and in 5 Ireland, together, with incomplete returns from 19 other stations, in all 180. More than half of these were merely rainfall stations, at which no records of barometer, thermometer, hygrometer, or anemometer were made. Mr. Symons proceeded to describe the instruments which he knew to have been used by good, ordinary observers in 1837, and which could have been obtained at once by any one going to the shops of the opticians of the day. He then briefly enumerated the usual forms of instruments employed at the present time, detailing the equipment of ordinary meteorological stations. Lastly, he showed what he thought might in many respects be regarded as the essence of much that had gone before, and of the marvellous progress which had characterised the Victorian reign. Thanks to the help of Mr. Scott and Mr. Gaster, he was able to exhibit in the lantern a chart showing the state of the weather over Western Europe only an hour or two before the time of the lecture. We were, he said, so used to weather maps that they did not strike us as at all a marvel, but when we looked into details they really were startling. There were records for that day from the sunny Riviera, eastwards as far as Berlin, and northwards, not only up to the top of the Gulf of Bothnia, but actually up to Bodo, within

the Arctic circle. If that did not prove the existence of a widespread interest in meteorological work, excellent organization, and the wonderful development of human intercourse, he did not know how otherwise it could be demonstrated.

At the conclusion of the lecture, Mr. Birt Acres, by means of a cinematoscope, exhibited some photographic studies of clouds and waves.

OUR IMPRESSIONS OF THE EXHIBITION.

The Annual Exhibition of the Royal Meteorological Society—usually held in conjunction with the Ordinary Meeting in March—was this year, in commemoration of the sixtieth year of Her Majesty's reign, devoted to a display of the instruments in use by meteorologists in 1837 and 1897.

The instruments accredited to the earlier period comprised—

- 6 Barometers.
- 10 Thermometers.
- 9 Hygrometers.
- 3 Rain Gauges.
- 3 Anemometers.
- 1 Actinometer.

Several of these would probably be excluded if the rigid limitation adopted by Mr. Symons in his descriptive lecture had been adhered to, inasmuch as one or two were undoubtedly of more recent form and construction, while others—though invented before 1837—were not in general use at the time.

The most striking characteristic of the barometers is perhaps an absence of that precision now considered requisite. No. 6 in the catalogue being a good illustration of this.

“6. *Large Cistern Barometer*.—This instrument was made for the Meteorological Society of London in 1837 by Mr. R. C. Woods, and cost forty guineas. The proportion of the calibre of the tube to that of the cistern is as 1 : 50, a proportion which was considered sufficient to obviate the necessity for applying capacity corrections. The tube and cistern originally held 70 lbs. of mercury.”

On the other hand, Morland's diagonal, or open scale barometer, was obviously designed with a view to greater accuracy in reading. We have never heard of one of these in actual use, probably owing to modern patterns attaining the desired accuracy by other means.

The thermometers show little variation from modern forms, barring a general tendency to larger bulbs and bores and consequent sluggishness; a notable exception being the Maximum, made by Prof. Phillips himself, with a bulb of quite modern smallness, but apparently with round bore and somewhat close scale.

Modern hygrometers again show little advance over those exhibited, if we assume that those dependent on a hygroscopic substance such as

catgut, swansquill, whalebone, vegetable fibre, &c., for their indications were little used for scientific records. Yet the hair hygrometer belonging to the same class is in very general use on the continent, and has, we think, been unjustly discredited in this country; for, in the recording form exhibited by Messrs. Richard Freres, it gives a beautiful trace, and is more reliable in frosty weather than are the dry and wet in the hands of the average observer.

Of dew-point hygrometers, Daniell's is capable of as great a degree of precision as any modern rival, though Dines's shows a great gain in convenience by replacing the ether by water.

Chemical hygrometers, in which a given quantity of air is deprived of its aqueous vapour by means of sulphuric acid or other substance having great affinity for moisture, were conspicuous by their absence from both sections of the exhibition, though at one time they were much commended for use by meteorologists.

Of the three rain gauges exhibited, the first ("Howard's") is in a modified form, the rain gauge of the Englishman all the world over, while the other two—the "Crosley" and the "Side tube"—are fortunately dead and buried, though we hear of an occasional case of a misguided observer reverting to these archaic forms.

May we be forgiven for saying of the next class of instruments—"Anemometers"—that the whole science of anemometry is only just emerging from a state of barbarism worthy of the middle ages. But, thanks mainly to the modern apostle of anemometry, Mr. Dines, it is emerging.

The earliest anemometer in the catalogue is Lind's, "in which the force of the wind is shown by the depression and elevation of a column of water." This is the principle adopted by Mr. Dines in his latest pattern, the pressure tube anemometer. Of the remaining anemometers we would only say—*De mortuis nil nisi bonum*.

The list of 1837 instruments terminates with Herschel's actinometer, but there is no actinometer in the 1897 list. Have meteorologists given up using this instrument, or is it the fact that they never did use it?

Of the modern instruments we have little to say, they provide a delightful display of inventive genius and high-class workmanship, and make the amateur meteorologist long for unlimited cash to purchase, and time to use, the varied apparatus designed for wresting nature's secrets from her.

The Society itself exhibited a completely equipped meteorological station, necessarily substituting green baize for grass. We noticed in front of the thermometer screen a beautifully painted footboard for the observer. Do not the instructions say that the screen should be surrounded by grass?

It would be wearisome to give even a condensed list of the exhibits, and we will content ourselves with a few which had most interest for us, freely admitting that our selection probably has little to commend it to others.

"127. *Seismograph* as arranged by Prof. J. Milne, F.R.S., for recording earthquakes, earth-tremors, &c. *Exhibited by* L. P. CASELLA, F.R.Met.Soc."

This appealed to our mechanical taste as a well designed, well arranged, and well made piece of apparatus.

"149. *Set of Meteorological Curves having reference to the gale of March 3rd, 1897, comprising—*

1. For Falmouth. Barograms, Thermogram, Anemograms, and Rainfall Curves.
2. For the Scilly Islands. Pressure Tube, Anemograms, and Aneroidogram.
3. For London. Aneroidogram with open scale.
4. Two Weather Charts showing the systems prevailing over the British Islands at 8 a.m. on March 3rd and 4th."

giving opportunity for a very interesting comparison of the various meteorological elements during a gale of exceptional severity.

"156. *Photograph showing the fixing of a 70 ft. Earth Thermometer at Col. Knight's Observatory, Harestock, Winchester.*"

"138. *Case of Earth Thermometer used at Harestock, Winchester. Exhibited by* COL. H. S. KNIGHT, F.R.Met.Soc."

From the above, and from other information which has come to our knowledge, we believe that the problems of earth temperature have never been attacked with the same amount of thoughtful care and elaborate instrumental equipment as Col. Knight is devoting to them.

"155. *Photographs, Drawings, and Charts, illustrating the use of Kites for obtaining meteorological records in the free air. Exhibited by* A. L. ROTCH, F.R.Met.Soc."

Our last entry relates to a subject which remained almost dormant during the first fifty years of the Queen's reign, but is now receiving the attention which it deserves.

We must pass over numbers of beautiful photographs, only mentioning some of frost on window panes which showed charming specimens of nature's handiwork.

Mr. W. H. Dines, F.R.Met.Soc., showed an experiment illustrating the Formation of a Tornado Cloud. A tornado, waterspout, or whirlwind is one of those phenomena which cannot be seen every day, and when it does occur, observers are too often busy in securing their property, and therefore unable to study it; but by Mr. Dines's apparatus, the verisimilitude of a small tornado can be examined at leisure.

RAINFALL AT MUSWELL HILL.

To the Editor of the Meteorological Magazine.

SIR,—The rainfall of the 7 months, Sept. 1st, 1896, to March 31st, 1897, has been so excessive, that it may be interesting to compare it with past years.

A record of R for a quarter of a century was completed there on

December 31st last; during that time, once only, just 20 years ago, has the total R for the 7 months, Sept. 1st to March 31st, exceeded that of the same period in 1896-7. In 1876-7 the aggregate for those 7 months was 24·63, being 8·09, or nearly 49 per cent. above the 25 years' average (16·54); while in 1896-7 it was 23·37, being 6·83 or 41½ per cent. above the average.

	1872-3.	1876-7	1880-1	1882-3	1885-6	1896-7	Average for 25 years.
	in.	in.	in.	in.	in.	in.	in.
Sept. ...	1·71	3·82	3·76	3·06	4·76	6·26	2·47 .. Sept.
Oct.	5·80	1·22	5·36	5·53	3·90	3·06	3·15 ... Oct.
Nov. ...	4·09	3·46	2·11	3·10	3·67	1·12	2·80 ... Nov.
Dec.	4·79	6·63	3·40	2·91	1·22	4·05	2·41 ... Dec.
Jan.	2·66	5·01	1·29	2·50	4·72	2·23	2·14 ... Jan.
Feb.	2·38	1·80	4·03	3·95	·65	3·02	1·77 ... Feb.
March ...	1·80	2·69	2·31	·91	1·73	3·63	1·80 ... March
	23·23	24·63	22·26	21·96	20·65	23·37	16·54
Excess above Average }	6·69	8·09	5·72	5·42	4·11	6·83	

During the 25 years there have been only five previous instances when the rainfall of those 7 months exceeded 20 inches, and the table appended gives the totals of each month on these occasions. In 1876-7 the excess was, in a great measure, due to the enormous amounts of December and January; while in 1896-7, September, December and March contributed most largely to the result.

Yours truly,

J. W. SCOTT.

Elleray, Etchingham Park, Finchley, N., April 3rd, 1897.

REVIEWS.

On Periodicity of Good and Bad Seasons. By H. C. RUSSELL, B.A., C.M.G., F.R.S. (Proc. R. Soc. New South Wales, June 3rd, 1896.) 8vo, 47 pages, 1 plate.

THIS paper opens with the following paragraph:—

“I feel some reluctance in coming forward to night, with the results of my investigations into the periodicity of good and bad seasons—floods and droughts if you will—because they must come to you as a surprise, and they will make a claim on your confidence, which at first sight you will probably not be disposed to grant. For myself, I know that some years ago, if anyone had come to me, stating that it was possible to forecast the seasons many years in advance, I should have received the statement with incredulity. It will not be a surprise to me therefore if you feel the same, but I hope you will give a fair hearing before coming to a conclusion, so that you may have before you the evidence that has convinced me, and you can then form your own opinions.”

We can hardly describe fully the laws which Mr. Russell thinks that he has established, but broadly we should state them as follows:—

(1) A recurrence of similar weather each 19 years; (2) If representing good seasons (which seems to mean wet ones) by the letter G, and bad ones (which are droughty ones) by B, there should be a normal sequence, but his own table does not show it.

Well, our opinion is that Mr. Russell has not proved his case. We shall be delighted to be convinced that we are wrong, because the discovery of any definite rule respecting coming seasons would be a priceless boon to the human race, and—compared with it—the discomfiture of the Editor of the *Meteorological Magazine* would not be of the slightest consequence. We cannot analyze and criticize 47 pages in two. The only thing to do is to indicate what we think has unconsciously led astray so able a man as Mr. Russell.

The first and great mistake seems to be that the author has not laid down a definition of what constitutes a good or a bad season. On page 3 he mentions “a period of months or years during which little rain falls, and the country gets burnt up.” Yes, but what is “little rain,” how much “burning up” is involved. And on the very next page we read “Drought is not wholly made by a shortage of rainfall. Its most important factors are great heat and drying winds.” Here again we have an absence of definition; what is the precise meaning of “great heat,” and what is the humidity and velocity constituting a “drying wind.” These questions may seem puerile, but we believe that without sharp definitions of this kind, no two persons going independently through a 30 years meteorological register would take out droughts beginning and ending at similar times; and if this is true where we have a perfect statistical record as our basis, how much stronger does it become when we have only old chroniclers upon which to rely.

Then the diagram is novel, it goes from 1788 to 1895, and every year is “classed as good or bad, that is, having sufficient or insufficient rainfall,” and moreover—as the author tells us on the previous page—“without regard to their (*i.e.* the droughts) intensity.” This is quite new—a diagram with no such thing as an average year, though rather oddly no characters are assigned to 1855–56. We have tried to find out how the diagram has been constructed, and give the figures for the first ten years we tried:—

Years.....	1870	1871	1872	1873	1874	1875	1876	1877	1878	1879
Total R at {	64·2	52·3	37·1	73·4	63·6	46·2	45·7	59·7	49·8	63·2
Sydney ... }	+	—	—	+	+	—	—	+	—	+
Character in										
Diagram..	G	G	B	G	G	B	B	B	G	G

Roughly, the years with large totals are marked Good, those with small ones Bad; but 1877 and 1878 seem reversed. But we are not yet sure that we are on the right track, because from the diagram and from the nature of things it seems that the droughts are reckoned independently of the civil year. And if so, would two students

start with the same month? Moreover, what becomes of the multiples of the odd months in relation to the 19 years period?

Then Mr. Russell works in records of red rain, gales, cyclones, and great frosts, but at present we are inclined to wait for the strong test of futurity. Sometimes we are puzzled to know at what the author is driving; for instance, on the last two pages we read of storms and famines in Cook's Island "About 1813," "In December, 1831," "In March, 1846," and "On March 27th, 1866." We do not see the 19 year cycle in these dates— $1813-31 = 18$; $1831-46 = 15$; $1846-66 = 20$; moreover, we find in the diagram 1813B, 1831G, 1846B, 1866B.

However, Mr. Russell is so able, and has done such good work for New South Wales, that we hope that it is only our obtuseness which prevents our being convinced. Probably the curve of the dividends of the Colonial Banks will afford a fair commentary on the predictions which are, Good for 1897-8, 1901-2, and 1906; and Bad for 1899-1900, and 1903 to 1905.

Buletinul Observatiunilor Meteorologice din Romania de STEFAN C. HEPITES, Directorul. Anul V., 1896. Bucuresci, 4to., 1897.

WE are glad to see that Director Hepites is advancing rapidly with the organization of the meteorological service for Roumania, and that, as regards promptitude of publication, he is showing the Directors of Western Europe an example. This pamphlet contains chiefly the monthly summaries of the 34 climatological and 309 rainfall stations which he has established, but in the first place he must be congratulated on their number, and secondly upon the promptitude which has enabled him to give us the complete totals for the year—within three months of its closing. We hope that at an early date Dr. Hepites will give a map showing the position of all his stations. Meanwhile we may just mention that the rainfall during 1896 over Roumania seems to have been generally about 16 inches and the following appear to have had the greatest and least rainfall:—

	Lat.	Lon.	Altitude.	RAIN in 1896.			Days with or more
				Total. in.	M. in 24 hrs. in.	Date. '04	
Domnesci, Muscel	45° 9' N.	24° 53' E.	1640ft.	53.78	2.96	10 vi.	84
Mangalia, Constanta...	43° 37' N.	28° 37' E.	105ft.	6.46	1.09	16 xii.	28

Annales de l'Observatoire Météorologique du Mont Blanc (Altitude 4,358 mètres = 14,298 ft.) Publiées sous la Direction de J. VALLOT, Fondateur et Directeur de l'Observatoire. Tome II avec 7 Planches et 19 Figures. 4to. Steinheil, Paris 1896.

ON a previous occasion, *Met. Mag.*, Vol. XXX (1895), pp. 9-10, we had great pleasure in calling attention to the splendid work being done by M. Vallot at great cost of money, of time, and of strength in the building, equipping and maintaining this loftiest of European

meteorological stations. We are glad to welcome the second of his valuable volumes of *Annales*, and we congratulate M. Vallot on the very fair, and yet appreciative, report upon his work made by the reporters of the *Académie des Sciences* (as they were MM. Mascart, Bouquet de la Grye and Daubrée it is not easy to see how the author could have more competent judges). The following is a free translation of the concluding sentence of their report :—

“This short note will sufficiently show that in pursuit of his object M. Vallot has had to conquer many difficulties, sufferings and dangers. He has carried out the whole without any government assistance and entirely at his own expense. This savant deserves all credit for his energy, his perseverance and his devotion to Science.”

Reference to our previous review will show how thoroughly we agree with the above statement.

The present volume deals chiefly with barometric records, actinometric observations and the triangulations necessary for M. Vallot's survey of Mont Blanc on the scale of rather more than three inches to the mile. One paper of 24 quarto pages, devoted to difficulties of scientific observations at great altitudes, is extremely interesting. In fact it is a sort of epitome of the author's experiences, and as he tells us that he has made 22 ascents, and has on one occasion remained nine consecutive days at his lofty observatory, his experience is unique. We are sorry to infer from one expression that the severe strain produced by the climbing, the deficiency of oxygen, and the low temperature have somewhat impaired M. Vallot's health, it would have been wonderful if that were not the case, but he is as energetic as ever and promises a third volume at an early date. France may well be proud of such a worker.

Report and Results of Meteorological Observations made at Ardgillan, Co. Dublin during the year 1896, by CAPT. E. R. TAYLOR, F.R.Met.Soc. Privately printed, 4to., 1897. London. 23 pp., 1 plate. The same for 1892. 4to., 1897, 6pp.

CAPTAIN TAYLOR has in these two pamphlets given in a very clear and compact form the results of his station—so clear indeed that there is scarcely any room for criticism. If we had had a sea level pressure of 31.043 inches to record, we think that we should not have passed it over so lightly as the author has done on p. 14. It is never safe to prophecy, but judging by the past it will probably be 50 or 100 years before such a fact has to be recorded again. Then on page 3 he tells us that there are at Ardgillan two rain gauges, an 8-inch and a 5-inch, but we cannot find the result of the former, although from the pamphlet for 1892 it is evident that it, the 8-inch gauge, was the first erected.

Another welcome addition to the pamphlet for 1897 will be a view of the station showing the position of the instruments, or a scale plan of the ground such as used to be given by the Royal Meteorological Society.

The smaller pamphlet for 1892 is welcome, as it contains the results for the first year for which records exist.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, OCTOBER, 1896.

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	62·9	8, 9	29·2	28	53·6	40·5	41·5	84	100·6	24·8	inches 3·05	18	6·2
Malta.....	84·1	2	56·6	27	76·5	62·7	63·2	81	134·8	50·3	2·50	4	6·5
<i>Mauritius</i>	82·6	13	63·0	9	79·5	67·3	62·9	73	138·2	54·0	·54	14	5·4
Calcutta.....	91·7	5	69·4	21	88·8	73·0	69·9	69	152·5	62·0	·00	0	1·0
Bombay.....	95·0	29	76·6	31	90·2	78·7	75·7	76	141·3	63·6	·01	1	1·1
Ceylon, Colombo.....	89·8	29	72·0	29	86·5	74·8	74·0	84	145·0	69·0	16·78	23	7·0
<i>Melbourne</i>	89·5	28	36·9	2	68·5	47·5	47·7	70	139·5	29·0	·78	7	5·7
<i>Adelaide</i>	97·8	28	40·0	7	77·3	52·5	46·2	54	155·8	28·5	·34	7	3·8
<i>Sydney</i>	92·4	13	47·6	3	73·4	58·4	56·1	71	149·9	39·2	2·19	10	4·7
<i>Wellington</i>	65·0	26	34·0	1	58·9	46·9	42·5	68	130·0	27·0	3·18	16	4·3
<i>Auckland</i>	67·5	31	40·0	10	62·2	48·9	45·8	71	137·0	35·0	1·93	20	5·0
Jamaica, Kingston.....	92·8	21	71·3	23	89·7	74·1	...	...	...	...	·97	5	...
Trinidad.....	88·8	...	72·1	...	...	...	74·3	81	...	...	6·05	...	...
Grenada.....	88·4	19	72·0	14	85·0	75·4	71·0	75	158·0	...	4·14	14	3·0
Toronto.....	66·8	29	27·8	26	52·4	37·4	38·1	75	83·0	23·0	2·16	11	6·3
New Brunswick, Fredericton.....	66·7	1	25·4	11	52·0	35·9	37·7	80	...	...	5·15	13	7·2
Manitoba, Winnipeg.....	73·6	2	13·4	21	48·7	26·4	...	...	...	...	1·01	7	6·2
British Columbia, Esquimalt.....	65·5	15	35·2	27	56·1	42·5	46·0	92	...	...	2·87	12	6·2

a—and 26.

REMARKS.

MALTA.—Adopted mean temp. 69°·1, or 0°·4 below the average. Mean hourly velocity of wind 8·0 miles. Average temp. of sea 73°·5. Thunderstorms on 1st, 2nd, 3rd and 5th. Lightning on 5 days; hail on 3rd. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·8 above, of dew point 1°·1 above, and rainfall 1·09 in. below, their respective averages. Mean hourly velocity of wind 9·8 miles, or 1·4 below average; extremes, 20°·2 on 4th and 29th, and 2·0 on 9th; prevailing direction, E.S.E. The driest October on record, with the exception of 1878. T. F. CLAXTON.

CEYLON, COLOMBO.—Thunderstorms occurred on 14 days; lightning was seen on the 29th. F. W. GRIMLINTON.

Adelaide.—Mean temp. 2°·9 above the average of 39 years. Another very dry month, the total fall being 1·52 in. below the average for 39 years, and the least but one on record for this month. C. TODD, F.R.S.

Sydney.—Rainfall ·67 in. below, temperature 2°·4 above and humidity 1°·6 above, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Showery in the early part of the month, wind chiefly S.E.; the middle of the month generally fine. On night of 23rd severe thunder and rain storm from N.W., causing damage; 1·20 in. of rain falling between 7 and 8 p.m. The remainder of the month unsettled. Prevailing wind N.W., frequently strong. Hail on 2nd. Mean temp. 0°·7 below, and rainfall 1·19 in. below, their respective averages. R. B. GORE.

Auckland.—A cold and windy month, with an unusual predominance of S.W. winds. Mean temperature and rainfall considerably below the average. T. F. CHEESEMAN.

JAMAICA.—Mean hourly velocity of wind 2·8 miles. Kingston rainfall one-eighth of the average. Island rainfall eleven per cent. below the average. R. JOHNSTONE.

SUPPLEMENTARY TABLE OF RAINFALL,
MARCH, 1897.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	3·41	XI.	Rhayader, Nantgwilt ...	7·92
II.	Dorking, Abinger Hall	5·66		Lake Vyrnwy	8·11
„	Birchington, Thor	3·10	„	Corwen, Rhug .....	...
„	Hailsham	4·51	„	Criceith, Talarvor	3·66
„	Ryde, Thornbrough	5·20	„	I. of Man, Douglas	4·81
„	Emsworth, Redlands ...	4·16	XII.	Stoneykirk, Ardwell Ho.	4·86
„	Alton, Ashdell	6·04	„	New Galloway, Glenlee	8·57
III.	Oxford, Magdalen Col..	2·59	„	Lilliesleaf, Riddell	3·72
„	Banbury, Bloxham	4·04	XIII.	N. Esk Res. [Penicuick]	4·75
„	Northampton, Sedgebrook	3·67	„	Edinburgh, Blacket Pl.	2·87
„	Duddington [Stamford].	2·91	XIV.	Glasgow, Queen's Park..	4·05
„	Alconbury	1·84	XV.	Inverary, Newtown	7·96
„	Wisbech, Bank House...	2·12	„	Oban, The Corran	7·88
IV.	Southend	3·19	„	Islay, Gruinart School ...	1·97
„	Harlow, Sheering	3·74	XVI.	Dollar	5·47
„	Colchester, Lexden	2·97	„	Balquhidder, Stronvar...	11·12
„	Rendlesham Hall	2·00	„	Ballinluig	5·85
„	Rushall Vicarage	2·66	„	Dalnaspidal H. R. S.	9·70
„	Swaffham	2·76	XVII.	Keith H. R. S.	4·13
V.	Salisbury, Alderbury ...	4·82	„	Forres H. R. S.	1·41
„	Bishop's Cannings	4·06	XVIII.	Fearn, Lower Pitkerrie..	1·97
„	Blandford, Whatcombe .	5·51	„	N. Uist, Loch Maddy ...	6·16
„	Ashburton, Holne Vic...	7·08	„	Invergarry	5·29
„	Okehampton, Oaklands.	5·57	„	Aviemore H. R. S.	2·12
„	Hartland Abbey	4·89	„	Loch Ness, Drumnadrochit	2·65
„	Lynmouth, Glenthorne.	6·52	XIX.	Invershin	5·34
„	Probus, Lamellyn	4·48	„	Scourie	3·90
„	Wellington, The Avenue	5·01	„	Watten H. R. S.	2·63
„	Wincanton	4·17	XX.	Dunmanway, Coolkelure	11·29
VI.	Clifton, Pembroke Road	4·20	„	Cork, Wellesley Terrace	5·57
„	Ross, The Graig	3·81	„	Killarney, Woodlawn ...	7·40
„	Wem, Clive Vicarage ...	2·63	„	Caher, Duneske	5·52
„	Cheadle, The Heath Ho.	2·77	„	Ballingarry, Hazelfort...	5·00
„	Worcester, Diglis Lock	3·11	„	Limerick, Kilcornan ...	4·49
„	Coventry, Kingswood ...	3·09	„	Broadford, Hurdlestown	...
VII.	Grantham, Stainby	2·49	„	Miltown Malbay	6·45
„	Horncastle, Bucknall ...	2·07	XXI.	Gorey, Courtown House	4·59
„	Worksop, Hodsck Priory	2·44	„	Athlone, Twyford	4·91
„	Neston, Hinderton	2·01	„	Mullingar, Belvedere ...	4·22
VIII.	Southport, Hesketh Park	2·84	„	Longford, Currygrane...	3·76
„	Broughton-in-Furness ...	7·64	XXII.	Woodlawn	5·34
IX.	Ripon, Mickley	4·66	„	Crossmolina, Enniscoe ..	8·03
„	Melmerby, Baldersby ...	3·01	„	Collooney, Markree Obs.	6·60
„	Scarborough, Observat'y	2·66	„	Ballinamore, Lawderdale	6·39
„	Middleton, Mickleton ...	5·66	XXIII.	Lough Sheelin, Arley ...	...
X.	Haltwhistle, Unthank...	5·53	„	Warrenpoint	5·74
„	Bamburgh	3·04	„	Seaforde	4·73
„	Keswick, The Bank	8·02	„	Belfast, Springfield	5·65
XI.	Llanfrechfa Grange	5·58	„	Bushmills, Dundarave..	4·19
„	Llandoverly	6·89	„	Stewartstown	4·15
„	Castle Malgwyn	6·13	„	Killybegs	9·70
„	Builth, Abergwesyn Vic.	9·25	„	Lough Swilly, Carrablagh	7·02

MARCH, 1897.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which >0.1 or more fell.	TEMPERATURE.				No. of Nights below 32°.	
		Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours		In shade.		Max.		Min.		In shade.	On grass.
				Dpth	Date			Deg.	Date	Deg.	Date.		
I.	London (Camden Square) ...	3.42	+ 1.81	.49	2	17	61.7	23	26.8	30	3	14	
II.	Maidstone (Hunton Court)...	...	...	...	...	...	...	...	...	...	...	...
III.	Strathfieldsaye	4.65	...	.57	2	21	...	...	...	...	...	...
IV.	Hitchin	4.13	+ 2.79	.65	2	19	61.0	21	26.0	29	6	...	
V.	Windsor (Addington)	2.97	+ 1.25	.66	17	19	65.0	21	24.0	30	7	11	
VI.	Bury St. Edmunds (Westley)	2.73	+ 1.18	.59	2	15	61.0	22	31.0	30	...	...
VII.	Norwich (Brundall)	2.33	...	.46	2	17	62.0	21	27.8	13	5	12
VIII.	Weymouth (Langton Herring)	4.51	+ 2.61	.76	2	21	57.0	31	33.0	30	0	...	
IX.	Torquay (Cary Green)	5.89	...	1.52	2	18	58.6	19 ^b	35.0	5, 30	0	5	
X.	Polapit Tamar [Launceston]..	3.89	+ 1.36	.59	2	22	58.1	27	29.9	30	2	4	
XI.	Stroud (Upfield)	3.60	+ 1.41	.77	2	20	67.0	26	31.0	7, 29	2	...	
XII.	Churchstretton (Woolstaston)	3.76	+ 1.63	.51	17	24	57.0	22 ^c	29.0	30	9	20	
XIII.	Tenbury (Orleton)	3.44	+ 1.36	.72	2	21	63.8	21	24.0	30	5	10	
XIV.	Leicester (Barkby)	2.10	+ .39	.46	14	21	64.0	21	22.0	29	10	19	
XV.	Boston	1.82	+ .28	.36	14	17	60.0	21	28.0	13	6	...	
XVI.	Hesley Hall [Tickhill]	2.47	+ .57	.50	2	20	61.0	21	25.0	30	6	...	
XVII.	Manchester (Plymouth Grove)	2.61	+ .39	.40	3	20	62.0	22	27.0	30	3	7	
XVIII.	Wetherby (Ribston Hall) .....	...	...	...	...	...	...	...	...	...	...	...
XIX.	Skipton (Arncliffe)	9.89	+ 4.79	1.42	4	24	...	...	...	...	...	...
XX.	Hull (Pearson Park)	2.93	+ .88	.40	2	18	59.0	21	21.0	30	9	10	
XXI.	Newcastle (Town Moor)	2.96	+ .33	.38	14	19	...	...	...	...	...	...
XXII.	Borrowdale (Seathwaite)	19.99	+ 9.49	1.91	2	28	...	...	...	...	...	...
XXIII.	Cardiff (Ely)	4.39	+ 1.41	.66	2	24	...	...	...	...	...	...
XXIV.	Haverfordwest	5.75	+ 2.51	1.02	2	26	55.1	25	28.1	30	2	9	
XXV.	Aberystwith (Gogerddan)	5.46	+ 2.48	1.46	2	21	61.0	23	...	...	...	...
XXVI.	Llandudno	2.92	+ .84	.46	12	19	62.0	22	34.5	8	0	...	
XXVII.	Cargen [Dumfries]	5.91	+ 2.61	.86	2	22	56.0	23	23.4	30	6	...	
XXVIII.	Jedburgh (Sunnyside) .....	...	...	...	...	...	...	...	...	...	...	...
XXIX.	Colmonell	6.32	...	.62	3	24	59.0	21	21.0	31	...	...
XXX.	Lochgilthead (Kilmory)	6.11	+ 1.65	.70	22	27	...	...	21.0	30	10	...
XXXI.	Mull (Quinish)	7.55	+ 3.71	.96	22	22	...	...	...	...	...	...
XXXII.	Loch Leven Sluices	5.50	+ 2.53	1.00	23	20	...	...	...	...	...	...
XXXIII.	Dundee (Eastern Necropolis)	3.60	+ 1.20	.65	15	25	58.0	24	25.7	30	8	...	
XXXIV.	Braemar	5.92	+ 3.28	.94	13 ^a	26	51.8	24	18.6	3	14	22	
XXXV.	Aberdeen (Cranford)	3.91	...	.60	13	26	58.0	24 ^c	24.0	28	8	...
XXXVI.	Cawdor (Budgate)	1.89	-.15	.29	22	25	...	...	...	...	...	...
XXXVII.	Strathconan [Beaul]	6.18	+ 1.86	.68	17	15	...	...	...	...	...	...
XXXVIII.	Glencarron Lodge	7.40	...	1.00	18	30	52.1	22	20.6	31	13	...	
XXXIX.	Dunrobin	3.68	+ 1.43	.53	22	25	54.0	24	26.0	30	6	...	
XL.	S. Ronaldsay (Roeberry)	4.01	+ 1.47	.55	26	28	50.0	21	26.0	29 ^e	12	...	
XLI.	Darrynane Abbey	6.40	...	.77	27	26	...	...	...	...	...	...
XLII.	Waterford (Brook Lodge)	5.91	+ 3.01	1.12	11	23	58.5	24	29.0	30	3	...	
XLIII.	O'Briensbridge (Ross)	4.80	...	.94	11	20	...	...	...	...	...	...
XLIV.	Carlow (Browne's Hill)	4.75	+ 2.38	.98	2	22	...	...	...	...	...	...
XLV.	Dublin (Fitz William Square)	2.98	+ .97	.74	11	24	61.6	21	29.0	30	1	9	
XLVI.	Ballinasloe	4.75	+ 2.12	.79	11	28	58.0	22	30.0	30	7	...	
XLVII.	Clifden (Kylemore)	10.68	...	1.09	2	26	...	...	...	...	...	...
XLVIII.	Waringstown	5.38	+ 3.03	.78	27	26	59.0	24 ^d	21.0	29	11	17	
XLIX.	Londonderry (Creggan Res.) ..	5.05	+ 2.32	.99	4	27	...	...	...	...	...	...
L.	Omagh (Edenfel)	5.44	+ 2.93	.70	11	26	56.0	21	24.0	29	7	17	

+ Shows that the fall was above the average ; - that it was below it.
a—and 15. b—and 24. c—and 26. d—and 25. e—and 30.

METEOROLOGICAL NOTES ON MARCH, 1897.

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.

HITCHIN.—The wettest March in our record, which began in 1850, excepting 1864, when 4·14 in. of R fell.

ADDINGTON.—A month of very unsettled weather, with frequent very high winds. Thunder was heard on the 10th, 15th and 17th; on the 15th there was a rainbow at 7 a.m., and again at 4 p.m.; on the 17th there was much L at night. The morning of the 30th was very cold, the shade temp. falling to 24°. Brook overflowing on 3rd. Only twice during 27 years has the rainfall been exceeded in March—to wit, 1876, 3·60 in., and 1888, 2·99 in.

BURY ST. EDMUNDS, WESTLEY.—A mild month, with high winds. Vegetation very forward. TS, with H, on 4th; S and R on 31st.

NORWICH, BRUNDALL.—A windy, but mild month. Mean temp. 44°·9, constituting the fifth March in succession with temp. higher than the average. Between the 17th and 28th the thermometer did not once fall to 40°, and on two nights the min. was as high as 47°. R of month '61 in. above average. T on 4th and 18th. Squally, with H, on 1st; gales on 3rd and 19th.

WEYMOUTH, LANGTON HERRING.—The previous heaviest rainfall in March in 23 years was in 1891, 3·58 in., which is '93 in. less than that of the present month. For the first three months of this year the rainfall is 4·05 in. in excess of the average, and is '56 in. more than in the next highest. The average temp. at 9 a.m., 44°·4, is 2°·7 above the average of 26 years. Between 8 and 9 a.m. on the 3rd occurred the most destructive storm remembered here; trees were uprooted in all directions, and slates and tiles blown off in great numbers. A severe TS occurred on the evening of the 17th. Solar halos were seen on the 2nd, 9th and 27th; and lunar halos on the 12th and 13th. Constant fogs from 20th to 25th.

TORQUAY, CARY GREEN.—Rainfall 3·47 in. above the average. Mean temp. 46°·7, or 2°·8 above the average. Duration of sunshine 136 hours 50 minutes, being 8 hours 30 minutes below the average. No absolutely sunless day.

POLAPIT TAMAR [LAUNCESTON].—A wet month. The first half of the month was cold and stormy. The average shade temp. rather less than that of February. T, L and H on 4th; T and H on 16th; and T on 17th. S.W. gale on 2nd.

STROUD, UPFIELD.—S.W. gale on night of 2nd, and N.W. gale all day on 3rd, with S and sleet; and S.W. gale on 4th. T and H on 10th. S.W. gale on 11th. Sharp TS at 7.30 p.m. on 17th. S.W. gales on 26th and 28th. S on the hills on 31st.

WOOLSTASTON.—A cold, wet, and stormy month. Heavy gales, with S storms, on 2nd, 3rd, and 11th. S on the 30th and 31st. Mean temp. 42°·8.

TENBURY, ORLETON.—A warm, wet month; in fact, the wettest March since 1867. All vegetation very forward, but severe frost on the 30th checked it considerably. T and L on the evening of the 17th.

LEICESTER, BARKBY.—A month of great barometrical fluctuations and very high winds, even for March; almost all "Lion" and no "Lamb." Mean temp. 44°·4. Thunder on 10th and 17th. S on 31st.

ARNCLIFFE VICARAGE.—Very wet, with much wind, and less S than usual.

HULL, PEARSON PARK.—TS on 4th; squally, with H, on 16th. T on 18th. Squally, with H showers, on 26th.

WALES.

HAVERFORDWEST.—I cannot find a record of a wetter March than this since the commencement of observations in 1849. It commenced with very stormy

weather and low temp. A gale of great energy, after a day of storm and heavy rain, sprang up at 0.30 a.m. on the 3rd, accompanied by H and S showers; some squalls being of exceptional violence, especially one at 6.30 a.m., and several large trees were uprooted. Prevailing winds were from S., S.W., W., and N.W. The month ended as it began, stormy. Vegetation very forward.

ABERYSTWITH, GOGERDDAN.—Very stormy throughout the month. Snow-storms on the 2nd and 3rd, with strong wind from S.W.

SCOTLAND.

CARGEN [DUMFRIES].—Absence of sunshine, Easterly winds, and almost incessant rainfall combined to make the month the most unpleasant on record. Barometrical pressure only on one day (7th) exceeded 30 inches, and, with the exception of the mean reading in 1862, is the lowest recorded in March at this station. The temp. has been 1° above the average, but never have there been more wet days, while the total rainfall has only once (in 1868, when the exceptional figure 8.14 in. was registered) been exceeded. S fell almost continuously during the afternoon and night of 30th. A severe gale blew from S. on 22nd. The number of hours of sunshine recorded has only once been smaller. Farm work was very much retarded.

COLMONELL.—Rainfall 2.99 in. above, and mean temp. 2°.1 above the average of 20 years. H shower on 1st; soft S on 3rd; S, sleet, and H on 4th.

BRAEMAR.—The old saying in March, "In like a Lion and out like a Lamb," was falsified this year. It may be said here, In like an angry Lion, and out like a fierce Lion. Roaring winds, with snow and drift.

ABERDEEN, CRANFORD.—The month was very cold, with high winds.

S. RONALDSAY, ROEBERRY.—A very cold, wet month. Mean temp. of the month, 38°·8.

IRELAND.

DARRYNANE ABBEY.—The first half very wild and cold; the second half mild but stormy. The wettest March registered. H showers on 2nd, 3rd and 4th.

WATERFORD, BROOK LODGE.—A very wild and wet month. The wettest March for about 50 years. H on 1st, 4th, 10th and 15th. S showers on 3rd, 10th and 12th. L on 4th, 5th and 17th. Thick fog on 19th, 20th, 21st, 22nd, 23rd and 25th. Gale from S.W. on 26th. Water in screen frozen on 29th.

O'BRIENSBRIDGE, ROSS.—This was the third bad March in succession, and the worst of the three.

DUBLIN.—Like March, 1896, this was a changeable, wild, and rainy month. During the first half temp. was low. A warm spell followed, but temp. again fell briskly on the 28th, and the month closed cold and ungenial. Compared with February, the mean temp. showed a falling off of one degree. Notwithstanding, the progress of vegetation was very rapid, and on the last day the trees presented quite a vernal appearance. Mean temp., 45°·2, 2°·1 above the average. Foggy on two days. High winds were noted on 20 days, reaching the force of a gale on 9. S or sleet occurred on 6 days, and H on 7 days. Solar halos on 5 days. Lunar halos on 3 days. T on the 17th. L on the 1st and 3rd.

WARINGSTOWN.—Unusually wet. Spring rather early, but labour backward.

OMAGH, EDENFEL.—A month of almost continuous gales and rain, the total fall exceeding by .97 in. the next wettest March (1868) since the records commenced in 1865. As a result the saturation of the soil prevented spring sowings of all kinds, and farm labour is backward almost beyond precedent. Temp., however, was sufficiently high to promote considerable vegetation, especially in trees, until checked by the sharp frosts of the last week.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXVI.]

MAY, 1897.

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

Louis Pascal Casella.

1809—1897.

It is but a few years since Mr. Casella retired, and few of those who saw him during the closing years of his business life would have thought that he was then well beyond the "fourscore years."

It is only since his death that we have heard that his second name was not Philip, but Pascal, and that it was supposed to be a family name. There seems little chance of now verifying the tradition, but it is a curious coincidence that the deceased, whose name will not soon be forgotten by meteorologists, should have borne also the honoured name of Pascal. Moreover, it is strange that Mr. Casella's Italian parent should have given his son the French name. Although Mr. Casella's father was by birth and parentage an Italian, he had resided in Edinburgh during the latter part of the 18th century, and he and his son removed to London only about 1835. Shortly afterwards the son joined the late Mr. Tagliabue as an instrument maker; he married his daughter, and half a century ago succeeded to the business, which at that time was extensive rather than scientific. Long before that time Mr. Casella had become a member of the original Meteorological Society, and, whether as a cause or as a consequence we know not, but, as a fact, Mr. Casella has chiefly been known as a maker of high-class instruments for meteorologists and travellers. As the business is being continued by one of the sons we think it best to leave the father's work to stand upon its own merits; but there was one feature in Mr. Casella's character which, now that he has passed beyond human praise, ought to be mentioned: his kindness of disposition was well-known, but far more noteworthy was his benevolence to those who were in need.

HAILSTORM IN SOUTH LONDON.

To the Editor of the Meteorological Magazine.

SIR,—The storm of the 27th ult. having apparently been peculiar to this locality, I venture to think that some notes upon it may be of interest to you. Commencing at 6.30 p.m., the hail fell so thickly that the ground was soon covered to a considerable depth, bearing a resemblance to a heavy snowfall. A great deal of damage accrued to fruit trees, the partly “set” fruit of the pear and plum being cut off completely, and early rose-trees stripped of leaves and buds. The hail was followed by heavy rain, which, being unable to escape down the gutters and drains through the mass of hailstones which choked them, flooded the houses, doing not a little damage. The hailstones were of a large size and divers shapes, one which I picked up measuring half-an-inch square, but being soft, they did little damage to glass. The storm lasted one hour, and on measuring the rain at its conclusion the amount in the gauge was found to be 1·18 inches. I am informed by an “old inhabitant” that it is necessary to go back to August, 1846, for a parallel hailstorm in this neighbourhood. You will probably receive many letters on the subject, and it will be interesting to note how far the storm extended; as, from what I can gather, the area affected by it was very small, and the rainfall very variable even within that limit.

I am, Sir, yours faithfully,

D. W. HORNER.

Clapham Park, S. W., May 1st, 1897.

[Our correspondent is correct in referring to the great storm of August 1st, 1846; but that was far more serious than the one in 1897, giving the tremendous rainfall of 3·12 inches in 2 hours 17 mins. We do not think that any rain gauge recorded the full intensity of the recent storm; Mr. Horner’s 1·18 in. is the highest, and that is by no means remarkable for a thunderstorm with hail—and at most stations in the neighbourhood, *i.e.*, in North Surrey, the fall was quite insignificant. The only returns of even half-an-inch which we have received are—

Kingston	in. '60	Surbiton (Seething Wells)	in. '73
Brixton (Acre Lane).....	'62	New Malden (Sewage Works) ...	1·02
Wimbledon (Sewage Works)	'68	Clapham Park (New Park Road).	1·18

and yet we know from the pierced leaves which Mr. Horner has sent us that the hail was serious, and from eye-witnesses that the following accounts are substantially correct] :—

HEAVY THUNDERSTORM IN SOUTH LONDON.

“A correspondent writes :—For many years I have lived in South London, but never have I experienced anything like the scene which was witnessed at the base of Brixton Hill during the prevalence of last night’s thunderstorm. Taking it altogether, with rain and hail, there was not probably more than twenty or five-and-twenty minutes’ downpour, but that sufficed to temporarily

transform the appearance of the locality. The hill itself is a steep declivity—neither so high nor so steep, it is true, as that of Highgate—but a steady, persevering rise, starting at, say, the White Horse in the Brixton Road, and terminating a mile or a mile-and-a-half further south at Streatham Place. It is a broad thoroughfare, flanked by open gardens and shaded in many places by trees of respectable size and antiquity. The pavements are high-pitched, and the gutters are, consequently, relatively speaking, deep. Under the centre of the roadway itself run the two continuous tunnels through which the miles of tram cables run that draw cars and bogies from Kennington to Streatham. After the first few peals of thunder the hail began to pour down as though through some vast overhead sieve, and in a few minutes gutters were choked and lawns were covered for a depth of an inch or more. This was succeeded by rain of a semi-tropical character, and was followed a little later by a second storm of blinding hail. The hill was speedily converted into something like a cataract, the water running between the high kerb stones inches deep. Horses driven from the side streets refused to face it, and more than one driver had to get down and lead his frightened charge. It will scarcely be credited, but I actually saw a plank of timber merrily floating down the roadway. The southern tram traffic was first impeded, and then temporarily suspended, the bogies with their broad noses making heavy way 'up stream,' and throwing up water on each side as though they were snow ploughs driving through a drift. One lady I saw cross the main road, just at the base of the hill, had the water above her boot ankles, and I myself had to wade through inches of water to make my way to a belated tramcar which managed to make slow progress through the miniature sea because it was going citywards."—*Daily News*.

"Another correspondent writes:—A very curious experience happened to me yesterday. I had been spending the morning at a South Coast watering-place. It was to all appearance a perfect summer day—warm and balmy, with just wind enough to temper the sun. I left about half-past five, and as I entered the train, I noticed that the carriage was flooded with the sunshine, and it was necessary to draw down the blinds on one side. Then I lit a cigar, plunged into the *St. James's Gazette*, and for an hour or so forgot all about the weather. Suddenly, some time after we had passed Croydon, I looked out of the window, and almost shouted in my astonishment. An amazing spectacle greeted me. I had passed from summer to winter. The fields, the roofs, the roads, the railway-track, were all white with what seemed snow. I learnt afterwards that it was only hail, but to all appearance it was snow lying thickly on the ground, and the whole landscape was quite wintery."

St. James's Gazette.

ON THE WORSHIP OF METEORITES.

By the late PROFESSOR NEWTON.

THE January number of the *American Journal of Science* opens with an article written some years since by Professor Newton, but not previously published.

"In it the author has brought together a large number of facts showing the superstitious regard attached to meteorites from the

very earliest times. The first case mentioned is that of the iron from an altar of an Indian mound in Ohio, which was preserved with other articles evidently regarded as of peculiar value. By some this iron is regarded as probably the same as that of which a number of masses were found about 1886 in Kiowa county, Kansas. Another case spoken of is that of the stone which fell at Ensisheim, in Alsace, 1492, which was preserved in a church at that place. A fall of stones some nineteen years later near Milan, in Italy, is also alluded to as having probably been the occurrence recorded by Raphael by the fireball in his picture of the Foligno Madonna now in the Vatican. The sacred stone of the Mohammedans preserved in the Kaaba of the mosque at Mecca is also mentioned as perhaps a case in which a meteorite has been selected for long continued worship. The author then goes on to discuss a number of instances recorded in classical literature, and, although it is impossible to say that in each case a meteorite was the object described, in many cases it seemed highly probable. The Palladium of Troy, the needle of Cybele, the original image of the Ephesian Artemis, are some of the cases which the author describes in detail with quotations from the original authorities.

"On a later page of the same number a description is given by Warren M. Foote, of a new meteoric iron from the Sacramento Mountains, in New Mexico. This is a typical siderite and weighed, as found, 237 kilograms (521 pounds). It shows the common octahedral structure with unusual distinctness. Two plates accompany the article, one showing the appearance of the iron itself, one-eighth the natural size, the other the Widmannstätten figures printed directly from an etched slab. As further bearing on the same subject is to be mentioned a catalogue of the meteorites in the Yale University collection, which forms an appendix to the number."—

Science.

THE FORMATION OF DEW.

By Dr. J. G. McPherson, F.R.S.E., Lecturer on Meteorology in the University of St. Andrews.

UNTIL very recently the exact constitution of the nature and formation of dew was unknown even to scientific men. The opinion was generally held that if you went through the glistening meadow on a summer evening, through the diamond drops sparkling in millions, you would get your trousers or your boots moistened with dew. It was also believed that dew fell from the air upon the ground. Now in both cases the opinion was wrong, for it was not dew at all which was encountered in the meadow, and dew does not fall from the air. If you look into the garden on a dewy night—for there is such a thing as dew for all that—you will find some plants moist. Glistening drops appear on the Brocoli, but the Peas are dry. Place a hand-lantern below one of the healthiest Brocoli leaves, and you will find that the moisture is collected in clear drops along the edge of the leaf and at the end of the veins of the leaf. The leaf

veins radiating from the centre line of the surface have carried the moisture of the healthy plant to the edges to keep up plant circulation ; and the drops you see are not dew drops, but the watery juices carried out by the energy of the healthy plant. For place the lantern under an unhealthy leaf, and you will find no drops ; there is no circulating vitality in it. Again, examine grass blades, and you will find large drops near the tips of the blades, the rest of the blades being quite dry. The large drops seen on plants at night are falsely called dew ; they are produced from the plants themselves as tokens of their active and healthy growth.

This can be demonstrated in more than one way. Remove a branch of Poppy and connect it by means of an indiarubber tube with a head of water of about 40 inches. After placing a glass receiver over it to prevent evaporation, leave it for three hours. Then you will find that water has been freely excreted through the veins, resembling what were familiarly called "dew drops." If the water pressed into the leaf is coloured with aniline blue, the drops when they first appear are colourless, but before they grow to any size the blue appears, showing that little water was held in the veins. What, then, has been for centuries called dew is not dew at all, but the watery juices of the healthy plants.

But look over dead leaves on a dewy night, and you will see a fine pearly lustre—that is dew. Dead matter gets equally wet when equally exposed, and real dew is not so common as is generally supposed. On many nights on which grass gets wet no true dew is deposited on it, and on all nights, when growth is healthy, the exuded drops always appear before the true dew. The difference between the true and the false dew can easily be detected. The moisture exuded from the leaf veins of the grass—false dew—is always isolated at points situated near the tips of the blades, forming drops of some size ; whereas true dew collects evenly all over the blades. A glance distinguishes the pearly lustre of the dewy film from the glistening diamond drops of the healthy plant's juices.

But whence comes the dew ? It does not fall from the air. Whence comes it, then ? We shall see. Ground a little below the surface is always warmer than the air over it. As long, then, as the surface of the ground is above the dew point, vapour must rise and pass from the land into the air. The moist air so formed will mingle with the air above it, and its moisture will be condensed, forming dew wherever it comes into contact with a surface cooled below the dew point. In fact, dew rises from the ground.

Place some metal trays over the grass, the soil, and the road on dewy nights. You will generally find more moisture on the grass inside the trays than outside ; you will always observe a deposit of dew inside the trays, even when there is none outside at all. This shows that far more vapour rises out of the ground during the night than condenses as dew on the grass and other objects.

Pieces of iron lying on grass are soon surrounded with richer grass, on account of the moisture which the cold metal attracts from the rising water-vapour. Travellers in Australia and South Africa state that they often found the under side of their waterproof bedding placed on the ground to be wet after camping out at night. That shows that even in dry countries vapour rises from the ground at night, I remember, when walking in the vicinity of Hexham with an acute observer, trained to farming, that, on my remarking that the farmers might to their profit remove the extraordinary quantity of

small stones from the fields in order to give room for the growth of the grain, he shrewdly said, "These stones collect moisture from the ground; the soil is thin, with a gravelly subsoil, and unless the maximum amount of moisture be collected (which can only be done by allowing these stones to remain), there would be a very deficient crop. They must not therefore be removed."

Dew, then, rises from the ground. But how is the dew formed on bodies high up in the air? If the dew comes out of the ground, should it not be found on bodies only exposed to the earth? Now, dew does not rise in particles, as it was once considered to fall in particles like fine rain. It rises in vapour. Some is caught by what is on the surface of the earth, but the rest ascends in vapour form until it comes in contact with a much colder surface, to condense it into moisture. The vapour does not flow upwards in a uniform stream, but is mixed in the air by eddies and wind currents, and carried to bodies far from where it rose. In fact, dew may be deposited, even though the country for many miles all round be dry and incapable of yielding any vapour. In such cases the supply of vapour to form that dew would depend on the evaporation of the dew, and on what was wafted over by the winds.

But the most practically convincing proof of the rising of dew from the ground is in the form of hoar frost or frozen dew. If it has been a bright, clear, sunny day in January, with no snow on the ground, look over the garden, grass, and walks on the morning after the intense cold of the night; big leaves may be found scattered over the place. You see little or no hoar frost on the upper surface of the leaves, but turn up the surface next the earth, or the road, or the grass, and what will you see? You have only to handle the leaf in this way to be highly astonished. A thick, white coating of hoar frost, as thick as a layer of snow, is on the under surface. Leaf after leaf will present the same appearance. If a number of leaves have been overlapping each other, then there will be no coating of hoar frost under the top leaves; but when you reach the lowest layer, next the bare ground, you will find the hoar frost on the under surface of the leaves. Now, that is positive proof that the hoar frost has not fallen from the air, but has risen from the earth. And hoar frost is, as we have said, frozen dew.

Dew, then, mostly rises from the ground, and what used to be thought dew is the active exudation of the healthy grass. These two facts are now established. Brilliant globules are produced by the vital action of the plant, showing life in one of the most charming forms in the phenomena of Nature. — *Wakefield Express*.

REVIEWS.

The Atmosphere in relation to Human Life and Health. By FRANCIS ALBERT ROLLO RUSSELL, V.P. Royal Meteorological Soc., Fellow San. Inst., &c. Smithsonian Institution, Washington, 1896. 8vo, pp. 148.

WHEN a paper has received Honourable Mention and a Silver Medal from the Hodgkins Fund, and has been accepted and printed by the Smithsonian Institution, an ordinary reviewer feels it rather presumptuous to add his little meed of praise, and decidedly dangerous even to hint that the author has not always said what the reviewer would have expected him to say.

The first noteworthy features of this work are the large and extremely varied amount of information compressed into it, and the hopelessness of recovering any lost statement owing to there being neither index, nor table of contents, nor even specific headline on the pages. This might easily have been avoided, because the Memoir itself was written somewhat methodically in Parts and Sections. The Parts are—

I.—Constitution and Conditions of the Air ...	page	2
II.—Climate Air and Health	"	51
III.—Various Atmospheric Conditions and Phenomena	"	87
IV.—Subjects for Research	"	117

Perhaps these do not sound very definite, but the Sectional headings, of which there must be more than a hundred, are so. We will give a few, just as we turn over the leaves :—Ozone, Vapour of water, Living germs in the air, Organic emanations from the skin, Influenza, Mode of attack of Miasmatic diseases, Mechanical ventilation in schools, The zodiacal light, Malaria.

There is a mass of information in the paper, of which it is not easy to convey an idea; perhaps the simplest plan is to reproduce two paragraphs :—

TYPHOID FEVER.

“Typhoid, or enteric, fever is most common in the autumn, and much less prevalent in May and June. There is a sharp decline in its prevalence in London in December. In New York, and in large towns in Europe, the maximum is decidedly apparent in late summer or autumn. The variation of prevalence according to season seems to show a distinct connection between the development of the bacillus and the temperature of soil and water; and, considering the long incubation and duration of cases, the maximum of infection must take place at the very time when the temperature of the soil, at 1 ft. or 2 ft. deep, is about at its highest.”

HEIGHT OF THE ATMOSPHERE.

“Meteors which have been calculated to pass with ignition through air at a height sometimes as great as 300 miles; auroræ, of which the height has been estimated by careful observation sometimes to exceed 281 miles; and the duration of twilight, with polarizing effects of the sky, giving a height of 198 to 212 miles, agree in showing a much greater altitude for the extension of our atmosphere than was formerly supposed. First 5, and then 45, miles was generally stated as the outside limit. And we have to remember that at this great altitude of about 300 miles, the atmosphere is dense enough to produce very palpable effects. It would be a bold proposition to assign a limit to the atmosphere within 1,000 miles.”

On the last pages of the Memoir, Mr. Rollo Russell develops, apparently in all seriousness, the most extraordinary meteorological proposal of which we ever heard—namely, the modification of climate

by the erection of monster walls as wind barriers! That we may not be suspected of misrepresenting his views, we conclude by reprinting two sentences from page 147.

“Portsdown Hill, which runs east and west for nearly seven miles, and is over 400 ft. high, would be another highly favourable ridge for an experimental wall, say 400 ft. in height. The practicability of works of this kind can hardly be questioned when we hear of structures like the reservoir embankment at Bombay, a stone barrier 118 ft. thick, over 100 ft. high, and two miles long. A less amount of material would have gone toward a wind wall 30 ft. thick at the base, 300 ft. high, and three or four miles long.

“A wall 300 ft. or 400 ft. in height, and five or six miles in length, extending from near the Thames a few miles east of London, in a north-westerly direction, would probably have the effect of stopping a considerable amount of fog, which often moves from the Essex marshes toward the metropolis. It would somewhat increase the rainfall on its westerly side. A wall stretching from N.W. to S.E. across some of the heaths in the neighbourhood of Woking would reduce the rainfall of North-east Surrey and of London.”

The Roman wall, and even the great wall of China, though of far greater length than any suggested by Mr. Rollo Russell, are trifles compared with the walls 300 ft. or 400 ft. high which the writer suggests. What landowners, and Parliament, would say to such proposals, has to be ascertained; and it might have facilitated discussion had the cost per mile, of a wall 400 ft. high and strong enough to resist any gale, been procured from some competent engineer. There is another object which these gigantic walls might serve, they might assist the proposed communications with the inhabitants of Mars.

Effects of the Weather upon Vegetation. A Lecture given by JOHN CLAYTON to the Bradford Naturalists' Society, March 1st, 1897.
 Byles & Sons, Bradford, 1897. 8vo., with a photograph.

THIS is one of the most instructive and original lectures that we have seen for a long time. Mr. Clayton is evidently a keen, painstaking, and very original investigator; and instead of the lecture being a series of platitudes and quotations, as is generally the case, it is almost wholly the result of investigations carried out with great care and patience during many years. As is it published at a nominal price, we merely specify a few of the points treated—such as, the relation of tree girth to amount of foliage, relative growth of plants in sun and in shade, followed by considerations as to the sunshine recorded in different parts of England and its influence on crops, percolation gauges, why trees split in times of frost, and the relation between the elongation of twigs and their increase in girth. When a well-printed pamphlet gives information, almost wholly original, on all these points for sixpence,—we need not advise our botanical and agricultural readers what course to pursue.

Observations made at the Blue Hill Meteorological Observatory, Massachusetts, U.S.A., under the direction of A. LAWRENCE ROTCH, A. M. Discussion of the Cloud Observations, by H. HELM CLAYTON. [Excerpt Annals of the Astron. Obs. of Harvard College.] Cambridge, U.S.A., 1896. 4to, 228 pp. and 18 plates.

THIS work is much more important and interesting than its title suggests, for it is not merely a Discussion of the Blue Hill Cloud Observations. Chapter I., entitled "Historical Sketch of Cloud Nomenclature," is really much more than a "sketch"; it occupies more than 50 4to pages, and gives the best history of the subject that we remember. It may be convenient to enumerate in chronological order the authorities quoted by Mr. Clayton:—

1801	Lamarck	1881	Möller	1888	Abercromby
1803	Howard		„ Weilbach	1889	Maze
1804	Lamarck	1882	Vettin		„ von Helmholtz
1815	Forster		„ Klein		„ Clayton
1828	Clos	1883	Koppen		„ { Hildebrandsson
1831	Kaemtz		„ Russell, Rollo	1890	{ Köppen
1841	Loomis		„ Ley		{ Neumayer
1846	Fritsch		„ Mohn		„ van Bebbber
1857	Jevons	1884	Tissandier	1891	Abbe, C.
1860	Schmid	1885	Scott		„ Singer
1861	Herschel		„ Sprung		„ Vincent
1863	Fitzroy		„ Ley	1892	Kassner
„	Poëy	1885	{ Hildebrandsson		„ Möller
1865	„		{ Capello	1893	Gaster
1868	Loomis		„ Barker, Wilson		„ Hildebrandsson
1870	Poëy		„ Möller		„ von Bezold
1874	Muhry	1886	Jesse	1894	Ley
1875	Blasius		„ Toynbee		„ Davis, W. M.
1879	Ley	1887	Abercromby		„ { Hildebrandsson
„	Poëy		„ Clayton		„ { Riggerbach
1880	Ley		{ Hildebrandsson		{ Teisserenc de Bort
„	Hildebrandsson		„ { Abercromby		

Although the above list is not—does not profess to be—complete, it sufficiently indicates the thought and care devoted to the preparation of the "sketch"—a sketch of great ability and usefulness. We are not prepared to controvert any of the writer's statements, but at the same time we regret that he has been led to prepare, for use at Blue Hill, so complex a nomenclature (29 varieties) as that given on p. 342.

It is impossible for us to deal exhaustively with this work. Cloud observations as to amount, form, motion and altitude, have long been a feature in Blue Hill work; and in this paper we have a masterly discussion of them in relation to cyclones and anticyclones, to wind motion, to rainfall, to temperature, and to weather forecasting. We have long had doubts respecting the ideal forms of cyclones, and the following paragraph from p. 449 supports our doubts.

"Another point of interest shown by the preceding results is, that a cyclone cannot be looked upon as an eddy in the atmos-

phere like an eddy in a river, because the highest air currents have a resultant velocity of drift thirty times as fast as the lowest current, and the eddy would be rapidly destroyed. The cyclonic circulation must rather be considered as continuously renewing itself, and struggling against velocities of drift which vary with the altitude."

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, April 21st, at the Institution of Civil Engineers, Great George Street, Westminster, Mr. E. Mawley, F.R.H.S., President, in the chair. The following papers were read:—

Mr. W. H. Dines on "*The relation between cold periods and anti-cyclonic conditions of weather in England during the winter.*" There seems to be a generally accepted belief that anti-cyclonic conditions during the winter are likely to be accompanied by exceptional cold, but (for England) the author's observation has led him to the opposite conclusion, and he always expects a frost to break up as soon as the barometer gets much above 30·00 inches. To test the truth of this theory, he tabulated the height of the barometer during all the cold periods during the three winter months of the fifty years 1841-90. Out of 74 frosts, he found that 16 only had a pressure exceeding 30·20 inches, and the majority of these were of very short duration. Thirty-three, or less than half, had a pressure exceeding 30·00 inches. Twenty-one had a pressure below 29·80 inches, and these included almost every frost in the period remarkable for its length or severity.

Mr. A. Lawrence Rotch on "*The use of kites to obtain meteorological records in the upper air, at the Blue Hill Observatory, Mass.*" Three kinds of kites have been used, viz.: 1, the Malay kite, which presents a convex surface to the wind; 2, the Hargrave cellular kite; and 3, a flat kite, with a fin or keel on the front, devised by Mr. Clayton. These kites are attached to a wire carrying self-recording meteorological instruments, and a steam winch automatically distributes the wire on the drum and records its pull. The instruments have been elevated more than one hundred times, and valuable meteorological data as to the changes of temperature, humidity, and wind, up to an extreme altitude of 8,740 feet above Blue Hill have been obtained.

The meteorographs recently employed are an anemo-thermograph, made by Fergusson of the Observatory, and a baro-thermo-hygrograph made by Richard of Paris. These instruments are constructed chiefly of aluminium, and each weighs less than 3 lbs. One of them is hung to the end of a steel pianoforte wire, having a tensile strength of 280 lbs., between two or more kites which are attached

to the wire by independent cords. According to the strength of the wind, other kites can be attached at intervals by a peculiar form of clamp, and serve to lift the wire.

The altitude may be determined by triangulation from two stations at the ends of a base-line, but more easily by one angular measurement at the winch, the length of kite line being known. When the Richard meteorograph is hidden by clouds, differential measures of altitude are obtained from its barometric records. Measurements of the height and thickness of the lower clouds are frequently made by this method.

Kites are greatly superior to captive balloons for meteorological observations, except during calms or very light winds, which, however, seldom extend aloft. Not only do kites cost very much less, but they can lift a light load, such as a meteorograph, much higher in ordinary winds. The Blue Hill Kites fly in all weathers, whenever the wind blows between twelve and fifty miles an hour, whereas captive balloons are driven down by strong winds along an arc whose radius is the lifted cable, and thus transmit violent shocks to the suspended instruments.

Mr. A. B. MacDowall on "*Suggestions of Sunspot influence on the weather of Western Europe.*" The author believes that there is a tendency to greater heat in the summer half-year, and to greater cold in the winter half-year near the phases of minimum sunspots than near the phases of maximum; the contrast between the cold and heat of the year being intensified about the time of minimum sunspots.

THE ICY SAINTS.

WE think that it would be good if some investigator would study the subject of low temperatures in May. In France, May 11th to 14th, the fête days of St. Mamertius, St. Pancras, St. Servais and St. Pacôme, are known as the "jours de glace," and the proverb is given in another form in Inward's *Weather Lore*:

"Who shears his sheep before St. Servatius's day loves more his wool
than his sheep."

The daily mean temperatures now adopted at Greenwich show a cooling of only about half a degree for the four days, but means do not tell us everything, and it is possible that the cold spell may vary in date, or in intensity. In our number for June, 1891, we reproduced a lovely frost scene of May 18th, and it will be remembered that on May 22nd, 1867, the Derby was run in a snow-storm. We do not suggest that either the 18th or the 22nd has much to do with the 11th-14th—but merely that the whole question is worth study. In 1895 the 11th-14th were hot, but the mean temperature at Greenwich fell to 42°·9 on 17th, and in 1897 the mean temperature in London on the 12th was 42°·6, and for the 11th-13th averaged 43°·6, or 8°·4 below the mean.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, NOVEMBER, 1896.

STATIONS. <i>(Those in italics are South of the Equator.)</i>	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
England, London	50·3	12	25·4	30	46·0	34·9	36·1	85	80·1	19·1	1·17	10	6·2
Malta.....	83·0	1	49·4	23	69·2	58·8	55·2	79	124·7	44·4	5·12	14	7·1
<i>Mauritius</i>	83·4	13	65·0	11	81·1	68·9	63·1	70	136·1	55·5	·91	9	5·5
Calcutta.....	89·7	2	58·0	28	83·6	64·4	62·8	68	147·2	49·6	·05	...	2·1
Bombay.....	92·8	12	66·2	24	88·2	75·4	70·6	69	139·5	58·3	·53	3	2·8
Ceylon, Colombo	91·0	5	72·2	23	87·4	75·0	73·3	82	152·0	68·3	19·81	27	6·0
<i>Melbourne</i>	97·4	23	36·5	2	74·5	51·4	48·9	67	145·5	24·6	·71	6	5·1
<i>Adelaide</i>	103·4	25	46·5	2	84·2	58·1	47·5	44	162·1	33·5	·52	3	4·4
<i>Sydney</i>	88·0	13	48·6	1	71·7	59·3	58·6	75	147·2	43·8	5·23	22	6·5
<i>Wellington</i>	69·0	25	39·0	2	62·2	48·4	45·4	70	139·0	30·0	2·82	12	4·3
<i>Auckland</i>	72·0	29	46·5	2	64·9	52·1	52·3	82	138·0	43·0	1·63	17	5·3
Jamaica, Kingston.....	92·3	10	69·4	15	88·9	71·6	63·9	71	...	...	1·40	9	...
Trinidad	91·0	3, 19	69·0	13	88·3	71·2	74·1	86	177·0	68·0	9·81	22	...
Grenada.....	88·0	4	67·2	30	83·1	73·4	74·4	77	155·2	...	20·90	26	5·0
Toronto	63·8	18	17·5	30	47·2	31·9	34·8	78	73·0	12·5	2·95	20	7·6
New Brunswick, } Fredericton	60·9	6	— 1·1	23	39·3	22·1	26·8	73	...	...	4·98	16	7·0
Manitoba, Winnipeg... } British Columbia, } Esquimalt	36·5	2	— 31·7	30	15·6	— 1·7	...	...	...	...	1·31	19	6·5
	56·7	13	16·7	27	40·9	33·6	35·4	90	...	...	10·97	19	7·1

REMARKS.

MALTA.—Adopted mean temp. 62°·7, or 0°·6 above the average. Mean hourly velocity of wind 10·8 miles. Average temp. of sea 69°·8. Lightning on 10 days; thunderstorms on 3 days; hail on 2 days. The shade max., 83°·0, is the highest recorded for November. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·3, dew point 1°·0, and rainfall ·98in. below their respective averages. Mean hourly velocity of wind 11·0 miles, or 0·1 above average; extremes, 25·0 on 4th and 2·3 on 3rd; prevailing direction, S.E. by E. to E. T. F. CLAXTON.

CEYLON, COLOMBO.—Thunderstorms occurred on 11 days. A. E. WACKRILL.

Adelaide.—A warm, dry month, the temp. being 4°·3 above, and the rainfall ·48 in. below, the average. C. TODD, F.R.S.

Sydney.—Rainfall 2·02 in. above, temp. 1°·1 below, and humidity 5°·4 above, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Showery in the early part of the month, with fine intervals; wind chiefly S.; the latter part very fine, with moderate and variable winds. Slight thunder on 1st and 11th. Snow on near hills on 1st and 2nd. Hail on 1st and 2nd. Slight earthquake on 27th, at 3 p.m. Mean temp. 1°·2 below, and rainfall 1·35 in. below, their respective averages. R. B. GORE.

Auckland.—A dry month, with an unusual predominance of cold S.W. winds. Rainfall barely half the average of 29 years. Mean temp. 2° below the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Mean hourly velocity of wind 2·7 miles. Rainfall about half the average. R. JOHNSTONE.

TRINIDAD.—Rainfall 2·95 in. above the 30 years' average. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,
APRIL, 1897.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	1·59	XI.	Rhayader, Nantgwillt ...	5·97
II.	Dorking, Abinger Hall .	1·62	„	Lake Vyrnwy	5·13
„	Birchington, Thor	1·78	„	Corwen, Rhug	2·42
„	Hailsham	1·87	„	Criccieth, Talarvor	3·15
„	Ryde, Thornbrough	2·62	„	I. of Man, Douglas	2·97
„	Emsworth, Redlands ...	2·26	XII.	Stoneykirk, Ardwell Ho.	2·37
„	Alton, Ashdell	1·77	„	New Galloway, Glenlee	2·75
III.	Oxford, Magdalen Col..	2·39	„	Lilliesleaf, Riddell	1·47
„	Banbury, Bloxham	1·42	XIII.	N. Esk Res. [Penicuick]	2·20
„	Northampton, Sedgebrook	1·90	„	Edinburgh, Blacket Pl..	1·04
„	Duddington [Stamford].	1·66	XIV.	Glasgow, Queen's Park..	2·01
„	Alconbury	1·49	XV.	Inverary, Newtown	3·97
„	Wisbech, Bank House...	1·56	„	Oban, The Corran	3·14
IV.	Southend	1·42	„	Islay, Gruinart School ...	1·27
„	Harlow, Sheering.....	1·79	XVI.	Dollar.....	1·51
„	Colchester, Lexden	1·66	„	Balquhiddel, Stronvar..	5·47
„	Rendlesham Hall	1·49	„	Ballinluig	2·59
„	Rushall Vicarage	2·02	„	Ednaspidal H. R. S.....	3·92
„	Swaffham	2·42	XVII.	Keith H. R. S.....	·77
V.	Salisbury, Alderbury ...	2·24	„	Forres H. R. S. ...	·70
„	Bishop's Cannings	2·25	XVIII.	Fearn, Lower Pitkerrie..	·82
„	Blandford, Whatcombe .	3·79	„	N. Uist, Loch Maddy ...	3·91
„	Ashburton, Holne Vic...	6·01	„	Invergarry	3·31
„	Okehampton, Oaklands.	5·05	„	Aviemore H. R. S.	1·44
„	Hartland Abbey	3·77	„	Loch Ness, Drumnadrochit	1·83
„	Lynmouth, Glenthorne..	4·54	XIX.	Invershin	·63
„	Probus, Lamellyn	5·03	„	Scourie	1·94
„	Wellington, The Avenue	2·79	„	Watten H. R. S.....	·92
„	Wincanton.....	3·30	XX.	Dunmanway, Coolkelure	8·55
VI.	Clifton, Pembroke Road	3·68	„	Cork, Wellesley Terrace	6·00
„	Ross, The Graig	2·13	„	Killarney, Woodlawn ...	4·01
„	Wem, Clive Vicarage ...	1·68	„	Caher, Duneske	4·17
„	Cheadle, The Heath Ho.	3·27	„	Ballingarry, Hazelfort...	4·04
„	Worcester, Diglis Lock	1·12	„	Limerick, Kilcornan ...	5·21
„	Coventry, Kingswood ..	2·18	„	Broadford, Hurdlestown	3·85
VII.	Grantham, Stainby	1·71	„	Miltown Malbay	6·85
„	Horncastle, Bucknall ...	1·28	XXI.	Gorey, Courtown House	4·19
„	Worksop, Hodack Priory	1·31	„	Athlone, Twysford	4·54
„	Neston, Hinderton	2·03	„	Mullingar, Belvedere ...	4·36
VIII.	Southport, Hesketh Park	2·73	„	Longford, Currygrane...	4·26
„	Broughton-in-Furness ...	3·73	XXII.	Woodlawn	4·39
IX.	Ripon, Mickley.....	1·61	„	Crossmolina, Enniscoo ..	4·90
„	Melmerby, Baldersby ...	1·35	„	Collooney, Markree Obs.	3·40
„	Scarborough, Observat'y	1·78	„	Ballinamore, Lawderdale	...
„	Middleton, Mickleton ...	1·73	XXIII.	Lough Sheelin, Arley ...	...
X.	Haltwhistle, Unthank...	1·85	„	Warrenpoint.....	3·64
„	Bamburgh	1·14	„	Seaforde.....	2·57
„	Keswick, The Bank	2·82	„	Belfast, Springfield	2·77
XI.	Llanfrechfa Grange	4·65	„	Bushmills, Dundarave..	2·38
„	Llandoverly	3·75	„	Stewartstown	2·86
„	Castle Malgwyn	3·23	„	Killybegs	4·22
„	Builth, Abergwesyn Vic.	6·01	„	Lough Swilly, Carrablagh	2·80

APRIL, 1897.

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 1830-9.	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) ...	1.57	— .17	.23	6	16	67.3	27	27.8	11	2	9
II.	Maidstone (Hunton Court)...	2.04	+ .39	.80	28	10	...	...	...	...	...	...
III.	Strathfieldsaye	1.53	...	.44	15	16	...	...	...	...	...	...
IV.	Hitchin	1.77	— .02	.43	28	13	66.0	26 ^c	26.0	10	5	...
V.	Winslow (Addington)	1.57	— .35	.31	16	14	68.0	28	26.0	11	3	7
VI.	Bury St. Edmunds (Westley)	2.07	+ .41	.45	16	15	64.0	29	30.0	6	...	...
VII.	Norwich (Brundall)	1.81	...	.29	16 ^a	17	67.8	27	27.0	9	6	12
VIII.	Weymouth (Langton Herring)	2.92	+ 1.04	.49	11	16	64.0	28	32.0	5	1	...
IX.	Torquay (Cary Green)	3.98	...	1.26	26	20	59.9	28	34.3	2	0	2
X.	Polapit Tamar [Launceston]..	3.32	+ 1.10	.44	16	24	65.8	27	29.4	11	1	4
XI.	Stroud (Upfield)	1.81	— .34	.26	12	20	68.0	28	31.0	4	1	...
XII.	Churchstretton (Woolstaston)	2.21	— .13	.37	16 ^b	20	63.5	27	27.0	5	7	13
XIII.	Tenbury (Orleton) .....	...	...	...	...	...	...	...	...	...	...	...
XIV.	Leicester (Barkby)	1.67	— .43	.38	17	17	67.0	29	21.0	4	6	16
XV.	Boston	1.29	— .42	.31	16	15	69.0	29	27.0	11	5	...
XVI.	Hesley Hall [Tickhill]	1.59	— .12	.42	28	15	67.0	29	27.0	5, 11	8	...
XVII.	Manchester (Plymouth Grove)	2.16	+ .45	.50	16	17	64.0	26	27.0	4	4	4
XVIII.	Wetherby (Ribston Hall) ...	...	...	...	...	...	...	...	...	...	...	...
XIX.	Skipton (Arneliffe)	4.11	+ .68	.82	17	16	...	...	...	...	...	...
XX.	Hull (Pearson Park)	1.75	— .17	.36	16	17	67.0	29	27.0	3, 11	11	11
XXI.	Newcastle (Town Moor)	1.69	— .14	.44	17	12	...	...	...	...	...	...
XXII.	Borrowdale (Seathwaite).....	7.27	+ .13	1.80	13	14	...	...	...	...	...	...
XXIII.	Cardiff (Ely).....	4.30	+ 1.89	.56	17	22	...	...	...	...	...	...
XXIV.	Haverfordwest	4.08	+ 1.45	.71	5	23	62.9	28	30.2	11	1	8
XXV.	Aberystwith (Gogerddan) ...	4.04	+ 1.48	.73	6	17	64.0	26	21.0	1, 7	8	...
XXVI.	Llandudno	3.11	+ 1.30	.55	13	18	59.5	28	33.5	8	0	...
XXVII.	Cargen [Dumfries]	3.46	+ 1.23	.92	13	12	60.8	26 ^a	24.6	1	9	...
XXVIII.	Edinburgh (Blacket Place)...	1.04	...	.33	13	13	57.3	29	26.4	3	6	14
XXIX.	Colmonell	3.12	...	.87	13	14	63.0	27	24.0	1	...	...
XXX.	Lochgilthead (Kilmory).....	3.48	+ .67	.79	13	13	...	...	21.0	1	10	...
XXXI.	Mull (Quinish)	3.74	+ .76	.88	13	13	...	...	...	...	...	...
XXXII.	Loch Leven Sluices	1.60	— .62	.70	14	7	...	...	...	...	...	...
XXXIII.	Dundee (Eastern Necropolis)	1.50	— .55	.55	13	15	59.0	28	27.7	2	8	...
XXXIV.	Braemar	2.51	+ .09	1.17	13	14	53.2	22	13.4	3	15	27
XXXV.	Aberdeen (Cranford)	2.51	...	.84	13	17	57.0	29	23.0	2	5	...
XXXVI.	Cawdor (Budgate) .....	.79	— .73	.20	15	12	...	...	...	...	...	...
XXXVII.	Strathconan [Beaully]	2.92	+ .11	.73	16	9	...	...	...	...	...	...
XXXVIII.	Glencarron Lodge.....	4.14	...	.78	13	15	57.7	27	23.0	2	12	...
XXXIX.	Dunrobin .....	.68	— 1.05	.23	12	8	53.0	28	27.8	3	4	...
XL.	S. Ronaldsay (Roseberry).....	1.42	— .19	.56	13	17	54.0	17	27.0	1, 2	4	...
XLI.	Darrynane Abbey.....	5.69	...	.80	12	23	...	...	...	...	...	...
XLII.	Waterford (Brook Lodge) ...	5.05	+ 2.58	.86	12	23	61.0	28	31.0	2	1	...
XLIII.	O'Briensbridge (Ross)	5.19	...	.54	3	20	...	...	...	...	...	...
XLIV.	Carlow (Browne's Hill)	3.63	+ 1.35	.47	5	22	...	...	...	...	...	...
XLV.	Dublin (Fitz William Square)	2.49	+ .37	.42	20	22	59.7	28	29.9	2	1	4
XLVI.	Ballinasloe	4.78	+ 2.44	.58	16	23	58.0	26	30.0	1, 2	5	...
XLVII.	Clifden (Kylemore)	7.38	...	1.14	5	19	...	...	...	...	...	...
XLVIII.	Waringstown	3.24	+ .82	.75	15	19	63.0	29	26.0	2	7	15
XLIX.	Londonderry (Creggan Res.)..	2.24	— .00	.33	29	20	...	...	...	...	...	...
L.	Omagh (Edenfel)	2.92	+ .69	.40	20	19	60.0	26	26.0	1	6	16

+Shows that the fall was above the average; —that it was below it.
a—and 28. b—and 17. c—and 27.

METEOROLOGICAL NOTES ON APRIL, 1897.

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.

ADDINGTON.—Cold, ungenial weather until the 26th, when there was a considerable rise in the max. temp. On the afternoon of the 16th a sharp TS occurred, and another on the evening of the 28th. Mean temp. just one degree higher than the mean of March. The cuckoo rather early, heard on the 15th. Swallows seen on same date. Nightingale later, not heard until 24th. S on 1st and 7th. H on 30th.

BURY ST. EDMUNDS, WESTLEY.—The month was cold, with the exception of the 13th till the 26th, then warm till the end. A violent TS occurred on the 28th, with unusual darkness about midday, very heavy in Mid-Suffolk. The migratory birds came at their usual times. Distant T on 7th and 17th.

NORWICH, BRUNDALL.—Rainfall .14 in. above the average; mean temp. slightly below. Prevailing winds from N.E., S.E., and S.W. The early part of the month was very ungenial, with S on 1st, 2nd and 5th. Windy weather and cool for the season till the fourth week, when some warm days alternating with heavy rains forced on vegetation.

WEYMOUTH, LANGTON HERRING.—Rainfall for the first four months of the year, 58 per cent. above the average. Average temp. at 9 a.m., 47°·1, or 0°·4 below the average of 25 years. Solar halos on 11th and 20th. Fogs on 9th, 27th and 28th. TS on 26th.

TORQUAY, CARY GREEN.—Rainfall 1·64 in. above the average. Total rainfall of the first four months 4·81 in. above the average. Mean temp. 47°·5, or 0°·7 below the average. Duration of sunshine 139 hours 35 minutes, being 43 hours 55 minutes below the average. Total sunshine of the first four months 86 hours 40 minutes below the average. The R of the 26th, 1·26 in., all fell in five hours, between 5 p.m. and 10 p.m.

POLAPIT TAMAR [LAUNCESTON].—Unusually wet for April, also a cold month generally. For the fortnight from the 11th to the 24th strong winds to half gales were prevalent. H storms on 6th and 7th. Distant L on 26th.

STROUD, UPFIELD.—Sleet on 1st. Gales from S.E. on 3rd, and from S.W. on 14th and 17th. T on 28th.

WOOLSTASTON.—A backward month. The first week very cold, with S storms on 1st and 6th. First swallow on 11th; cuckoo on 21st. T and L on 28th. Mean temp. 44°·1.

LEICESTER, BARKBY.—A rather cloudy and windy month. Mean temp. 45°·4. T on 16th and 28th. S on 6th and 7th. Cuckoo heard on 13th; swallow seen on 17th.

HULL, PEARSON PARK.—H on 2nd and 4th. TS at noon on 16th.

WALES.

HAVERFORDWEST.—The first four months of this year have produced 16·74 in. of rain, the general characteristics being constant wet and mildness. In 1867 the rainfall for the first four months was 26·55 in., character constant wet and severity, S forming a large portion of the fall. In 1872 constant R and mildness characterized the first four months, the fall being 23·34 in. So during the last 48 years there have been two notably wetter springs than the present. April this year has been remarkable for constant R, but never any very heavy fall.

S on the 1st. Lunar halos on 10th and 15th. Aurora on 11th. Vegetation very forward; ash and oak both out, ash the earlier. Prevailing winds from S.E. 19 days, S.W. 9 days.

ABERYSTWITH, GOGERDDAN.—A cold and stormy month, with very little sunshine.

SCOTLAND.

CARGEN [DUMFRIES].—A cold, rainy, sunless month, resembling in almost every particular the exceptionally unpleasant April of 1877. The mean Bar. pressure has only been less in six, the mean temp. lower in five, the rainfall greater in six, and the sunshine less in two, out of the 38 years over which observations extend. The mean temp. is only $1^{\circ}7$ higher than that of February, while the mean min., $34^{\circ}7$, is actually lower than that of either February or March. Easterly winds prevailed on 21 days. Heavy S showers occurred on 15th. The total R for the first four months of the year, 14.24 in., is only .71 in. above the average for that period. Vegetation is unusually backward, fully three weeks later than last year.

COLMONELL.—Rainfall .81 in. above, and mean temp. $0^{\circ}4$ below the average of 21 years. Heavy S shower on 1st; S on 14th; T on 14th and 15th.

MULL, QUINISH.—The week from 11th to 18th was exceptionally wet and stormy. Tremendous H showers, with T and L, from S.W. on 14th, 15th and 16th.

BRAEMAR.—A very cold and backward month.

ABERDEEN, CRANFORD.—This month has been cold, with little sunshine.

S. RONALDSAY, ROEBERRY.—A very cold month. Mean temp. $41^{\circ}6$, being $2^{\circ}6$ below the average of seven years.

IRELAND.

DARRYNANE ABBEY.—Another very wet month, and cold, except the last few days.

WATERFORD, BROOK LODGE.—Showers of S on 1st; heavy H showers on 6th; H and S on 14th. Swallows seen on 24th; cuckoo heard on 26th.

O'BRIENSBRIDGE, ROSS.—The wettest April for 30 years, but exceeded in 1867, when 6.43 in. of R fell. Temp. very low during the month, and gales frequent and heavy. Everything late.

DUBLIN.—A cold, changeable, rainy month. The amount of cloud was 12 per cent. in excess of that of April, 1896. Mean temp. $45^{\circ}9$, or $1^{\circ}8$ below the average. Fog on 21st. High winds on 16 days, reaching the force of a gale on 3rd and 10th. H fell on five days. Solar halos were seen on the 8th and 16th. Lunar halos on the 10th and 15th. S or sleet fell on the 1st and 14th.

WARINGSTOWN.—A very backward season.

OMAGH, EDENFEL.—Until the 21st the weather of April was a continuance of the extremely wet and unsettled weather of March, with the addition of a decreased instead of an increased mean temp.; as a result, vegetation, even of trees, absolutely stood still, as might also be said of all kinds of farm labour. The fourth week, however, was fine and generally dry and clear, and much agricultural work was overtaken; but the month ended in a return to the rainy and unsettled condition prevailing now for so many months.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXVII.]

JUNE, 1897.

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

HAILSTORM AT SEAFORD, SUSSEX,
MAY 30TH, 1897.

It is very rare for it to be possible to prove that in England, over a considerable area, a shower of hailstones has fallen each of which was as large as a hen's egg. This we are in a position to do, thanks to the following correspondence, and to two different photographs with which also we have been favoured. We intend to give (1) letters received from observers personally known to us; (2) verbatim reprints from local and other newspapers; (3) condensed notes from various sources; (4) a brief commentary on the whole.

To the Editor of the Meteorological Magazine.

SIR,—As I have not seen in a London or other paper any notice of a curious storm here, last Sunday, May the 30th, I send you some remarks in case you care to note them.

It had been an exceedingly hot day, with scarcely a breath of wind on the high cliffs towards Beachy Head, and during the afternoon light clouds covered the sky. At about 6.30 p.m. a dark cloud, with two long streamers apparently issuing from the sea, approached from the south, and on nearing the shore the calm surface of the water was suddenly covered with heavy splashes, as if a vast shower of big stones had been thrown in. Half a minute later hailstones fell on the land, varying in size from that of a small marble to four or even five inches round. The large stones all had a round nucleus of opaque white frozen snow, about half-an-inch in diameter, and this was surrounded by a ball of transparent ice. As these ice-balls of the largest size fell on an average ten feet apart, they did not do so much damage as would have taken place had they been closer together, but they broke every pane of glass exposed horizontally to their force. After the hail had fallen for two or three minutes, another five minutes of very heavy rain followed, and when I ran out, on this ceasing, to pick up two big hailstones which I saw on the road, I found on measuring them that they were $4\frac{1}{2}$ inches round. As these had been exposed fully seven minutes on the ground, and for five out of the seven to rain, I conclude that they were

originally somewhat larger. When the storm was over, very many persons came out and collected the large hailstones in bags; I wondered why.

In 1846 a similar storm occurred at Herne Hill, where my father lived, and in a very few minutes glass in his conservatories to the value of nearly £400 was destroyed, but I do not remember any other.

The glass used now is much stronger than it was in 1846, and in greenhouses especially; I noticed that last week the window-panes escaped very generally, whereas I am sure they would have been broken had the old glass been there.

It appears that the hail was most local, for it did not fall two miles off East or West.—Most sincerely yours,

A. S. BICKNELL.

5, Esplanade, Seaford, Sussex.

SIR,—The weather on 30th, though very warm, was lovely in the morning and afternoon; but towards 5 p.m. clouds began to draw up from the S.W., and about 6 p.m. there was distant T, which came closer. I counted 14 slowly between the L and the T. The remarkable feature was the large H; a quarter of an hour after the stones had fallen I saw three each measuring $1\frac{3}{4}$ in. by $1\frac{1}{8}$ in., slightly flattened and with a nodulated surface. A friend picked up several $4\frac{1}{4}$ in. in circumference. Several of the large ones left in a hot kitchen for four hours were found to have melted only to the size of small marbles; must not the ice have been exceptionally cold? Twigs and branches were cut off as with a knife, and much glass was broken.—Yours truly,

York House, Seaford, May 31st.

A. ALDAM MOON.

SIR,—Reports having reached me respecting the severe hailstorm which swept across this county on Sunday evening, May 30th, I am induced to send you the following account, furnished to me by the Rev. Chancellor Parish, of what occurred at his Vicarage of Selmeston, near Polegate.

“I am anxious to describe, as well as I can, the hailstorm which fell upon us yesterday (May 30th), as I am sure you must have watched it from a distance with great interest. The storm clouds drew up from the S.W., and I remarked them about 2.30, but they advanced slowly till they appeared all around us; at about 6 p.m., I came indoors and made my notes of the services of the day, &c., I then observed that it became vary dark, and suddenly, between 15 and 20 minutes past six, a terrific storm of wind and rain swept down upon us. I walked to the window of my study to look at it, and the rain changed to hail, and the stones became larger and larger till their size was quite alarming. The whole duration of the storm was, as near as I could guess (without having timed it),

six minutes or seven—viz., two minutes rain; one minute ordinary hail the size of a pea (diameter 0·1 in. to 0·2 in.); two minutes larger stones, the size of small marbles (diameter 0·4 in. to 0·5 in.); two minutes largest size of irregularly oval shape, (about $1\frac{1}{2}$ inches by $\frac{3}{4}$ inch). My drawing-room window and door were wide open, and the storm swept right through. Twenty-five panes of glass were completely smashed, and the shattered fragments were scattered all over the room. The floor was covered with hailstones. The noise was tremendous, and almost silenced the sound of the thunder, which was incessant. As the storm approached, some swallows made immense and successful efforts to get *above it*. They went almost straight up in the air, and when the storm suddenly ceased, there they were—high and dry. I should like to have seen it from their point of view. One feature was the surprising way that the stones bounded straight up off the lawn, more than two feet, I judge by the height of my railings. The rainfall here was only '31 in. as measured at 9 a.m., 31st."

At Sherrington Manor, a short distance from Selmeston, sad havoc was made upon the conservatories and hot-houses, not only the glass being broken, but the valuable plants very much injured.

From Crowborough I watched the progress of the clouds for some hours. Very heavy electric clouds appeared over the South Downs, near Newhaven, soon after 3 p.m., and for some time remained almost stationary. A rather strong easterly wind was blowing over Crowborough Hill at the time, which seemed to prevent the storm advancing in our direction; this wind at last increased in force, and apparently drove back the advancing clouds upon the main mass of the storm. Soon after six p.m., a line of nimbus cloud, two or three miles in length, of a whitish appearance, exhibited a well-defined edge on the northern side, and any further advance of the storm in our direction was checked. After passing over Seaford and Selmeston, it rapidly increased its pace, and finally disappeared to the eastward.

A rain storm, which passed over Crowborough from 6.55 to 6.59 p.m., came from quite another direction, viz., from the N.W. It came on quite suddenly with a vivid flash of lightning and unusually loud thunder. The rain fell in torrents for four minutes, when it ceased as suddenly as it had commenced. The rainfall was just '30 of an inch in the time. No hail fell here.

I enclose some newspaper cuttings respecting this storm, and also a photograph of a group of hailstones which fell at Seaford, in fac-simile size. Such large hailstones have not fallen in Sussex since Aug. 23rd, 1855, when they were ordinarily the size of pullets' eggs, and some much larger, measuring from three to six inches in circumference.

Yours truly,

C. LEESON PRINCE, F.R.Met.S.

The Observatory, Crowborough Hill, June 5th, 1897.

REMARKABLE HAILSTONES.

To the Editor of the "Morning Post."

SIR,—It would be interesting to know whether other places experienced the wonderful storm which visited us last Sunday, May 30th. At about 6.30 p.m. there fell for the space of some minutes a shower of hailstones varying in size from a hen's to a pigeon's egg, some of which weighed three-quarters of a pound each,* and measured over 5 in. in circumference. They had the appearance of balls of ice, with a coarsely granulated surface, and the centre of each was rayed like a crystalline star. The sight was a memorable one, and the damage done to the glass in the town and neighbourhood was very considerable.—Yours, &c.,

E. DEVERSON.

Seaford, Sussex, June 5th.

A SHOWER OF ICE.

ON Sunday evening, Seaford and the immediate district to the westward, were subjected to a sort of bombardment by a furious shower of ice, large frozen lumps and fragments crashing down with tremendous force, for a brief space of time. A hailstorm in summer is an unusual event, but a storm, whose hail consists, as it did on Sunday, of pieces of ice, most of which were considerably more than an ounce in weight, is a marvellous occurrence—at least in this country. In the tropics, according to travellers' tales, such a hail would not be regarded with surprise. Many of the hailstones which fell on Sunday were globular in shape, and were as large as a golf ball, though a few were equal in size to a small orange. Several of these, on being examined, were seen to have cores from which radial lines extended. Others were as large as a hen's egg, while some were angular in shape. Hailstones which were compared to cocoa-nuts for magnitude, were reported to have fallen, but their apparent size seems to have been due to the spectacles through which they were viewed. Ten "stones," picked up without making any selection as to bulk, weighed a pound, and one was found which turned the scale at four ounces. Others were put into the scale with the object of ascertaining the quantity of fluid resulting from liquefaction, and one was said to have filled, when melted, a "three measure of Scotch," whatever that may be, but a small wine glass, which the water from another filled, is a vessel whose capacity will be more generally understood. The shower of ice lasted only a few minutes, but it is scarcely necessary to state that it practically wrecked every greenhouse in the district. Much damage was also done to glass in a perpendicular position, and many

* This is a mistake, or misstatement. The dimensions given by the writer agree with those of other persons, and with the photographs, but the weight is at least three times too great. "Three-quarters of a pound" of ice is about 22 cubic inches; but the largest hen's egg may be taken as 4 cubic inches, and if so, then the " $\frac{3}{4}$ lb." is about five times too great. Probably the writer meant 3 oz., which would be very probable.—ED. *M.M.*

P.S.—We are glad, at the very moment of sending this for press, to be able to clear up the puzzle. We communicated with the writer, and find that three weighed $\frac{3}{4}$ lb., so that they averaged 4 oz. each; and she adds that several which she "handled were certainly much larger than hen's eggs"; this agrees very well with the "4 oz." She "heard of" five turning the scale at $1\frac{1}{2}$ lbs., i.e., 4.8 oz. each, but did not see it. Our correspondent mentions also the extreme density of the ice to which attention is drawn on p. 66.—ED. *M.M.*

windows in the houses along Claremont Road, and on the Queen's Park, were broken. At the Buckle—the unfortunate Buckle—the windows were riddled, and nearly every pane of glass in the Buckle Inn was smashed. Much poultry was killed.

The phenomenon, for only as such can it be described, occurred about a quarter to seven p.m. The afternoon had been very hot and sultry, and a dense bank of black clouds had become massed in the south-west. About six o'clock the reverberations of a distant thunderstorm were heard; the storm gradually approached, and then a funnel-shaped cloud—apparently a waterspout—was seen to detach itself from the black mass in the south-west; it crossed the bay in a northerly direction with terrific rapidity, and heralded by a violent eddying wind, and accompanied by blinding flashes of lightning, it swept over the land, its track being marked with rolling volumes as of smoke, while there descended a tremendous shower of ice, the clatter of which was almost awe-inspiring by its strangeness. The full force of the storm, however, seems to have been felt along the Bishopstone Valley, and *even on Monday, Norton Top, with its covering of ice, glittered in the sunlight like an Alpine peak.* Chyngton and Sutton, on the other hand, were just on the edge of the path of the storm. The oldest inhabitants, some of whom have very prodigious memories, have no recollection of such a phenomenon in the past, and doubtless an account of the shower of ice on Sunday will be handed down to posterity as an interesting item in the annals of local history. Mr. W. R. Wynter, of Seaford, has on sale some exceedingly fine photographs of groups of the hailstones, which he has taken.

SEAFORD.

A HAILSTORM of unusual violence was experienced at Seaford on Sunday evening—such a storm, in fact, as one hears of as occurring in other lands, but which one scarcely believes, and, unless seen, can hardly realise. The day had been beautifully fine, calm, and warm, but towards six o'clock a bank of clouds was seen to be moving up from the sea, and after a short time the appearance of these clouds was most peculiar. Suddenly there was a great gust of wind, and for two or three minutes great blocks of ice fell. Some of these exceeded six inches in circumference, while they weighed as much as two ounces each. They were of varied shape, some being round, others being long, but all were of immense size. The services at the various places of worship had just commenced, and the sound of the large blocks of ice falling on the roof reverberated through the buildings, so that the proceedings could scarcely be heard, while many of the congregation were considerably alarmed. Much damage was done to windows in the district, while the greenhouses suffered to a great extent, many of them having 50 and 100, or even more, panes broken. Such a storm has not been experienced by the oldest inhabitant.—*Brighton Observer*, June 4th.

RIPE.

TERRIFIC HAILSTORM.—On Sunday evening a hailstorm of remarkable violence broke over the district of Ripe and Berwick, the hailstones being of exceptional size, some of them being almost round and measuring as much as two inches in diameter. Much damage was done to greenhouses and other glass

structures in the gardens, and many young ducks and geese were killed outright, while the older birds suffered terribly from the force of the hailstones, a number having their eyes completely smashed. The service in the Parish Church at Ripe had to be stopped for a time at the height of the storm, as it was quite impossible to hear anything in the church but the incessant rattling of the hailstones on the roof. The storm appears to have passed through the Cuckmere Valley, in a line from Seaford to Heathfield, reports of the fall of hailstones of abnormal size having been made at each of these places. Curiously enough, just at the mouth of the Cuckmere river scarcely any hail fell.

SHORT NOTES TENDING TO DEFINE THE AREA OF THE STORM.

Berwick.—At Sherrington Manor the damage to glass is said to be £100.

Brighton.—No hail.

Eastbourne.—No hail.

Hailsham.—No hail.

Jevington.—No hail.

Littlington.—No hail of importance, and R only 0·04 in.

Selmeston.—Much damage was done here. Hail came down with terrific force. The stones were of enormous size, some measuring five inches in circumference, and weighing over an ounce. Panes of glass were broken in all directions, in cases of exposed cottages every pane being smashed, branches were broken off trees, young rooks were knocked dead from their nests, while ducks and fowls were killed in considerable numbers. Crops and vegetation suffered heavily.

OTHER STORMS IN SUSSEX.

Haywards Heath.—The feature of the thunderstorm here was the heavy downpour of rain, which flooded the lower portions of the town, the water rushing along the roads like little rivers. The manholes in the Mill Green Road were forced up, the water spurting several feet.

Wadhurst.—A terrific storm of T and H, the latter being very large indeed, passed over here. Considerable damage was done to fruit trees and vegetables, the roads were strewn with fallen leaves, and scarcely a house in the town but had several windows broken. The storm appears to have been very local, as in some parts of the parish there was no hail.

STORMS IN KENT THE SAME EVENING.

Bezley Heath.—This neighbourhood did not escape the severity of the storm on Sunday, but fortunately no serious damage resulted. A large limb of a tree in the Broadway was torn off by the severity of the storm.

Dartford.—Here, at Gravesend, and in the surrounding district, between seven and eight o'clock on Sunday evening, the storm occasioned darkness for a time, and there was a perfect deluge of rain. A large elm tree was blown down at Hawley, and considerable damage was done to the fruit trees in the neighbourhood, especially in the vicinity of Wilmington.

Gillingham.—At the Wesleyan Chapel two windows were broken with the hail, quite 1 in. in thickness. In Layfield Terrace, no fewer than 40 windows

were broken, and great damage was done in other outlying parts. The northern portion of the storm that passed over Strood-hill does not appear to have been so severe. In the town, except a few brilliant flashes of lightning and heavy claps of thunder, little was felt of the effects of the storm.

Hunton.—The hops on Stone Wall Farm escaped damage, but considerable injury was done to over 100 acres on the Hunton Court Estate, and about the same on Buston and Grove Farms. At Buston Farm the ground was covered with gooseberries. In several houses panes of glass were broken—at Mr. O. Foreman's no fewer than 15 squares were broken. Mr. Foreman says he found hailstones weighing an ounce.

Maidstone.—Soon after six a heavy mass of clouds congregated over the town, and lightning and thunder became excessively bright and loud, and hailstones fell as large as walnuts, doing immense damage. The storm travelled eastward from Maidstone, but opened and passed each side of Blue Bell-hill.

REMARKABLE HAILSTONES.

To the Editor of the "Morning Post."

SIR,—In reply to your Correspondent relative to remarkable hailstones, I may state that the same hailstorm passed over this town between seven and 7.30 p.m. on Sunday, May 30. The hailstones were similar in size to those your Correspondent describes. The noise of the hail was so great that the services in nearly all the churches were interrupted. I was myself taking Service at one of our district churches, and had to signal to the congregation to sit, as it was impossible to continue the hymn we were singing, no sound being heard of either music or voices above the clatter of the hail. It was accompanied by sharp flashes of lightning, but the thunder was inaudible from the same cause. Twenty minutes after the storm had ceased, when we came out from Service the hail stones were still lying in heaps by the roadside as large as shillings, and had rings of opaque white in the lumps of ice like cat's eyes. Great damage must have been done to the hops, and to glass, as well as to the fruit.—Yours, &c.,

E. DALISON.

St. Michael's, Maidstone, June 9th.

Rainham.—Here and at Bredhurst, Boxley and New Brompton hailstones fell of an immense size. In New Brompton the streets were covered with these hailstones, which took some time to thaw.

Sevenoaks.—The storm on Sunday night was very keenly felt here. The water rushed in torrents down the hills, and the thunder was very loud, while the lightning was awfully vivid and frequent. A large tree in Hitchen Hatch-lane was struck by lightning, and fell right across the road. The Town Surveyor (Mr. J. Mann) at once employed some men to remove the obstruction, but this could not be done until the tree had been sawn into pieces, and the branches lopped off. Oak-lane was completely flooded for a short time.

Tenterden.—A thunderstorm of short duration passed over this neighbourhood on Sunday evening. An oak tree near Smallhythe School was struck by the lightning, having the bark on one side taken clean off. A sheep was killed in a field not far distant.

STORMS AND DAMAGE IN OTHER COUNTIES.

NORTHAMPTON.—*Oundle*. The TS was so severe and the streets were so flooded that many persons could not leave the church after service.—*Peterborough*. Heavy TS, with much R, after 7 p.m.; streets flooded.

ESSEX.—*Clacton*. TS at 9 p.m., but not much R. *Colchester*. Brilliant L between 8 and 9 p.m.; not much R.

SUFFOLK.—*Bury St. Edmunds*. Sharp TS and heavy R about 9 p.m.

LINCOLN.—*Billingborough*. Heavy TS.—*Walcot*. Sheep killed by L.—*Deeping St. James*. Youth killed by L while driving, horse not hurt.

GENERAL CONCLUSIONS.

Over England E. of a line from the Isle of Wight to Lincoln thunderstorms of more or less intensity occurred between 5 and 9 p.m. on May 30th.

The principal ones were in Kent and Sussex.

By far the most noteworthy occurred over an area less than 4 miles from E. to W., about midway between Newhaven and Beachy Head, and 8 miles from S. to N.; how much less than this area there is not at present evidence to prove.

Neither the T and L nor R was exceptional, but the H was so.

THE SIZE OF THE HAILSTONES.

There is a general consensus of opinion that the circumference of the large ones exceeded 4 inches, and two different photographs sent to us give respectively 7·8 in. and 6·4 in. as the circumference—this of course gives a diameter of about 2 inches, and as they were mostly somewhat oval, we think that they must have been (as they appear in the photographs) very nearly the size of an ordinary hen's egg—say 2½ in. by 1½ in. by 1 in. They would, therefore, contain about 4 cubic inches of ice, and weigh very nearly 2 ounces each. It will be noticed that one writer says that ten weighed a pound—this would give 1·6 ounces each, and agrees very closely with our estimate of the size. We see that one is stated to have weighed “nearly a quarter of a pound,” and another account says “three or four ounces.” We have no doubt that the largest exceeded two ounces, and think that probably a very small number reached three ounces, but we see no evidence which will induce us to go to “four” ounces. In size, shape, and weight these stones seem to have closely resembled those which fell at Richmond, Surrey, August 3rd, 1879,* and at Richmond, Yorkshire, July 8th, 1893,† but if these falls are to be classed according to the magnitude of the stones, we think that Richmond, Surrey, would be first, and if by number of large stones, Richmond, Yorkshire, would be first. It is, however, certain that the Seaford fall was quite an exceptional event.

* *Met. Mag.*, Vol. XIV., p. 97.

† Russell, Rollo, *On Hail*. Photographs facing p. 224.

HEAVY RAINFALL AT PORT ELIZABETH, CAPE COLONY,
MAY 5TH, 1897.

FROM copies of the *Port Elizabeth Advertiser*, of May 8th, and of the *Cape Times*, of May 12th, with which we have been favoured, we have compiled the following note.

There had been a drought for some months in the neighbourhood of Port Elizabeth. On the night of Monday, May 3rd, the wind went to S.W., black clouds came up from the ocean, and there was steady rain, giving at the Hill station 0.53 in., up to 8 a.m. on the 4th. During the 4th, and up to 8 a.m. on the 5th, intermittent rain gave a total for the 24 hours of 1.34 in. It was raining hard at 9 a.m. on the 5th, but towards 11 a.m.

“the sky grew blacker away to the westward, and the rain began to come down in real earnest. At noon every street in the town was inundated, every sluit and gully was the course of a foaming torrent, and the low lying clouds were discharging their watery load in such amazing quantity that one would truly have believed that ‘the fountains of the great deep were broken up and the windows of heaven opened.’ The lower part of the town was for a couple of hours converted into a reservoir, fed by millions of gallons of rainwater plunging madly, feet deep, down every steep descent from the larger “catchment area” above the crest of the hill. Things were bad enough on the level surface above the Reserve, but the scene was tame compared with what we saw in every avenue leading to the lower level. The Park and all the district between the valley and the location, were a swamp. Rain fell absolutely in solid masses, and in finding level the floods of water did incalculable, almost incredible, damage. Down White’s Road, Donkin Street, Constitution Hill, and Russell Road came seething, roaring, waist-deep cascades, ripping up roadways and footpaths and paved sluits like channels of sand; tearing great gaps in the surface, scooping out hundreds of tons of subsoil, laying bare and smashing gas and water mains and pipes, and hurrying along on their red and discoloured surface great boulders, beams of wood, lumps of asphalt, and everything that was loose, no matter what its weight, to deposit all this *débris* in wild confusion on the surface of Main and Strand Streets. In the former thoroughfare, about half-past twelve midday, the scene was really grand, though not without a touch of awe at this outbreak of Nature’s resistless forces. Down every slope of road or lane were rushing muddy torrents, in many places waist-deep; the rain was driving along from the N.W. in sheets, forming a watery curtain which no eye could pierce for more than fifty yards; rocks and stones were being hurled into the middle of the road with the rattling roar one hears only on a shingle beach when heavy seas are breaking; on the low side the pent-up flood was finding its way into stores, cellars, hotels, and sheds, despite every effort to stay its inrush; and a few hardy people, drenched to the skin, gathered under the lee of corner buildings to watch the grandly-gloomy scene, or waded along the drowned footpaths, too wet to care for the extra soaking. So the storm raged for an hour or more, until a shift of wind to about N.E. brought relief; the surcharged clouds drove away out to sea, and by half-past one the sun was shining hotly in a clear sky. Such a waste of desolation in the leading thoroughfares of Port Elizabeth that same sun has never before shone upon. From Market Square to North End, Main Street at short intervals resembled

nothing so much as a stretch of rough foreshore—sand was deposited several inches deep on the lower side, while the roadway was strewn with (no exaggeration) hundreds and hundreds of tons of stones, boulders, and gravelly *detritus* washed down from above.”

The rainfall between 8 a.m. and 1.30 p.m. on the 5th was 5.32 in., and the observer says that, but for the wind sweeping the rain over, rather than into, the gauge, the total would have been six inches in six hours.

During the ten years 1886–95, the largest yearly total was 27.94 in. in 1888, and in 1895 the total for the year was only 16.88 in.

At the Van Staaden Waterworks Reservoir the fall was much less, the fall on the 5th being 3.65 in., against a total at Hill station of 5.44 in. From the following little note the fall seems to have been local :—

RAINFALL.

The following rainfall returns, measured at eight a.m. on 4th, 5th, and 6th May, 1897, are supplied by the Meteorological Commission : Cape Agulhas, 0.20 inch ; Cape St. Francis, 3.75 inches ; Port Elizabeth, 7.29 inches ; East London, 0.75 inch ; Durban (5th), 0.30 inch.

REVIEWS.

The Great Lakes as a Sensitive Barometer. By NAPIER DENISON. [Toronto, 1897], 8vo. Excerpt Proc. Canadian Institute.

A Probable Solution of the Secondary Undulations found upon Self-recording Tide Gauges. By NAPIER DENISON. [Toronto, 1897], 8vo. Excerpt Proc. Canadian Institute.

THESE are two early notes respecting a study of the seiches on Lake Huron, not merely in connection with the traces of a photographically recording barometer, but also with the weather types prevailing at the time over North America. The author is improving his appliances for observation by adding an extra sensitive barometer and in our opinion the inquiry is likely to bear good fruit. Mr. Denison's paper is, we think, the first in which the principal authorities upon the subject have been brought together—from Duillier in 1730 to De Saussure 1779, Vaucher 1804, Forel, Studer, Meyer, Favre, Veine, Guthrie, Kelvin, and Helmholtz. We can suggest one name—and one only—to be added to this list—viz., that of Mr. H. C. Russell, F.R.S., who has long been studying the oscillations of Lake George, which is about 130 miles S.W. of Sydney, New South Wales. In completing his work the author may find it useful to consult the paper by Sir John Lubbock “On the Fluctuation of High Water due to changes in the Atmospheric Pressure,” (Phil. Mag. 1837, pp. 195, 196); J. C. Ross “On the effect of the Pressure of the Atmosphere on the Mean Level of the Ocean,” with 2 plates, (London, 1854, 4to, 12 pag.): Mr. W. H. Wheeler's report to the British Association (Liverpool, 1896), “On the effect of Wind and Atmospheric Pressure on the Tides,” and a paper by M. F. L. Ortt, of The Hague, in *Nature*, May 27th, 1897.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday afternoon, May 19th, at the Rooms of the Royal Astronomical Society, Burlington House, Mr. E. Mawley, F.R.H.S., President, in the chair.

The first paper read was by Mr. C. V. Bellamy, "*On the Rainfall of Dominica, West Indies.*" After a brief description of the physiography of the island, the author discussed at length the rainfall at about 20 stations for the four years 1893 to 1896, illustrating the distribution by a shaded map. The Trade Wind, blowing from the Atlantic and bearing a vast amount of aqueous vapour, is intercepted by the ranges of hills, so that the country on their windward or eastern slopes receives the greatest amount of rain, while that on the leeward or western side of the island is the driest. The map shows a mean fall over the western coast districts of from 60 to 90 inches, over the north, west, and south coast districts of from 100 to 150 inches, and over the central area, the fall is greater, probably exceeding 200 inches. Table VI. gives the mean monthly rainfall for the four years; it shows that the rainy season extends over the months of July, August, September, October, and November; the remaining seven months representing the dry season. The mean monthly rainfall varies from 4.46 in. in February to 15.84 in. in November. The author expresses the opinion that hurricanes are of less frequent occurrence now than formerly.

The second paper was by Mr. R. H. Scott, F.R.S., and Mr. F. Gaster, "*On the Mean Monthly Temperatures of the British Isles.*" The authors dealt with the means of the daily minimum, average, and maximum temperatures for the various months of the year, in the 25 years 1871—1895. They pointed out that there is a great difference between the amount of range of temperature at the coast stations and that recorded inland. The range between January and July amounts to about 16° at coast stations, but to more than 23° at inland stations. The contrast between the temperature of the air at inland and at coast stations at different times of the year is due to the following causes—(1) The constant tendency of the sun to heat the surface of the earth; (2) the equally constant tendency of the earth to radiate its heat into space—both of these being modified greatly by the aqueous vapour and the clouds suspended in the atmosphere; (3) the fact that the solid portions of the earth absorb and reflect heat much more rapidly than the water; and (4) that while the ocean to the westward is of enormous size and great depth, the sea to the eastward is, comparatively speaking, limited in area and shallow, and separates the eastern shores of the British Islands from those of continental Europe by only a small distance.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, DECEMBER, 1896.

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	51·8	26	26·6	19	44·5	34·3	36·4	0·100 87	61·1	20·8	3·61	21	7·4
Malta.....	68·6	7	43·6	2	62·3	52·3	50·1	82	117·2	38·0	3·99	11	6·8
<i>Mauritius</i>	86·6	19 ^a	65·6	2	84·8	71·9	67·0	72	136·4	55·4	1·15	7	5·8
Calcutta.....	83·7	1	45·5	22	78·0	54·7	52·4	62	139·0	35·3	·00	0	2·0
Bombay.....	90·0	20	63·2	31	85·9	71·9	65·4	65	136·8	51·9	·00	0	2·5
Ceylon, Colombo	90·2	...	70·5	14	87·5	74·0	72·5	81	146·0	68·0	11·76	22	6·2
<i>Melbourne</i>	98·9	23	47·0	15	78·3	56·3	52·6	63	153·8	35·0	1·16	6	5·5
<i>Adelaide</i>	104·4	22	48·0	7	83·6	59·3	50·8	50	164·0	37·0	1·48	4	3·8
<i>Sydney</i>	101·4	28	58·4	8	77·8	64·4	58·7	70	156·0	52·8	1·50	12	5·4
<i>Wellington</i>	77·0	29	44·0	25	68·1	56·1	53·0	72	133·0	35·0	2·61	8	4·3
<i>Auckland</i>	83·0	14	53·0	5	74·4	59·6	57·1	70	147·0	51·0	·88	6	4·0
Jamaica, Kingston.....	90·9	6	66·8	30	87·6	71·0	68·7	74	...	...	2·14	9	...
Trinidad	91·0	2	67·0	27	87·0	70·1	72·2	82	167·0	66·0	6·33	15	...
Grenada.....	86·0	4	71·0	1	82·3	73·5	72·6	81	155·0	...	11·12	25	4·0
Toronto	48·9	12	1·1	23	33·8	21·3	24·2	80	60·0	— 2·0	·95	9	7·1
New Brunswick, Fredericton	44·9	14	—10·7	23	24·6	5·6	11·0	72	...	...	1·18	7	3·5
Manitoba, Winnipeg ...	40·0	11	32·7	1	20·6	0·8	...	...	...	...	·27	5	5·3
British Columbia, Esquimalt	55·0	8	29·0	16	46·8	38·5	41·8	95	...	...	10·41	24	3·8

a—and 21.

REMARKS.

MALTA.—Adopted mean temp. 56°·5, or 0°·2 above the average. Mean hourly velocity of wind 11·4 miles. Thunderstorm and hail on 20th. Average temp. of sea 62°·5. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·4 above, of dew point 0°·9 below, and rainfall 3·84 in. below, their respective averages. Mean hourly velocity of wind 10·9 miles, equal to average; extremes, 24·7 on 20th and 1·6 on 22nd; prevailing direction, E.S.E. to E. by N. Lightning on 4th, 8th, and 29th. Rainfall the least fall in December from 1875 to 1896. T. F. CLAXTON.

CEYLON, COLOMBO.—Lightning was seen on 10th and 11th; thunderstorms occurred on 17th, 18th, and 19th. ALFRED E. WACKRILL.

Adelaide.—Mean temp. 0°·4 above the average of 39 years. The severe drought continued until early morning of 27th, ·72 in. of R being recorded at 9 a.m. 27th, and ·70 in. on 28th; the average for 39 years being ·85 in. C. TODD, F.R.S.

Sydney.—Rainfall 1·08 in. below, temp. 1°·2 above, and humidity 0·6 above, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Early part generally fine, with occasional light rain; middle of month showery; latter part fine. Prevailing N.W. winds at times strong. R. B. GORE.

Auckland.—An exceedingly hot and dry December, the mean temp. being 4°·5 above the average, and the rainfall only one-third of the average.—T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Mean hourly velocity of wind 3·2 miles. Rainfall of Kingston and the Island generally a little over the average. R. JOHNSTONE.

TRINIDAD.—Rainfall 1·52 in. above the 30 years' average. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,
MAY, 1897.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	1·32	XI.	Rhayader, Nantgwillt ...	1·73
II.	Dorking, Abinger Hall .	1·57	„	Lake Vyrnwy	2·20
„	Birchington, Thor	·71	„	Corwen, Rhug .....	...
„	Hailsbam	1·23	„	Criccieth, Talarvor	1·35
„	Ryde, Thornbrough	2·02	„	I. of Man, Douglas	1·51
„	Emsworth, Redlands ...	1·44	XII.	Stoneykirk, Ardwell Ho.	1·89
„	Alton, Ashdell	1·51	„	New Galloway, Glenlee	1·94
III.	Oxford, Magdalen Col..	·92	„	Moniavie, Maxwelton Ho.	2·72
„	Banbury, Bloxham	1·36	„	Lilliesleaf, Riddell	1·45
„	Northampton, Sedgebrook	·83	XIII.	N. Esk Res. [Penicuick]	1·95
„	Duddington [Stamford].	1·08	XIV.	Glasgow, Queen's Park..	2·66
„	Alconbury	1·40	XV.	Inverary, Newtown	4·38
„	Wisbech, Bank House...	·80	„	Oban, The Corran	3·64
IV.	Southend	1·00	„	Islay, Gruinart School...	1·41
„	Harlow, Sheering	1·33	XVI.	Dollar	1·77
„	Colchester, Lexden	·82	„	Balquhiddier, Stronvar...	4·47
„	Rendlesham Hall	·62	„	Ballinluig	1·46
„	Rushall Vicarage	·59	„	Dalnaspidal H. R. S.	4·23
„	Swaffham .....	...	XVII.	Keith H. R. S.	1·98
V.	Salisbury, Alderbury ...	1·41	„	Forres H. R. S.	1·04
„	Bishop's Cannings	1·13	XVIII.	Fearn, Lower Pitkerrie..	1·49
„	Blandford, Whatcombe .	1·82	„	N. Uist, Loch Maddy ...	2·06
„	Ashburton, Holne Vic...	2·23	„	Invergarry	1·73
„	Okehampton, Oaklands.	1·74	„	Aviemore H. R. S.	2·09
„	Hartland Abbey	1·74	„	Loch Ness, Drumnadrochit	2·50
„	Lynmouth, Glenthorne.	1·46	XIX.	Invershin	3·40
„	Probus, Lamellyn	1·28	„	Scourie .....	...
„	Wellington, The Avenue	1·12	„	Watten H. R. S.	1·35
„	Wincanton	1·98	XX.	Dunmanway, Coolkelure	2·63
VI.	Clifton, Pembroke Road	1·65	„	Cork, Wellesley Terrace	1·40
„	Ross, The Graig	1·24	„	Killarney, Woodlawn ...	2·55
„	Wem, Clive Vicarage ...	·85	„	Caher, Duneske	1·60
„	Cheadle, The Heath Ho.	1·51	„	Ballingarry, Hazelfort...	2·17
„	Worcester, Diglis Lock	1·03	„	Limerick, Kilcornan ...	1·24
„	Coventry, Kingswood ..	1·62	„	Broadford, Hurdlestown	...
VII.	Grantham, Stainby	1·11	„	Miltown Malbay	2·12
„	Horncastle, Bucknall ...	1·22	XXI.	Gorey, Courtown House	1·18
„	Worksop, Hodseck Priory	·88	„	Athlone, Twyford	1·39
VIII.	Neston, Hinderton	1·12	„	Mullingar, B-ivedere ...	·81
„	Southport, Hesketh Park	1·44	„	Longford, Currygrane...	1·89
„	Broughton-in-Furness ...	2·94	XXII.	Woodlawn	2·29
IX.	Ripon, Mickley	·96	„	Crossmolina, Enniscoe ..	2·70
„	Melmerby, Baldersby ...	1·13	„	Collooney, Markree Obs.	2·51
„	Scarborough, Observat'y	·88	„	Ballinamore, Lawderdale	...
„	Middleton, Mickleton ...	1·44	XXIII.	Warrenpoint	1·12
X.	Haltwhistle, Unthank...	1·67	„	Seaforde	1·56
„	Bamburgh	1·72	„	Belfast, Springfield	2·32
„	Keswick, The Bank	2·43	„	Bushmills, Dundarave..	2·21
XI.	Llanfrechfa Grange .....	...	„	Stewartstown	1·92
„	Llandoverly	1·64	„	Killybegs	3·67
„	Castle Malgwyn	1·43	„	Lough Swilly, Carrablagh	2·48
„	Builth, Abergwesyn Vic.	2·04			

MAY, 1897.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					TEMPERATURE.				No. of Night-bells 32°.		
		Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours		Days on which '01 or more fall.	Max.		Min.			In shade.	On gms.
				Dpth	Date		Deg.	Date	Deg.	Date.			
I.	London (Camden Square) ...	1.08	— .82	.41	30	9	78.0	18	33.9	1	0	5	
II.	Maidstone (Hunton Court)...	1.21	— .17	.25	29	9	...	...	...	...	...	...
III.	Strathfieldsaye	1.14	...	.30	31	10	...	...	...	...	...	...
III.	Hitchin	1.12	— .83	.32	30	11	69.0	25	31.0	12	3	...	
IV.	Winslow (Addington) .....	.85	— 1.25	.21	31	11	72.0	25	32.0	4, 12	2	9
IV.	Bury St. Edmunds (Westley) ...	1.26	— .49	.21	11	10	68.0	30	28.0	13	...	...
V.	Norwich (Brundall) .....	.91	...	.26	11	14	74.0	30	34.6	11	0	7
V.	Weymouth (Langton Herring) ...	1.42	— .19	.39	29	11	73.0	18	36.0	13	0	...	
VI.	Torquay (Cary Green) .....	...	...	...	...	...	...	...	...	...	...	...
VI.	Polapit Tamar [Launceston].	1.39	— .44	.22	29	13	72.3	18	28.4	13	1	4	
VI.	Stroud (Upfield)	1.52	— .52	.47	28	11	69.0	21	37.0	3	0	...	
VI.	Churchstretton (Woolstaston) ...	1.19	— 1.68	.31	29	14	67.5	24	31.0	11	3	9	
VII.	Tenbury (Orleton)	1.00	— 1.55	.30	29	13	72.0	25	30.0	13	2	11	
VII.	Leicester (Rotherby Hall) ...	1.02	...	.30	29	10	...	...	...	...	...	...
VII.	Boston	1.08	— .64	.55	30	9	75.0	31	31.0	12	1	...	
VIII.	Hesley Hall [Tickhill]	1.13	— .91	.54	31	13	71.0	21	31.0	12	2	...	
VIII.	Manchester (Plymouth Grove) ...	1.85	— .50	.42	28	13	71.0	22a	32.0	11	1	3	
IX.	Wetherby (Ribston Hall) ..	...	...	...	...	...	...	...	...	...	...	...
IX.	Skipton (Arneliffe)	3.31	— .41	.92	28	16	...	...	...	...	...	...
X.	Hull (Pearson Park)	1.40	— .48	.48	29	10	68.0	31	31.0	11	2	2	
X.	Newcastle (Town Moor)	1.21	— .54	.38	25	9	...	...	...	...	...	...
XI.	Borrowdale (Seathwaite)	5.89	— 2.72	1.27	4	19	...	...	...	...	...	...
XI.	Cardiff (Ely)	1.30	— 1.55	.31	29	11	...	...	...	...	...	...
XI.	Haverfordwest	2.42	+ .06	.70	27	13	75.3	18	36.0	4	0	3	
XI.	Aberystwith (Gogerddan) ...	2.37	...	.57	27	13	74.0	18	23.0	12	11	...
XII.	Llandudno	1.13	— .80	.31	28	14	67.5	31	39.8	11	...	...
XII.	Cargen [Dumfries]	2.60	+ .08	.86	28	11	69.0	16b	30.4	13	2	...	
XIII.	Edinburgh (Blacket Place) ...	1.28	...	.40	28	14	67.9	31	33.9	13	0	6
XIV.	Colmonell	1.40	...	.39	25	12	74.0	19	27.0	12	...	...
XV.	Lochgilphead (Kilmory)	3.21	— .14	.68	4	15	...	...	28.0	12	2	...
XV.	Mull (Quinish)	3.95	+ 1.00	.59	28	18	...	...	...	...	...	...
XVI.	Loch Leven Sluices	1.80	— .76	.50	29	9	...	...	...	...	...	...
XVII.	Dundee (Eastern Necropolis) ...	1.35	— .31	.50	28	14	65.8	30	32.0	7, 20	2	...	
XVII.	Braemar	2.30	— .11	.52	4	14	64.0	20c	29.0	27	6	21	
XVII.	Aberdeen (Cranford)	2.39	...	.85	28	17	62.0	31	30.0	3	2	...
XVIII.	Cawdor (Budgate)	1.59	— .16	.38	26	14	...	...	...	...	...	...
XVIII.	Strathconan [Beauly]	4.19	+ 1.10	.80	5	12	...	...	...	...	...	...
XIX.	Glencarron Lodge	5.71	...	.82	4	19	68.0	21	30.5	13	4	...
XIX.	Dunrobin	2.55	+ .45	.49	30	17	59.0	5g	...	...	...	...
XIX.	S. Ronaldsay (Roeberry)	1.57	— .15	.26	28	17	63.0	16	32.0	10	1	...	
XX.	Darrynane Abbey	2.12	...	.36	26	16	...	...	...	...	...	...
XX.	Waterford (Brook Lodge) ...	...	...	...	...	...	...	...	...	...	...	...
XXI.	O'Briensbridge (Ross)	2.32	...	.49	6	15	...	...	...	...	...	...
XXI.	Carlow (Browne's Hill)	1.62	— .72	.34	6	12	...	...	...	...	...	...
XXII.	Dublin (Fitz William Square) ...	1.14	— .79	.27	6	14	63.6	16	36.2	6	0	0	
XXII.	Ballinasloe	1.50	— 1.19	.25	6	15	68.0	21d	36.0	11f	0	...	
XXII.	Clifden (Kylemore)	5.03	...	.82	30	17	...	...	...	...	...	...
XXIII.	Waringstown	2.47	+ .03	.36	26	16	74.0	16e	32.0	3f	2	10	
XXIII.	Londonderry (Creggan Res.) ...	2.86	+ .34	.73	28	19	...	...	...	...	...	...
XXIII.	Omagh (Edenfel) .....	...	...	...	...	...	...	...	...	...	...	...

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

a—and 23. b—and 22. c—and 21. d—and 22, 23. e—and 17, 21, 22, 24. f—and 13. g—and 6, 31.

METEOROLOGICAL NOTES ON MAY, 1897.

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.

ADDINGTON.—The third May in succession with a small rainfall, very little falling until after the 25th. The low night temp. kept vegetation much in check, but there was no frost severe enough to destroy anything. One peal of T was heard on the 25th, at 2.50 p.m., and T with R on the 26th. Shower of H in the neighbourhood on the 28th.

BURY ST. EDMUNDS, WESTLEY.—A cold month, with harsh N.E. winds and sharp frost on 13th; very unfavourable for vegetation. H on 6th and 11th. TSS on 25th and 30th. Distant T on 11th and 28th.

NORWICH, BRUNDALL.—A cold and changeable month, the second week being particularly unseasonable, with S on the 12th and H on the 11th, 12th, and 13th. T on the 25th and 30th, and L on the 30th and 31st.

WEYMOUTH, LANGTON HERRING.—For the first fifteen days of the month the weather was cold and dry, and up to the 24th only .33 in. of R fell, but 1.09 in. in the last week refreshed the fields and gardens, which were parched by a long continuance of N.E. winds. The mean temp. at 9 a.m. ($52^{\circ} \cdot 7$) is $1^{\circ} \cdot 4$ below the average of 25 years. Solar halo on the 17th. TS on the 19th. For the first five months of the year the rainfall is 47 per cent. above the average.

POLAPIT TAMAR [LAUNCESTON].—A rather unseasonable month on the whole; very dry during the day for the first three weeks, but cold at night. Easterly winds prevailed during the greater part of the month. A sharp frost on the morning of the 13th did considerable damage to vegetation.

STROUD, UPFIELD.—Snowstorm about 6 a.m. on 11th.

WOOLSTASTON.—A very cold and dry month. Violent storm of H on 11th, followed by S. Mean temp. $50^{\circ} \cdot 6$.

TENBURY, ORLETON.—A very dry month, with temp. slightly below the average. The first part of the month was very cold, with frequent frosts, which did much damage to the fruit. A very large proportion of cold N. and N.E. wind.

SKIPTON, ARNCLIFFE.—A rather dry month, with cold N. and N.E. winds.

HULL, PEARSON PARK.—H on 6th, 26th, and 28th; TS on 29th, and T on 6th, 28th, 30th, and 31st.

WALES.

HAVERFORDWEST.—The first week was in pleasant sequence with the last month; a drought then set in, with strong easterly and north-easterly breezes amounting at times to the force of half a gale. The dryness of the air was remarkable, particularly so as evidenced by the readings of the wet and dry bulb from the 17th to the 24th; on the 17th the 9 a.m. readings of the hygrometer differed $13^{\circ} \cdot 2$, and on the other days varied from 8° to 10° ; large ponds of water evaporated like magic, and had not the much-prayed-for R come, the hay and other crops would again have proved a disastrous failure. H storm on 30th, at 3.30 a.m., .35 in. fell in 15 minutes.

ABERYSTWITH, GOGERDDAN.—Bright sunshine, with drying E. wind, from the 14th to 24th. Springs very low, but nice rains in the last few days.

SCOTLAND.

CARGEN [DUMFRIES].—Although the temp. was very appreciably lower and the R much greater than in May of 1895 and 1896, the figures representing the meteorological conditions of the past month are chiefly remarkable as showing how very closely they correspond with the averages for May in the last 38 years. The unpleasant weather experienced in April continued during the earlier portion of May; from the 1st to the 13th the mean temp. was $45^{\circ}1$, and sleet and H showers were of frequent occurrence. A welcome change took place about the middle of the month, but the effects of the higher temp ($51^{\circ}9$ 14th to 31st) were marred by a constant succession of parching easterly winds, pastures and corn crops making little progress. A change of wind and nearly two inches of R during the last week effected marked improvement. Farm work is well advanced, but the R, it is feared, arrived too late to ensure a heavy hay crop, and pastures have seldom been barer at the close of May. The oak was just bursting into leaf at the close (this year behind the ash), and the hawthorne commencing to flower, being, with flowering shrubs generally, fully three weeks later than in the past two years. H on 4th. T in afternoon of 27th.

EDINBURGH, BLACKET PLACE.—H on 10th and 11th. Fogs on 20th, 27th, and 28th. Gale on 4th; and rainbow at 6.30 p.m. on 4th.

COLMONELL.—Rainfall $1\cdot05$ in. below, and mean temp. $0^{\circ}9$ below, the averages of 21 years. T on 27th.

BRAEMAR.—Another cold and backward month.

ABERDEEN, CRANFORD.—The month was cold, with high winds and little sunshine.

CAWDOR, BUDGATE.—S and H on 6th; H also on 5th, 10th and 11th.

S. RONALDSAY, ROEBERRY.—The first half of the month was wet and very cold, the last half warmer. Mean temp. $48^{\circ}9$, 1° above the average of seven years.

IRELAND.

DARRYNANE ABBEY.—A showery month, with a week of very fine, hot weather in the middle.

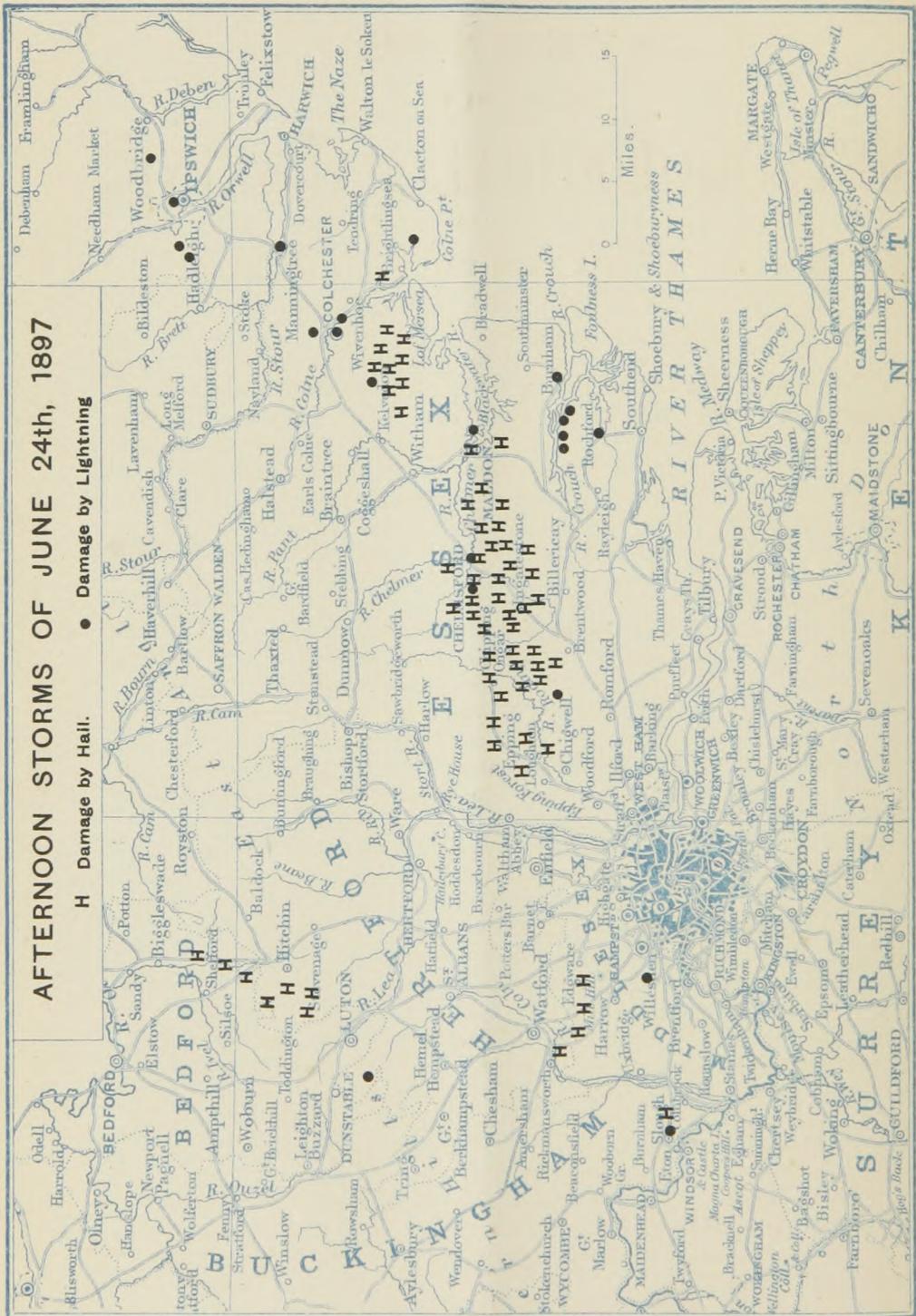
O'BRIENSBRIDGE, ROSS.—Wintry and cold up to the 11th, followed by brilliant sunny days until the 24th, and closing with another change to R and cold.

DUBLIN.—A cold, rather dry month, very showery at the beginning and close, fine and bright in the intervening period, with absolute drought from 12th to 24th inclusive. The prevailing winds were from polar quarters, N.W., N.E., and E. Mean temp. $50^{\circ}9$, or $1^{\circ}1$ below the average. Solar halo on the 24th. High winds on 12 days, attaining the force of a gale from W.S.W. on the 4th; slight fog on 20th. H on 5 days.

BALLINASLOE.—L and T at 1.45 p.m. on 29th.

AFTERNOON STORMS OF JUNE 24th, 1897

H Damage by Hall. • Damage by Lightning



SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXVIII.]

JULY, 1897.

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

THE STORMS OF JUNE 24TH.

IT may be noticed that this title is very vague—many occurred to us, but there were objections to all—"The Essex Hailstorm" would not do for two reasons, (i.) it would not include the disasters near Luton, Bedfordshire, and (ii.) the damage was not due to hail alone,—true, there was an enormous, an unusual, amount of H, and some of it was extremely large; but the mischief arose from the great strength of the wind, which gave to the H the penetrative energy, which its mere fall by gravity would not have done.

We repudiated the title of "Whirlwind" because we cannot trace any facts which indicate horizontal vortex motion, or the expansion of confined air. The facts would probably fit in with the theory of a revolving storm of which the axis was horizontal. We have tracked H storms which seemed to support such an idea—say that of a monster steam roller passing along, but sometimes resting on the surface, and at intervals lifted above it, so that little injury was done. We objected to the title "Afternoon storm," because all was not quiet till about 8 p.m.

We have had some experience of heavy hailstorms, so that they are not quite such novelties to us as they seem to be to many persons. We can just recollect the London storm of August 1st, 1846, when skylights went, and between three and four inches of rain came through; then in the *Met. Mag.*, Vol. xiv. pp. 97 and 125, will be found details of the severe one at Richmond, Surrey, August 2nd and 3rd, 1879, with one stone $4\frac{1}{2}$ inches long; but before that (we forget the date) we went to Winchmore Hill to see the wreck of one there, and remember three facts—casement windows with the lead knocked out as well as the glass—giant rhubarb stems cut right across—and a poor pony (which had been without shelter in a field) its back all lumps from the pelting which it had suffered—and there are many other cases in our previous volumes.

But we do not remember two instances within a month, of hailstones as large as hen's eggs falling in England, as seems to have been the fact both at Seaford, Sussex, in May, and at Ingatestone, Essex, in June.

At the end of this article we give some very condensed statements as to facts. We hope that this earlier portion is equally trustworthy, but, in order to economize space and to make it easily understood, we have arranged it as a kind of narrative.

The special feature of the early part of June 24th was its high temperature—approaching 90° in the shade. If any one should write a complete memoir of the events of this day, one point to study would be the automatic records of temperature, in order to ascertain the precise time of the sudden fall in temperature, so as to find out whether it was a cause, or a consequence, of the storms.

The earliest record of any disturbance was a shower at Twyford (Berks.), at noon. About an hour later there was a sharp TS, with very large H, at Slough (Bucks.). At 1.30 p.m. large H, L, T, and R were occurring round Uxbridge, Harrow, Stanmore and Pinner. At 1.55 the wind carried away some garden frames at Willesden; at 2.6 the captive balloon from the Royal Botanic Gardens; at 2.45 it carried away a tent a little south of Epping, Essex; at 2.55 it was wrecking Ingatestone; it reached Chelmsford at 3; Danbury at 3.10, and died out south of Colchester before 4 p.m. But this was not all—whether connected with this disturbance, or not, we do not know, probably not,—there was wreckage going on nearly at the same time (about 3.30 p.m.) along a strip of Bedfordshire, between Luton and Biggleswade, being specially bad in the parishes of Henlow and Lilley.

Later in the day, in North Surrey, Hampshire, and other adjoining counties, and along the East Coast, as far as Hull, there were TSS, with short heavy rains.

We should need an entire number to give details of the damage, so we do not make the attempt. Most persons have seen the accounts in the newspapers, and have learned from the statement in the House of Commons by the Minister for Agriculture (The Rt. Hon. W. H. Long, M.P.) that by personally driving through the Chelmsford and Ingatestone district he had been convinced that there was no exaggeration whatever.

His statement is conclusive and needs no support; but we should like to mention that we have been favoured by one of our correspondents with some beautiful photographs (by Duyshart & Co., of Chelmsford) of the damage, and they seem to us to demonstrate beyond dispute our conclusion that wind was as serious a destructive agent as the hail, and that the unusual ruin was the result of their joint action.

One great source of trouble is, that Essex has not had a bad hail-storm for some years, and therefore many of the farmers and nurserymen had given up insuring against injury by hail, and now of course are in dire distress. Not all, however, for we have heard of one man having already had from his Insurance Company a cheque for something over £880. Had all his brethren been equally careful, June 24th would have been a bad day for the companies.

We are aware that this article is not so strictly systematic as we usually try to make our notes, but there have been two great difficulties in the way—(a) the enormous amount of information to be epitomized; (b) the fact that if all the entries were grouped either chronologically or geographically, the special features as to wind, H and L could not have been brought out. We have, therefore, adopted the following grouping:—*Selections from Correspondence*, arranged nearly in chronological order, and so giving a history of the storms; *Animals and Poultry killed*; *Damage by Lightning*; *Hail*; *Wind*. In these sections the entries are arranged alphabetically, and most of them refer to Essex; but that the damage in Bedfordshire was nearly as serious (though over a smaller area) may as well be proved by a specimen extract:—

Langford.—A terrific storm passed over this village on Thursday week at about four o'clock in the afternoon. The lightning and thunder were not particularly severe, but the wind and hail were most alarming, and have caused sad havoc and loss. Such a storm has not visited this village since 1843. The crops have suffered terribly, wheat and barley being broken about half-way down the straw, and have already started to prematurely ripen. Onions have scarcely a particle of luke left on them, and turnip seed and beans are ruined. Many gardens are wrecked, the vegetables being badly cut, and the fruit stripped from the trees or so badly bruised that it will be of no service. In many cases the bark of the tree is so badly bruised and cut that in all probability the trees will die. A quantity of glass was broken, and a number of young fowls and ducks were killed. Numbers of dead rooks were collected from the fields next day. The hailstones were of enormous size and very irregular in shape, many resembling rough pieces of ice with sharp edges.

Two other subjects have to be mentioned:—First, our sympathy with the sufferers. By all accounts the Essex farmers have been having hard times. The harvest of 1897 promised to make amends. Over about 100 square miles (one-fifteenth of the county) this prospect has been swept away. Granting that over only half that area is there a total loss, it still means 32,000 acres, and putting it even at £3 an acre, it means a loss of about £100,000. We have seen the amount put at more than double that sum, but it will be hard enough to raise even the £100,000 at which we have put it. The Mansion House fund will need all the help it can get.

The other subject not mentioned is the map, on which, though the scale (in order to include the whole path) is necessarily small, the sites of damage are represented with precision, as far as information has reached us. The spaces without damage between Edgware and Epping, and again S.E. of Witham, are, we believe, strictly true.

SELECTIONS FROM CORRESPONDENCE.

Twysford, Haines Hill.—Heavy shower about noon, but it gave only 0·09 in. In the afternoon (about 4.30 to 6 p.m.) a TS brought the total for the day to 0·59 in.—S. M. WEDDERBURN.

Slough, Upton.—Violent TS at 1.15 p.m., several buildings struck and two cottages burned down. Very large H. Total R 1.31 in.

R. BENTLEY, F.R.Met.Soc.

Slough, Upton Park.—The R measured here at 2.15 p.m. was .20 in.; by 5 p.m. there had been a further fall of .73 in., and by 6.50 another .47, total therefore 1.40 in.—HUGH M. BAKER.

Southall.—A little west of this place I found a large elm had been uprooted, and I was told that much large H had fallen.

K. I. MARKS, F.R.Met.Soc.

Uxbridge, Harefield Park.—Very heavy TS in afternoon; the H was not large, but over an inch of R fell in less than 30 minutes; total R 1.70 in.—W. BATCHELOR.

Stanmore, Wealdstone.—A violent TS with H, of which single stones weighed more than an ounce, began about 1.30 p.m., and lasted about an hour, but R continued till 7 p.m. Total 2.30 in. Vegetables much cut in the gardens, and many rooks stated to have been picked up dead. According to reports, the storm was most severe at Wealdstone, severe at Rickmansworth and Stanmore, and slight at Pinner.—G. E. ELAND.

Harrow Weald, Hill House.—Heavy TS with H the size of hazel nuts between 1.30 and 3 p.m. The R in those 1½ hours was 1.84 in., and the total 1.30 to 7 p.m., 2.08 in.—A. CROSSMAN.

Ealing.—About 2 p.m. [1.50 p.m. we believe.—ED.] a storm swept through Ealing, raising clouds of dust of extraordinary volume and density, and doing considerable damage to Jubilee decorations. Two hours later a TS broke with torrents of R. At the Local Board offices the fall in one hour was 1.40 in., and at Perivale 1.78 in.

C. JONES, C.E.

Willesden Green.—At 1.55 p.m. a sudden squall lifted two glass frames, used as roof to a shed, and carried them away as if they had been sheets of paper. Total R 0.34 in.—R. LAMPORT.

Kensworth [Dunstable].—Terrific TS, a tree and a cottage struck; no H, and only 0.05 in. of R.—S. GRACE JONES.

Broxbourne.—T, H and R, total 0.61 in.—G. J. NEWBERY.

West Kensington, Edith Road.—At about 1.30 p.m. we had a sudden dry squall, and my thermograph showed a fall of 15°. About 5 p.m. we had a TS, and at 5h. 14m. 30s. I saw what looked like a large ball of pink fire, burst like a shell upon a house opposite, knocking off part of the gable, dislodging part of the roof and breaking the window.—G. VON U. SEARLE.

Finchley, Etchingam Park.—Frequent T (but not much L) 1 to 7 p.m. Very heavy R, with H rather larger than hazel nuts, 2.5 to 2.20 p.m. Total R 0.65 in.—J. W. SCOTT.

Muswell Hill.—T for some hours in afternoon. Total R 0.32 in.

S. G. ABETHELL.

Camden Square.—Hot in morning, 87°·8 in the shade. At 2h. 0m. 36s. p.m. a sudden strong gust of wind and sudden fall of temperature of 10°, calmer till 2.5, then very rough until 2h. 9m.

No R, L nor T, but in N.W. and N. a thick darkness covering everything. About 3 p.m. T, and thence till 6.16 p.m. L, T and R, but in no wise exceptional. Total R 0.26 in., most of which fell between 5 and 5.45 p.m.—G. J. SYMONS.

Ongar, Abbots Roding Rectory.—Total R 0.75 in.—L. CAPEL CURE.

Chelmsford, Writtle.—We have had a terrific storm here—H, R, L, T and wind. At 11 a.m. the shade temperature was 83°, and the air very oppressive; the storm so cooled the air that at 7.30 p.m. it was only 60°. At 3.3 p.m. there occurred such a storm of wind and H as I had never seen. During the storm we could do nothing but listen to the H smashing the windows, and it and the R pouring into the house. The worst of the storm was soon over, but the R continued till nearly 4 p.m., when I measured 1.42 in. At 4.10 p.m. I collected some of the stones, and measured them; the largest I saw were 1½ inches by 1 inch by ¾ in., and they did not melt till 6 p.m.

M. USBORNE.

Chelmsford, Melbourne.—In about 25 minutes during the R and H storm we registered 1.08 in. As the H would not be caught by the funnel of the gauge, I am unable to give total amount. The storm began soon after 3.0 p.m., and came from S.W. Before it reached us, it became very dark, and we could hear the roar of the storm as it approached; then a few hailstones about the size of marbles; then the storm was upon us, with L, and in half-an-hour it was all over, but as we were in the track, windows and crops were almost totally destroyed. The larger hailstones were 2 in. long by 1½ to 1¾ in. wide and ½ in. thick.—EDWARD ROSLING.

Wickford, Runwell Hall.—A little R and some H fell here about 3 p.m., but it amounted only to 0.03 in., so that the storm cannot be said to have reached here, in fact, the damaged trees along the road hence to Colchester show that the limit was about 4 miles N., in which direction, and notably over Ingatestone, it was very dark.

HENRY KEMBLE, LT.-COL.

Chelmsford, Spergula.—Total R in 15 minutes, 1.14 in.

J. C. THRESH, M.D., F.R.Met.Soc.

Chelmsford, High Street.—Terrific hailstorm, which came up like an advancing wall of ice. R 1.37 in. in 20 minutes. F. CHANCELLOR.

Braintree, Fennes.—We were about 15 miles N. of the zone of greatest intensity. Distant T at intervals from about 11 a.m. 2–3 p.m., T remarkably continuous and gradually louder. 3 p.m., T and L sharp, when nearest about 1 mile distant. R, a smart shower, no hail, .09 in. Damage, none.

HENRY S. TABOR, F.R.Met.Soc.

Danbury Rectory, Chelmsford.—At 3 p.m. the storm was travelling from the due West to this hill, accompanied by unusual darkness, vivid forked lightning and a rushing wind, that came along in swirls and eddies rather than in one direct blast. At 3.4 p.m. rain began to fall; at 3.10 p.m. the wind was blowing a hurricane, and huge hailstones were hurled upon us; at 3.15 p.m. (about) the worst was

over; at 3.30 p.m. the storm had passed. My rain gauge measured .83 during the 26 minutes. I should like to observe that there were no hailstones in the funnel of the gauge when I examined it at 3.30 p.m., though the ground all round was strewn with them. (Diameter of gauge is 5 inches, height from ground 1 ft.) Owing to the velocity of the wind, the hail fell at an unusually acute angle, but why none were in the gauge I do not know. I weighed one of the hailstones, which was an average one of the larger sized ones, and it scaled $\frac{1}{2}$ oz. Almost every pane of glass on the west side of the house was shattered, including a large sheet of plate glass.—J. BRIDGES PLUMPTRE.

Writtle, Little Boyton Hall.—The rainfall here was 1.34 in. We were about 500 yards out of the main hailstorm, and did not get any wind, but a few very large stones and very heavy rain; the 1.34 in. fell in 30 minutes (timed). The lightning was overhead, 10 seconds time between flash and report approximately, but during height of storm the lightning and thunder were absolutely continuous, a fact which those in the middle of the storm could not notice. The R at Writtle was 1.99 in.

R. W. CHRISTY.

Hatfield Peverel, Cardfields.—I am very happy to say that Cardfields was only on the outskirts of the storm, though Fairfields (another house on my farm) had 54 windows broken out of a possible 76. The storm was preceded by a dense black cloud, travelling from N.W. to S.E., making it too dark to read, and the hail and rain began at 3.5, and at 3.25 the storm was over and the sun shining brightly, and in the 20 minutes I registered .92 in. Some of the hailstones which fell at Fairfields were slabs of ice larger than the palm of your hand, and Mr. Edward Corder, of Writtle, told me that he measured one $4\frac{1}{2}$ inches by $3\frac{1}{2}$ inches which weighed 5 ozs. The centre of the storm was apparently Writtle, Blackmore, and that neighbourhood, where the crops are almost entirely destroyed.

ALF. ROSLING.

Maldon.—The storm was not at its worst here. The hailstones were all rounded at the edges, and I think did not exceed half-an-inch in diameter. Hence, we had no broken windows, nor even frame or pit lights, nor was my garden much injured. R 1.12 in., the greater part of which fell in an hour. We are 10 miles from Chelmsford, where thousands of panes of glass were broken, and at Widford and Ingatestone, 5 to 8 miles nearer London, they caught the utmost severity of the visitation. At Chelmsford I saw drawings of some hailstones, taken by Mr. Charles Pertwee, architect, which measured nine-eighths of an inch across and five-eighths in thickness. These specimens had all the appearance of pieces of broken ice, having jagged edges. The L and T were extremely severe, being almost continuous throughout the hour that the storm lasted.

THOS. ISAAC.

Colchester, Lexden.—Very severe TS, but no H. Total R 0.92 in.

S. F. HURNARD.

Ipswich, Bishop's Hill.—Unusually severe TS, but not much H or R.

G. A. BIDDELL, C.E.

Bury St. Edmunds, Westley.—Very heavy TSS; total R 0.97 in., but the storms were very partial, villages within two miles having little or no rain.—R. BURRELL.

Norwich, Brundall.—Much damage by L during a series of TSS, 3 to 6 p.m. R here only 0.07 in.

ARTHUR W. PRESTON, F.R.Met.Soc.

East Molesey, Palace Road.—R in two hours, 4.30 to 6.30 p.m., 1.55 in.—M. S. JENKYN.

Surbiton, Vronvelin, Lovelace Road.—Between 4.45 and 6.30 p.m. R 1.96 in.—F. J. BARCLAY.

North Surrey.—The following heavy rains occurred on the 24th :—

New Malden (Sewage Works)	1.82 in.
Esher (" ") ..	2.32 ,,
West Molesey (Chelsea Water Works)	1.96 ,,
Surbiton (" " ")	2.12 ,,

F. CAMPBELL BAYARD, LL.M., F.R.Met.Soc.

Pirbright Camp.—A TS with H and R, 5 p.m. to 5.30 p.m.; R 0.93 in.—H. ELWICK.

Marlow.—Sudden squall of violent wind, L, T, H and R, about 6.8 to 6.15 p.m.—W. R. GOWERS, M.D., F.R.S.

Alton, Colmer Rectory.—No storm near here till about 6.30 p.m., and then only distant. At 8.5 p.m. another short and sharp, but neither H nor R remarkable.—T. HERVEY.

Alresford, Swarraton Rectory.—TS with H began in E. at 7 p.m., and worked round by N. to N.W., and by 7.50 p.m. 1.42 in. of R had fallen.—W. L. W. EYRE, F.R.Met.Soc.

ANIMALS AND POULTRY KILLED.

Essex.—The number of birds killed was enormous, and in many districts there will be no shooting. Not only were young birds drowned, but old ones were struck dead by the hailstones. Cases are on record where wood-pigeons, crows, and other birds fell from trees as if shot by guns, with their heads split open by the falling ice.

Galleywood.—Galley Hall, only a few chickens killed.

Little Baddow and District.—Mr. Charles Smoothy, of Old Riffhams Farm, Little Baddow, reports as under:—"I am sorry to say that the storm here was very destructive to game. We picked up three old partridges, and several young, in a field adjoining my house, killed by the hail, evidently while brooding their young. Some of them were cut as if they had been struck by a bullet. From the severity of the storm, which lasted about half an hour, I am sure no birds could live in the open. This storm has killed hundreds. I am afraid that sportsmen will be greatly disappointed in September. Old birds as well as young must have been killed unless they were well

sheltered by fence or wood. There were over 200 fowls killed in the village of Little Baddow.

Margaretting Hall.—One lamb and several chickens killed.

Mundon.—Some young ducks killed by hail.

Stondon.—Halsford Bridge Farm, 12 chickens killed.

„ Woolmongers Farm, 50 chickens killed.

„ Paslow Wood Common, 10 young turkeys and many chickens killed.

West Hanningfield.—Many chickens killed.

Widford.—Many pheasants killed.

Wigborough.—Nine chickens killed.

Writtle.—Many chickens drowned, two goslings struck dead by hail.

DAMAGE BY LIGHTNING.

Burnham.—Mr. Read's new workshop was struck but not much damaged.

Colchester.—Chimney struck at the Ordnance Stores.

„ Mile End Church, roof and clock damaged.

„ Mount Cottage, Butt Road, chimney struck.

Ealing, Hanger Hill.—Oak tree struck.

Ingatestone.—Harding's Farm, chimney struck and fell through roof.

Laver de la Haye.—Oak tree struck.

Manningtree.—Brantham Mill struck, but not ignited.

Rochford.—Market Place. Roof of Mr. Ashby's house struck.

„ Eastwood. Several trees struck.

„ Mr. Bentall's chimney struck and fell through roof.

St. Osyth Priory.—Tower struck and clock stopped.

Wallasea.—Cottage near the schools much damaged.

HAIL.

Barking.—None.

Blackmore.—When the storm broke it caused two horses to bolt with a mowing machine, which was smashed, another pair ran away with a water-cart, knocked down three other horses, and the whole five fell into a ditch in a heap.

Chelmsford.—The hailstones were of various shapes, some globular, some oval, some oblong, some like sections of cylinders, and some exactly like small saucers, the edges resembling white lace, while the centres consisted of transparent ice, bluish in colour. Mr. Charles Pertwee picked up in the garden of his house, Claremont, London Road, two of the cylindrical shaped hailstones, which he found upon measurement to be five-eighths of an inch thick, and one and one-eighth inches across. It seemed as if rain-drops were congealed on the surfaces of the original stones. Mr. Pertwee had more than 200 squares of glass broken.

Chelmsford.—The corrugated iron shed of Messrs. Hodge and Taylor, near the railway, was so riddled by the hail that it looked as if it had been shot at. About 25 sheets of the iron were pierced.

Danbury.—At the Rectory the hail knocked holes in the water-spouts.

Galleywood.—Flattish stones were picked up here measuring two inches square.

Ingatestone.—Mr. Arthur H. Raven says that he picked up one stone which measured $5\frac{1}{2}$ inches round, and another which weighed (at the Post Office) $3\frac{1}{2}$ ounces.

Ingatestone.—At Lee Farm the hail went through the slate roofing.

Ingatestone.—Mill Green Park, twenty-four hours after the hail-storm the stones lay a foot deep on the N.W. side of the house, and one taken up haphazard measured $4\frac{1}{2}$ inches in circumference.

Ingatestone.—Ingatestone Hall. Mr. Coverdale thus relates his own personal experience of the storm:—"I was driving with my son and my coachman, a man named Gray. We had just got up to Mr. Kortright's house when the storm came on. We jumped out of the trap and hastened into the house. The storm descended without the slightest warning, except the blackness. First the hail and rain came down vertically, and then at a sharp angle. Down came the top of a tree at once. My man Gray—how he stood the storm I don't know—managed to get the cob under the sides of the house, and Mr. Kortright, my son, and I went out to try to assist. The hailstones immediately riddled the umbrella which I put up, and beat me back. The pony sustained a cut right down his nose. (This was a jagged wound about $1\frac{1}{2}$ inches in length, and the pony's whole body was covered with lumps about the size of hen's eggs. A pailful of hailstones was gathered out of the trap). My man's chest and arms looked afterwards just as if he had had five minutes with a bruiser. They were discoloured everywhere, and full of bumps. The force with which he was struck by the hailstones may be estimated by the fact that although he was wearing a mackintosh, livery coat, sleeved waistcoat, and shirt, he is black and blue. His tall hat was dented in. My son got a crack on the head through his hat, and there was a bump on his head in a moment as big as a hen's egg."

Ingatestone.—Mill Green. The roof of Mrs. Du Cane's house looked as if some one had gone along and broken the tiles with a hammer.

Kelvedon Common.—Several hailstones were measured by Mr. Brenes, some of them more than $2\frac{1}{4}$ inches across.

Layer Breton.—Hail as large as walnuts.

Little Baddow.—At Cuckoo's Farm, at 3 p.m., the hailstones were the size of a hen's egg—they smashed a stable window, and so pelted the horse that he nearly went mad; one stone struck a chicken dead at one blow.

Little Baddow.—On Saturday (about 48 hours after they had fallen), Mr. Mecklenburg found in a ditch hailstones which weighed more than half an ounce.

Little Baddow.—Mr. C. Smoothy says that the hail not merely came through his windows, but cut the blinds to shreds. After they

had been lying some time, he measured one $6\frac{1}{2}$ inches in circumference.

Maldon.—A man driving some ladies had on a hard hat, it was cut through in four places by the hail, and the ladies' umbrellas were riddled.

Margaretting.—Mr. Bright reports hailstones 6 inches round.

Margaretting Hall.—Mr. D. Christy said :—"I was on the top of that haystack when the storm broke. The wind blew away the poles and ladders, and there I had to stay! Two trees close to the stack were twisted and blown about to such an extent that I expected them to come down upon the stack every moment. One or two trees were blown down quite close to me, but I did not hear them, owing to the noise of the wind and hail. One of my old men (Cheek), who is of the same age as the Queen, was caught in the storm, and his arms and body were beaten black and blue by the hail. He has been in bed until this morning, unable to get up. Five other men took shelter under a tree, but when they saw a tree on each side of them blown down, they rushed into the open. Two of my horses bolted with a wagon which overturned into a ditch, and we had to take the wagon to pieces before we could get it out again."

Navestock.—Mr. Long measured a hailstone $4\frac{1}{2}$ inches in circumference.

Ongar.—Cattle have been injured by being pelted with the hail, which drove them nearly wild.

Springfield.—A lady was driving her pony cart, the pony was frightened by the hail and bolted (fortunately homewards), the next day the lady found her shoulders and back stiff and sore from the fusillade of hailstones.

Stock.—Mr. Barton was with a cart, the horse, frightened by being hit by the hail, bolted, and the cart was upset, neither horse nor man was hurt by that, but afterwards a hailstone struck Mr. Barton on his felt hat, and through it, raised a large bump. Some of the stones were as large as hen's eggs.

Theydon Bois.—A hailstone was picked up at Birch Hall which measured 3 inches by $1\frac{1}{2}$ inches.

Writtle.—A hailstone cut through a man's hat and inflicted such a gash that it had to be sewn up.

Writtle.—Skeggs Farm. Mr. Milbank says that he was out in the storm, his straw hat was cut to pieces, his arms, back, and head covered with bruises; four days after the storm there were bruises black and green 3 inches square.

WIND.

Abridge.—Storm lasted from 2.45 to 3.30 p.m.; heavy rain; tent blown down.

Blackmore.—At Spriggs' Farm 30 trees were blown down, one was $4\frac{1}{2}$ feet in diameter. A barn 60 feet long was blown down.

Braintree.—No wind.

Great Baddow.—Six elms blown down—four in one group. On

Great Sir Hughes Farm the top was taken off a tree and dropped on a cottage roof, which it broke in.

Ingatestone.—At Harding's Farm 20 large trees uprooted and many others had tops off.

Ingatestone—In Hyde Park about 20 large trees uprooted and 150 broken.

Ingatestone.—Nearly every private house was damaged, not merely the windows but the roofs, and by overthrown trees. At Mill Green a large frame covered with tiffany was whirled over a clump of trees 30 feet high and carried 60 yards.

Ingatestone.—At Jordan's Farm about 300 tiles were blown off.

Ingatestone.—Mr. Howell, baker, was driving his cart; it was blown over and he was bruised from head to foot. [Probably partly by the fall and partly by the hail.]

Mill Green.—At Mr. Du Cane's house all three chimneys down, one fell through the roof on to a bed.

Mountmessing.—Trees uprooted and blown in all directions.

Stock.—Chimney pots were blown off, stacks overturned, roofs carried away, and trees torn up.

West Hanningfield.—A wagon had just been loaded with clover hay; seeing the hail, the horses were taken out to put them into shelter; this had hardly been done when the wagon was blown over.

Writtle.—At Skeggs' Farm a wagon with two tons of hay upon it was blown completely over; the windmill was so much damaged that it is of no further use, and will have the sails removed.

METEOROLOGY IN BELGIUM.

THE June number of *Ciel et Terre* contains, under the title of *L'Observatoire au Parlement*, a very interesting survey of the present state of Meteorology; but we do not like it, it is too humble. Meteorology has won an honoured position in almost every civilized country in the world, and certainly not least in Belgium, though as yet there is in that country no separate meteorological office, and M. Lancaster writes as if he were pleading for one. If his countrymen understood the subject there would be no need to plead, the office would be created forthwith. Moreover, we are further puzzled because M. Lancaster quotes two able speeches in Parliament in favour of separating the Astronomical and the Meteorological branches of the National observatory, so as to create a separate Meteorological department, and says nothing as to any objections being raised thereto. If opposite views were expressed, we think that they should have been set out, and dealt with in the article. But as far as we can see the arguments are unanswerable, and so, perhaps, by this time all is, as it should be, settled, and Belgium has its *Bureau Météorologique*.

THE RECENT AUSTRALIAN AND INDIAN EARTHQUAKES.

By PROF. J. MILNE, F.R.S.

THE mails which have recently arrived from Australia, bring long accounts of a severe shock which, on May 10th, shattered chimneys, loosened bricks, cracked ceilings and created alarm in South Australia. The vibrations extended eastwards to Victoria and New South Wales, and from the numerous time-observations which were made, it is clear that sufficient material has been collected to determine the centrum from which the shock emanated. From the character of the movement and its effects, as noted in Adelaide, it seems likely that the origin will be found at a distance of 150 or 200 miles to the south of the same, and, therefore, be sub-marine.

The Australian and other colonies require not only seismographs, but the equivalent of the instrument employed in the Isle of Wight; and the reasons they require them are manifold. Had there been instruments of this type in Australia in 1888, when cable communication with the rest of the world was interrupted for a period of 19 days, it would at once have been known that the cause of this interruption was seismic, and not an operation of war, with the result that the calling out of military and naval reserves would, together with other expenses, have been avoided.

Since 1876 the cables connecting Australia and Java have been interrupted at least eighteen times, and on several of these occasions, when two or more cables were broken simultaneously, we know the cause to have been earthquake movements, producing submarine landslides.

The photograms of the unfelt movements throw light upon disturbances often noted in the records of various instruments employed at observatories. They also help us to confirm, extend, correct, and sometimes disprove, ordinary telegraphic information; but their chief value is that they furnish the means of calculating the velocities with which motion is propagated along different paths *through* our earth, which factors throw new light upon the effective rigidity of the globe on which we live.

The Indian earthquake, which recently wrought much havoc in Assam, announced itself in the Isle of Wight before half-past eleven on the morning of Saturday, June 12th. The movement continued for several hours, and the seismogram is the largest I have yet obtained. A record of this disturbance might have been obtained anywhere on the surface of the globe.

In Greenwich mean civil time, the commencement of movement was in the Isle of Wight at 11h. 29m. 10s.; at Edinburgh at 11h. 18m. 0s.; at Strasburg at 11h. 18m. 32s., and at Grenoble at 11h. 28m. 0s. I should estimate the apparent rate at which the preliminary vibrations were transmitted from Assam to Western

Europe, at 7 to 8 km. per second, or that they took *about* 16 minutes on this journey. If this is the case, the primary shock took place in Assam, in Greenwich time, at 11h. 2m. 0s., or 11h. 12m. 0s. a.m. The origin of this disturbance was in the Cherra Hills, about 240 miles N.E. from Calcutta, or on the convexity of the orogenic fold which runs from Burma, in the south, to Eastern Assam, in the north. The great earthquake of 1869 originated in the same region.

Shade Hill House, Newport, I. of Wight.

WINTERS IN BERWICKSHIRE.

[WE have recently been favoured by Mr. W. Hewat Craw, of West Foulden, Berwickshire, with the following table. It seems to us not merely interesting in itself, but suggestive of a guide to winter severity, which would be very useful if adopted generally, and which may even be found so for years when the thermometric records were untrustworthy or non-existent.—ED.]

Note of the time when the Hill stock (black-faced sheep) required to be fed with hay during snowstorms on the farm of Rawburn, Berwickshire, 1883-1897 :—

Winter.	No. of days when haying was needed.	Days between which sheep required hay.
1883—84	... — ...	No hay required ; snow did not lie so deep as to prevent the sheep feeding.
1884—85	... 16 ...	From 10th to 26th January.
1885—86	... 34 ...	From 25th Jan. to 11th Feb., and from 2nd to 19th March.
1886—87	... 19 ...	From 10th to 18th January, and from 14th to 25th March.
1887—88	... 28 ...	From 21st Feb. to 21st March.
1888—89	... 5 ...	From 1st to 5th March ; one hirsle only.
1889—90	... — ...	No hay required ; a mild, open winter.
1890—91	... 10 ...	From 17th to 27th March.
1891—92	... — ...	No hay required.
1892—93	... 4 ...	From 27th February to 3rd March.
1893—94	... — ...	No deep snowstorms, but changeable, with severe frosts.
1894—95	... 54 ...	From 10th January to 5th March. Severe winter, with deep snow.
1895—96	... — ...	No hay feeding needed from deep snow.
1896—97	... 24 ...	In December, 10 days, from 11th to 21st. In Jan. and Feb., 14 days, from Jan. 21st to Feb. 4th.

ROYAL METEOROLOGICAL SOCIETY.

THE last meeting of this Society for the present session was held at the Rooms of the Royal Astronomical Society, Burlington House, on Wednesday afternoon, June 16th, Mr. E. Mawley, F.R.H.S., President, in the chair.

A paper by Mr. R. C. Mossman, F.R.S.E., on "The Non-Instrumental Meteorology of London, 1713-1896," was read by the Secretary. The data were obtained from:—

I. Register kept at Richmond, Surrey, from April 1713 to June 1745, by Mr. George Smith, a Proctor to Queen Anne.*

II. A daily record given in *The London Magazine* from 1747 to 1758.

III. Register printed monthly in the *Gentleman's Magazine*, 1763-1771. The station from November to April was near the north bank of the Thames, just below London Bridge. During the other half of the year, it was situated seven miles west of Hyde Park Corner.

IV. Registers kept by Mr. Thomas Hoy at Kensington, 1771-1774; Muswell Hill, 1775-1782; and Sion House, near Kew, 1783-1822.

V. Register kept at Greenwich by Mr. J. H. Belville from March 1st, 1811, to July 7th, 1856.

VI. Daily weather notes from Greenwich Observatory, published in the Registrar-General's *Weekly Return of Births, Marriages, and Deaths*, 1855-1896.

The phenomena tabulated were Thunderstorms, Lightning without Thunder, Mist and Fog, Snow, Hail, Gales and High Winds.

The thunderstorms show an average number of 10 per annum. The maximum was 25 in 1878 and 1880, and the minimum 1 in 1729. The maximum in one month was 12 in June 1726. The annual period is well marked, embracing the six months April to September, during which time 91.5 per cent. of the whole took place. The maximum occurring in July, and the minimum in February.

The total number of fogs was 4,076, an average of 24 per annum. They increase rapidly during September, but the maximum is not clearly defined, the values for October, November and December being practically the same. The minimum is reached in June.

The total number of days with snow was 2,267, an average of 14 per annum.

The snowiest winter was that of 1887-88 with 43 days, while in the winter of 1862-63 there is not a single instance of a snowfall. The greatest number of falls in one month was 17 in January 1814.

The mean date of first snowfall is November 9th; the earliest date being September 24th in 1811; and the latest April 10th in 1834. The mean date of last snow is March 30th, the extreme dates being January 6th, 1894, and May 27th, 1821.

Hail is essentially a spring phenomenon, reaching a maximum in

* See *Met. Mag.*, Vol. xxxi. p. 161.

March and April. The minimum is in July and August. It is probable that most of the cases in summer are falls of true hail accompanying thunderstorms, whereas in spring in nearly every case the substance precipitated is "graupel" or soft hail. The total number of falls observed was 988, equal to an average of 6 per annum.

Mr. C. Harding gave an account of the hailstorm which occurred in the south-west of London on April 27th, 1897. This accompanied a thunderstorm in which the lightning was very vivid. The hail lasted only about 20 minutes, from 6.30 to 6.50 p.m., and in that short space of time the melted hail and rain amounted to about an inch of water. The ground was quite white with hailstones, which in some places remained unmelted the whole of the next day. Much damage was done to fruit trees and shrubs. The paper was illustrated by a sketch-map, shaded to show the area over which hail was observed; extending over a length of about six miles from New Malden to Tulse Hill, and varying in width from about half-a-mile at the S.W. end, to about a mile-and-a-half at the N.E. end, and including Wimbledon, Tooting, Balham, Streatham and Brixton. The stations recording a precipitation of more than an inch were Streatham 1.62 in. and Clapham Park 1.18 in.

THE FROST—EARTH TEMPERATURES & WATER PIPES.

THIS heading does not seem appropriate to Midsummer, but it is only now that the anomaly to which we called attention in April, 1895, has been explained—very unsatisfactorily.

In the *Meteorological Magazine*, Vol. XXX., p. 39, we gave a table of "Earth temperatures at 1 foot in February, 1895," and we made the following remark:—"In the above table the stations are grouped in the order of their mean temperature [for the month] and some results are remarkable. The coldest station, Lowestoft, 29°·0, is within a short walk of the hottest but one, Somerleyton, 33°·8. We believe that the thermometers at both stations have been verified, but think that reverification is desirable."

To-day, June 30th, 1897, we have received the April number of the *Quarterly Journal* of the Royal Meteorological Society, and on page 96 we find the explanation of the whole matter, in the following report by Mr. Marriott. The italics are ours.

"Lowestoft, September 4 [1896]. On comparing the thermometers it was found that the wet had gone up 0°·2. The 1 foot and 2 feet earth thermometers have long tubes surrounded by wooden or metal cases. I had not previously been able to test these thermometers, but on this occasion, with the assistance of Mr. Miller, I succeeded in doing so. *I found that the 1 foot thermometer had slipped down its case about 3° and was consequently reading much too low. The 2 feet thermometer was fully 1° too high.*"

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JANUARY, 1897.

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	47·0	10	23·4	18	39·8	31·7	34·0	93	69·0	16·6	2·05	20	7·3
Malta.....	66·6	9	39·4	31	60·1	49·1	47·2	82	124·3	32·3	1·05	10	5·6
<i>Mauritius</i>	88·0	18	69·6	31	84·9	74·6	71·1	78	135·7	62·2	6·35	17	7·0
Calcutta	87·7	15	49·0	19	79·8	57·5	53·6	61	140·5	41·2	·04	...	1·6
Bombay.....	88·8	9	61·1	20	81·1	67·1	63·7	69	134·6	51·2	·01	1	2·0
Ceylon, Colombo	92·2	6	68·0	13	89·2	73·9	71·2	76	152·0	65·0	3·81	8	3·1
<i>Melbourne</i>	102·2	7	46·5	17	74·0	56·2	52·7	68	150·8	38·2	5·46	9	6·0
<i>Adelaide</i>	105·1	30	51·7	24	82·4	59·3	51·3	52	162·6	40·5	·66	4	4·6
<i>Sydney</i>	90·3	22	51·6	18	78·2	64·3	58·4	63	154·8	44·2	2·15	13	4·4
<i>Wellington</i>	81·0	12	45·0	1	71·6	57·8	53·0	66	145·0	35·0	8·05	11	4·1
<i>Auckland</i> .....	...	...	...	...	...	...	...	...	...	...	...	...	...
Jamaica, Kingston.....	89·5	18	62·0	12	85·7	66·6	62·6	66	...	...	·02	1	2·6
Trinidad	90·0	5 ^a	64·0	3 ^b	87·3	67·6	68·4	76	171·0	62·0	·75	11	...
Grenada.....	87·8	10	70·0	21	82·2	72·5	72·8	83	155·0	...	6·10	20	3·0
Toronto	51·7	3	-7·2	25	29·7	15·6	21·6	87	62·5	-9·3	1·92	15	8·0
New Brunswick, Fredericton	55·3	5	-18·0	19	24·2	3·8	13·0	75	...	...	3·45	10	4·8
Manitoba, Winnipeg	38·0	1	-38·4	23	8·5	-12·0	...	...	...	...	·89	9	5·2
British Columbia, Esquimalt	51·3	7	-22·2	27	42·6	34·6	37·2	93	...	...	5·95	20	3·2

a—and 11. b—and 4, 15

REMARKS.

MALTA.—Adopted mean temp. 53°·8, or 1°·0 above the average. Mean hourly velocity of wind 11·6 miles. Average temp. of sea 59°·0. T8 on 19th. L on four days. Severe hailstorm on the 23rd, at 1.5 a.m. Hailstones of dense ice, reaching in size to that of a hen's egg, fell for several minutes. Much damage was done to skylights and windows of westerly aspect. Three hundred and twenty panes of glass were destroyed in this College in about five minutes. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·6 above, of dew point 1°·2 above, and rainfall ·94 in. below, their respective averages. Mean hourly velocity of wind 8·4 miles, or 2·8 miles below average; prevailing direction E.S.E. and E. by N. T and L on 13th. L on 1st and 16th, and T on 7 days. T. F. CLAXTON.

CEYLON, COLOMBO.—Lightning was seen on 6th and 7th; thunderstorms occurred on the 24th. ALFRED E. WACKRILL.

Adelaide.—A remarkably cool month. Mean temp. 3°·6 below the average. Rainfall ·19 in. below the average. C. TODD, F.R.S.

Sydney.—Rainfall 1·51 in. below, humidity 9 below, and mean temperature 0°·2 below, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—On the whole a wet month, with interval of fine warm weather; heavy rain in the middle and at the end of the month, 3·20 in. being recorded on the 15th. Strong N.W. winds prevailed, and gales or high winds on ten days. Earthquake on 14th. R. B. GORE.

TRINIDAD.—Rainfall 1·27 in. below the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,
JUNE, 1897.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	3·84	XI.	Rhayader, Nantgwillt ...	3·10
II.	Dorking, Abinger Hall .	1·66	„	Lake Vyrnwy	4·29
„	Birchington, Thor	1·55	„	Corwen, Rhug .....	...
„	Hailsham	2·15	„	Criccieth, Talarvor	3·18
„	Ryde, Thornbrough	3·08	„	I. of Man, Douglas	4·76
„	Emsworth, Redlands ...	3·06	XII.	Stoneykirk, Ardwell Ho.	4·92
„	Alton, Ashdell	2·53	„	New Galloway, Glenlee	4·75
III.	Oxford, Magdalen Col..	2·40	„	Moniavie, Maxwellton Ho.	4·67
„	Banbury, Bloxham	2·61	„	Lilliesleaf, Riddell	3·35
„	Northampton, Sedgebrook	2·39	XIII.	N. Esk Res. [Penicuik]	4·45
„	Duddington [Stamford].	2·17	XIV.	Glasgow, Queen's Park..	5·67
„	Alconbury	1·75	XV.	Inverary, Newtown	6·70
„	Wisbech, Bank House...	2·03	„	Oban, The Corran	4·99
IV.	Southend	2·64	„	Islay, Grunart School ...	1·67
„	Harlow, Sheering	2·53	XVI.	Dollar	6·19
„	Colchester, Lexden	2·62	„	Balquhider, Stronvar...	5·74
„	Rendlesham Hall	2·31	„	Ballinluig	4·95
„	Rushall Vicarage	1·92	„	Dalnaspidal H. R. S.	5·76
„	Swaffham .....	...	XVII.	Keith H. R. S.	4·99
V.	Salisbury, Alderbury ...	2·93	„	Forres H. R. S. ...	2·77
„	Bishop's Cannings	3·69	XVIII.	Fearn, Lower Pitkerrie..	1·94
„	Blandford, Whatcombe..	3·96	„	N. Uist, Loch Maddy ...	1·32
„	Ashburton, Holne Vic...	3·53	„	Invergarry	2·40
„	Okehampton, Oaklands..	2·55	„	Aviemore H. R. S.	3·93
„	Hartland Abbey	2·36	„	Loch Ness, Drumnadrochit	3·21
„	Lynmouth, Glenthorne.	3·10	XIX.	Invershin	1·57
„	Probus, Lamellyn	1·99	„	Scourie .....	...
„	Wellington, The Avenue	2·35	„	Watten H. R. S.	1·02
„	Wincanton	2·78	XX.	Dunmanway, Coolkelur..	5·36
VI.	Clifton, Pembroke Road	3·22	„	Cork, Wellesley Terrace	3·10
„	Ross, The Graig	3·20	„	Killarney, Woodlawn ...	4·31
„	Wem, Clive Vicarage ...	2·38	„	Caher, Duneske	4·19
„	Cheadle, The Heath Ho.	3·13	„	Ballingarry, Hazelfort...	3·52
„	Worcester, Diglis Lock	2·78	„	Limerick, Kilcornan ...	...
„	Coventry, Kingswood ..	2·93	„	Broadford, Hurdlestown	4·27
VII.	Grantham, Stainby	2·20	„	Miltonam Malbay .....	...
„	Horncastle, Bucknall ...	1·68	XXI.	Gorey, Courtown House..	2·67
„	Worksop, Hodsck Priory	2·76	„	Athlone, Twyford	4·43
VIII.	Neston, Hinderton	2·58	„	Mullingar, B-ivedere ...	4·08
„	Southport, Hesketh Park	3·28	„	Loughford, Currygrane...	4·68
„	Broughton-in-Furness ...	7·58	XXII.	Woodlawn	5·21
IX.	Ripon, Mickley	3·02	„	Crossmolina, Enniscoe ..	3·96
„	Melmerby, Baldersby ...	3·11	„	Collooney, Markree Obs.	4·74
„	Scarborough, Observat'y	2·05	„	Ballinamore, Lawderdal..	6·07
„	Middleton, Mickleton ...	2·74	XXIII.	Warrenpoint	6·00
X.	Haltwhistle, Unthank...	3·79	„	Seaforde	5·88
„	Bamburgh	2·50	„	Belfast, Springfield	5·99
„	Keswick, The Bank	4·38	„	Bushmills, Dunlarave..	5·68
XI.	Llanfrechfa Grange	3·17	„	Stewartstown	6·71
„	Llandoverly	2·56	„	Killybegs	8·36
„	Castle Malgwyn	2·79	„	Lough Swilly, Carrablagh	5·10
„	Builth, Abergweayn Vic.	3·29			

JUNE, 1897.

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			Max.		Min.			
				Dpth	Date		Deg.	Date	Deg.	Date.		
I.	London (Camden Square) ...	1·87	— ·14	·68	8	11	87·8	24	43·3	10	0	0
II.	Maidstone (Hunton Court) ...	...	...	...	...	...	...	...	...	...	...	...
III.	Strathfieldsaye ...	2·04	...	·92	8	10	...	...	...	...	...	...
IV.	Hitchin ...	2·33	+ ·47	·88	8	13	81·0	23	41·0	18	0	...
V.	Winslow (Addington) ...	2·55	+ ·69	1·01	8	12	84·0	13	40·0	10	0	0
VI.	Bury St. Edmunds (Westley) ...	2·94	+ 1·15	·97	24	11	75·0	23	43·0	19	0	...
VII.	Norwich (Brundall) ...	2·23	...	·61	18	14	83·0	24	43·4	19	0	0
VIII.	Weymouth (Langton Herring) ...	2·94	+ ·71	·89	8	9	76·0	25	45·0	17	0	...
IX.	Torquay (Cary Green) ...	...	...	...	...	...	...	...	...	...	...	...
X.	Polapit Tamar [Launceston] ...	1·73	— ·48	·44	19	12	78·0	25	41·7	3	0	0
XI.	Stroud (Upfield) ...	2·44	+ ·05	·72	8	12	80·0	23 ^b	45·0	18	0	...
XII.	Church Stretton (Woolstaston) ...	2·73	+ ·18	·81	8	13	78·0	13 ^c	42·0	17	0	0
XIII.	Tenbury (Orleton) ...	2·32	— ·30	·66	9	11	83·0	12	42·0	10	0	0
XIV.	Leicester (Rotherby Hall) ...	2·05	...	·54	8	14	...	...	...	...	...	...
XV.	Boston ...	1·92	+ ·03	·38	8	12	88·0	23	42·0	21	0	...
XVI.	Hesley Hall [Tickhill] ...	3·03	+ 1·11	1·42	30	16	84·0	13	39·0	10	0	0
XVII.	Manchester (Plymouth Grove) ...	3·62	+ ·97	·72	1	13	85·0	23	39·0	8	0	1
XVIII.	Wetherby (Ribston Hall) ...	3·83	+ 1·94	1·14	6	15	...	...	...	...	...	...
XIX.	Skipton (Arneliffs) ...	5·38	+ 2·02	·85	19	17	...	...	...	...	...	...
XX.	Hull (Pearson Park) ...	1·57	— ·18	·36	19	10	83·0	12 ^d	39·0	10	0	...
XXI.	Newcastle (Town Moor) ...	2·82	+ 1·18	·70	18	13	...	...	...	...	...	...
XXII.	Borrowdale (Seathwaite) ...	9·03	+ 2·45	1·90	15	18	...	...	...	...	...	...
XXIII.	Cardiff (Ely) ...	3·13	+ ·70	·86	8	12	...	...	...	...	...	...
XXIV.	Haverfordwest ...	3·14	+ ·58	·72	17	16	78·2	23	43·5	3	0	0
XXV.	Aberystwith (Gogerddan) ...	2·26	...	·49	16	10	83·0	12	33·0	1,2	0	...
XXVI.	Llandudno ...	2·30	+ ·53	·68	17	17	76·2	13	43·4	5	0	...
XXVII.	Cargen [Dumfries] ...	3·36	+ 1·41	·92	15	12	75·2	5	38·0	19	0	0
XXVIII.	Edinburgh (Blacket Place) ...	3·99	...	1·00	13	21	73·4	5	36·0	8	0	0
XXIX.	Colmonell ...	5·22	...	1·61	15	21	77·0	13	42·0	8 ^e	0	...
XXX.	Lochgilthead (Kilmory) ...	7·51	+ 4·41	1·69	15	20	...	...	36·0	18	0	...
XXXI.	Mull (Quinish) ...	3·28	— ·01	·82	15	19	...	...	...	...	...	...
XXXII.	Loch Leven Sluices ...	4·90	+ 3·15	1·30	16	11	...	...	...	...	...	...
XXXIII.	Dundee (Eastern Necropolis) ...	5·10	+ 3·60	1·45	15	19	71·9	2	39·5	19	0	...
XXXIV.	Braemar ...	4·19	+ 2·20	·75	15	18	74·0	29	37·2	1	0	6
XXXV.	Aberdeen (Cranford) ...	3·80	...	·86	16	16	72·0	28	38·0	6	0	...
XXXVI.	Cawdor (Budgate) ...	3·63	+ 2·23	·89	15	17	...	...	...	...	...	...
XXXVII.	Strathconan [Beaully] ...	2·39	— ·10	·74	16 ^a	8	...	...	...	...	...	...
XXXVIII.	Gleucarron Lodge ...	3·23	...	·92	22	13	74·7	29	34·8	9	0	...
XXXIX.	Dunrobin ...	1·54	— ·48	·41	15	9	70·0	12	41·0	7	0	...
XL.	S. Ronaldsay (Roeberry) ...	·56	— 1·20	·10	11	12	68·0	29	38·0	7	0	...
XLI.	Darrynane Abbey ...	4·91	...	1·13	19	25	...	...	...	...	...	...
XLII.	Waterford (Brook Lodge) ...	2·79	+ ·72	·83	8	14	74·0	5,30	41·0	19	0	...
XLIII.	O'Briensbridge (Ross) ...	3·62	...	·74	8	14	...	...	...	...	...	...
XLIV.	Carlow (Browne's Hill) ...	3·60	+ 1·76	·81	29	15	...	...	...	...	...	...
XLV.	Dublin (FitzWilliam Square) ...	3·26	+ 1·60	·66	8	20	73·7	22	43·0	19	0	0
XLVI.	Ballinasloe ...	5·37	+ 3·07	1·38	23	21	71·0	5	43·0	17	0	...
XLVII.	Clifden (Kylemore) ...	6·77	...	1·32	15	15	...	...	...	...	...	...
XLVIII.	Waringstown ...	5·11	+ 3·04	·87	15	21	79·0	5	40·0	18	0	0
XLIX.	Londonderry (Creggan Res.) ...	6·15	+ 3·73	1·70	15	20	...	...	...	...	...	...
L.	Omagh (Edenfel) ...	7·41	+ 4·94	1·41	15	21	73·0	5	40·0	18	0	...

+ Shows that the fall was above the average ; — that it was below it.
a—and 22. b—and 24. c—and 23. d—and 13. e—and 16, 24.

METEOROLOGICAL NOTES ON JUNE, 1897.

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

ENGLAND.

CAMDEN SQUARE.—In some copies of our last number the second figure of the date of the min. temp. in May had disappeared; it should have been not 1 but 13.

ADDINGTON.—Rainfall above the average of ten years. Great range of max. temp. at times, between the 6th and 8th as much as twenty-five degrees, and between the 24th and 25th twenty-two degrees. T on 1st and 24th.

BURY ST. EDMUNDS, WESTLEY.—A hot month with much growing weather. Vegetation made great progress, and the country looked lovely at the close. Remarkable for the heavy TS of the 24th, which though very severe here was very partial, villages within two miles having little or no rain. Distant T on 6th.

NORWICH, BRUNDALL.—The month entered with fine warm weather. The 7th and 8th were very wet and cold, followed by warm weather. A gale of unusual violence for June occurred on the night of the 18th, and TSS on 18th, 24th and 27th. Much destruction was done in Norwich by the storm of the 24th, both to life and property, and buildings were damaged by L on the evening of the 27th, at Blofield, one mile from this station. The max. temp. on 8th, 50°·6, is the lowest recorded in June since 1886.

WEYMOUTH, LANGTON HERRING.—The mean temp. at 9 a.m. is 0°·8 above the average. The hay crops in this neighbourhood are the heaviest that have been known for many years, and the grain crops promise well. There was a severe TS on the 26th, which lasted for more than seven hours, the flashes of L following each other in quick succession. T also was heard on the 24th and 28th. Very high wind on the 18th. Fog on 27th. The rainfall for the first six months of the year, 18·17 in., is with the exception of 1879, when 20·43 in. fell, the heaviest in that period in 23 years, is 45 per cent. above the average for the first half of the year, and nearly three times that of the corresponding period in 1896.

POLAPIT TAMAR [LAUNCESTON].—Generally a fine, very seasonable month. Distant T very frequent during the last week.

STROUD, UPFIELD.—Very heavy R from 11 a.m. to 1 p.m. on 1st, 54 in. falling in the two hours. TS in evening on 26th; heavy TS at night on 28th, with vivid L.

WOOLSTASTON.—A very variable month with repeated and very abrupt changes from sultry heat to cold stormy weather. T on the 6th. Gale on the 18th. Mean temp. 58°·8.

TENBURY, ORLETON.—A fine warm month, with mean temp. about 2°·5 above the average. T on 6th, 24th and 30th.

ROTHERBY HALL.—Total R for first 6 months 11·24 in., against 7·71 in. in 1896.

WALES.

HAVERFORDWEST.—Fine bright hot weather in the first week, followed by nearly a fortnight of broken weather, which was most acceptable to the country, and contributed to the realization of the splendid hay crops, and to every likelihood of a magnificent harvest. Fine, bright, warm weather, with some heavy falls of R at night, closed this most seasonable June. Distant TS on 13th.

ABERYSTWITH, GOGERDDAN.—Bright sun, with S. or S.W. wind, most of the month.

SCOTLAND.

CARGEN [DUMFRIES].—The mean temp. of the month was 1°·5 above the average. The constant and sudden fluctuations of temp. were very remarkable;

on no less than six occasions was there a difference of upwards of 10° in the maximum temp. of succeeding days. The duration of sunshine was greatly below the average. Light winds, mostly easterly, prevailed during the month. Farm crops have hardly ever had a better appearance at this season. Warm weather constantly following R caused luxuriant growth, and corn, hay, and turnip crops promise to be much above the average. T and L on 1st and 29th. T on 2nd and 13th.

EDINBURGH, BLACKET PLACE.—The coldest June since 1888, and the wettest since 1879. The rapid alterations of heat and cold were of frequent occurrence. Fog on six days. TSS on 13th and 14th. Mean temp. on 20th, only $45^{\circ}5$. Very heavy R at 10 a.m. on 16th, .44 in. fell in 16 minutes, and the temp. fell till 2.30 p.m., when it was $43^{\circ}4$.

COLMONELL.—Rain 2.46 in above, and mean temp $0^{\circ}5$ above, the average of 21 years.

LOCHGILPHEAD, KILMORY.—The wettest month of June remembered, without reference to records; very low temp. also at times.

BRAEMAR.—A dark and wet, but fine growing month.

ABERDEEN, CRANFORD.—Generally cold and cloudy; gale, with R, on 16th, 17th, and 18th.

S. RONALDSAY, ROEBERRY.—A very dry month. Mean temp. $51^{\circ}3$, being $0^{\circ}9$ below the average of seven years.

IRELAND.

DARRYNANE ABBEY.—A very wet month, with extremely heavy falls of R for a few hours on 19th and 23rd. On the 19th almost all the fall was between 9 a.m. and 1 p.m., and caused great floods. On 23rd most of the fall was between 9 and 11 a.m. Constant thick mist and fog in the last fortnight.

WATERFORD, BROOK LODGE.—Temperature much below that of last year. Heavy TS on 12th; T and L on 28th. Fog on 27th, 28th, and dense fog on 30th.

O'BRIENSBRIDGE, ROSS.—Remarkable for extreme variations of temp., frequent summer L without T.

DUBLIN.—Although the R and rainy days were in excess of the average, and the amount of cloud was large, June, 1897, must be regarded as a favourable month, conducive to health, and propitious to vegetation. It is remarkable that with a preponderance of easterly and north-westerly winds, the relative humidity was very high, and radiation temperatures by night were not low. There was a cold spell from the 15th to the 20th. Mean temp. $58^{\circ}7$, or $0^{\circ}9$ above the average. High winds were noted on seven days, but the force of a gale was attained only on the 16th and 19th. Fogs on seven days. TS on the 12th, and L on 22nd. Solar halos on the 5th and 28th.

BALLINASLOE.—Gales from W. on the night of the 15th and all day on 16th, at night on 17th, and all day on 18th and 19th. L and T and heavy R from 10 to 11.30 p.m. on 22nd and L and T at 8 p.m. on 23rd.

WARINGSTOWN.—The wettest June since observations began in 1861, the next wettest being June, 1879, when 4.54 in. fell.

EDENFEL.—The rainfall (7.41 in.) of the past month has not been equalled in any spring or summer month in 33 years, and during that time has been only twice exceeded in any month of the year, viz., by 7.70 in. in October, 1870, and 7.67 in. in December, 1876. As it came after the turnip sowing and before the hay harvest, but little actual damage has been occasioned, except in the lands adjoining mountain torrents, where in many instances the seeds were washed out of the ground. Vegetation is profuse, but there is quite an ominous paucity of flower on all fruit trees, plants and flowering shrubs. Temperatures have been rather below the average, and everything is nearly a month later than last year. The rainfall of the six months, 23.57 in., is the heaviest yet recorded in that period.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXIX.]

AUGUST, 1897.

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

FROMONDUS AND HIS NOTES ON THE WEATHER.

A RECENT number of *Ciel et Terre* contains the only modern notice which we remember to have seen of Professor Libert Froidmont, of Louvain.* The article, like nearly all those which appear in our Belgian contemporary, is well worth reading, but there are one or two points upon which the author (Prof. Monchamp) may be glad of a little information, and possibly by drawing attention to the article here, still further particulars may be forthcoming.

Prof. Monchamp regards the record of the weather kept by Froidmont in 1614 and in 1625 as "the earliest kept in Belgium, if not in the world." Has he forgotten "Tyge Brahe's Meteorologiske Dagbog, holdt paa Uraniborg for Aarene 1582—1597"?

Everybody did not secure a copy of Merle's MS., so it may be well to give wider circulation to a specimen month, nearly 300 years earlier than Froidmont:—

*Record of the Weather at Driby, Lincolnshire, by the Rev. W. Merle,
A.D. 1343.*

- March 1.—Frost, with little snow, and afterwards light rain.
,, 2.—Slight fog.
,, 3 & 4.—Slight frost, with little hoar-frost.
,, 5.—Light rain, with N.W. wind.
,, 6 & 7.—Very strong S.W. wind.
,, 9.—Very strong S.W. wind, with rain.
,, 13.—Very strong S.E. wind, with rain.
,, 15.—Little hoar-frost, with strong W. wind.
,, 16.—Strong W. wind in the night.
,, 17.—Very strong W. wind, with rain.
,, 19.—Very strong W. wind, with light rain.
,, 20.—Little hoar-frost, with little ice.
,, 21.—Little hoar-frost.

* Libertus Fromondus was Dr. of Theology, and Prof. of Philosophy and Theology in the University of Louvain. He was born on the 3rd (or 6th) of September, 1587, at Hackör on the Maas (Haccourt, near Liège, Belgium), and died at Louvain, near Brussels, October 27th, 1653.

- March 25 & 26.—Stormy, that is to say, very strong N.W. wind, with cold and with hail, rain, and snow many times in the day.
- „ 27.—Slight hoar-frost, with N.W. wind, before mid-day; after mid-day, serenity without wind, followed by light rain, with light thunder once.
- „ 28.—Stormy, with very strong N.W. wind, and with hail, rain and snow very often in the day. At mid-day there was an earthquake, which was so great that, in certain parts of Lyndesay, stones in the chimneys fell down, after shaking in very great agitation, and it lasted long enough for the “*Salutatio angelica*” to be said distinctly.
- „ 29.—Stormy, with hail, snow, frost, rain and N.W. wind.
- „ 30.—Severer frost than on the 29th, with snow and wind.
- „ 31.—Heavier snowfall than on the 30th, with N.W. wind, and there was a good deal of snow then.

The aforementioned earthquake was not felt at Oxford.

We shall be glad of information as to editions of Froidmont's book. We have the first five of the following six; are there any others?

FROMNDI, LIBERTI. *Meteorologicorum libri sex.*

			Size of Type.
A	4to.	Ex Officina Plantiniana, Antverpiæ 1627, xii.-438 pp.	7·lin. × 4·3in.
B	sm.8vo.	Guilielmus Turner, Oxoniæ, 1639, xiv.-527 pp. ...	4·9,, × 2·7,,
C	4to.	Hieronymi Nempæi, Lovanii 1646, xii.-591 pp. ...	6·9,, × 4·3,,
D	sm.8vo.	Ed. Story, Londini, 1656, xiv.-527 pp. ...	4·9,, × 2·6,,
E	sm.8vo.	J. Redmayne, Londini, 1670, viii.-464 pp. ...	5·4,, × 3·2,,
F	4to.	... .. Londini, 1670... ..	... ..

Prof. Monchamp quotes only editions A and C, and a London edition of 1655, of which we can trace no other copy. Is it a mistake? or was D issued in 1655 as well as in 1656? It will be noticed that, besides giving what we believe to be the forms (4to, 8vo, &c.) of each volume, we give the length and breadth of a full page of type—*i. e.*, without head-lines or marginal notes. We have long regarded the 4to, 8vo, &c., as confusing, and are glad to quote the following authority against them:—“At the recent International Congress of Publishers in Paris the inexactness of designating the size of books as 4to, 8vo, and 12mo, was discussed, and a resolution was passed to the effect that publishers' catalogues should give the actual sizes of volumes, in the metric system.”—*Science*, July 23rd, 1897.

De La Lande in his *Bibliographie Astronomique* calls edition B 12mo. D is once described as 12mo, but generally as an 8vo, though the dimensions are very small for that, and E is described by one authority as 8vo, and by another as 18mo!

We think that one sentence in Prof. Monchamp's interesting note is incorrect, but as the Editors have passed it, we are almost afraid

to criticize. However, we venture on reprinting it, and putting in italics the statement to which we object.

“Il cite (p. 79) un témoin digne de foi qui, au milieu d'une nuit de l'automne de 1625, a vu une longue traînée lumineuse partir de l'occident, s'élever jusqu'au zénith, et faire pâlir la Lune, qui pourtant brillait alors de tout son éclat. *Il s'agit sans doute ici de la lumière zodiacale.*”

Surely the zodiacal light never shone at midnight brightly enough to dim the light of the moon. Would not the passage of a bright meteor accord better with the statement?

Prof. Monchamp gives a diagram of the winds according to Froidmont, which we commend to the attention of Mr. J. G. Wood, in case he should feel inclined to carry further the interesting consideration of the subject which he gave in Theophrastus.

We agree with Prof. Monchamp in his concluding paragraph, which may be freely paraphrased as follows:—

In finishing my little paper, I would advise those interested in Meteorology to read the whole of Fromondus's book. Meteorology has, of course, made great progress in nearly 300 years, but all the theories and facts are not to be despised; even the errors are useful, they show us the road travelled, and the pits to be avoided, they should render us cautious both as to our theories and our facts, if we wish to be respected when another 300 years have passed.

RECENT STORM RAINS.

IN two consecutive numbers we have had to deal with hail of quite exceptional size, falling during the storms in Sussex and Essex, and now we have some equally remarkable rainfall records.

July 20th.

OXFORD.

St. Giles', Oxford.—TS from 3.45 to 5 p.m. and 1.30 in. of R, 1.14 in. falling by 4.45 p.m.—E. M. TAWNEY.

The fall at *Magdalen College* was 0.83 in., and at the *Radcliffe Observatory* 1.66 in.

DEVON.

Water Works, Torquay.—On July 20th we had a very heavy fall of rain on our watershed, viz., 3.02 in. at Tottiford, and 1.40 in. at Kennick. Of the 3.02 in. at Tottiford, 2.75 in. fell in 70 minutes, and at the same time there was a heavy fall of hail, some of the stones being quite an inch across. A large amount of soil was washed into our reservoirs, and no less than 186 cubic yards found its way into the Intake. The storm appeared to have its centre between the village of Lustleigh and our reservoirs, and the roads suffered severely.—W. INGHAM, A.M.I.C.E.

GLOUCESTER.

Upfield, Stroud.—Very severe TS from 4.30 to 5.30 p.m. R in that hour 1.62 in., and 0.33 in. more in the following two hours. Within a mile of here a tree, a brick wall and a brick chimney stack were struck, and a sheep was killed by L.—ROSE E. STANTON.

Further Barton, Cirencester.—Three heavy TSS took place: The first at noon, over in about an hour, when .27 in. of R fell. The second began with T in the S.W. before 2.30 p.m.; at 3 p.m. two trees were struck by L about half-a-mile distant; the storm passed round to the E. The third came up also from the S.W.; R and H began at 5 p.m.; two violent claps of T, instantaneous with the L, at 5.15 p.m. and 5.30 p.m., when a Scotch fir had a strip of bark peeled off from top to bottom. The H stones caused great damage to apples and all vegetation; they were chiefly round, some with sharp points, but not pyramidal. Bar. steady; no wind. Total R 1.43 in.—E. BROWN.

NORTHUMBERLAND.

Pawston, Coldstream.—R 2.13 in., the heaviest fall in 24 hours since September, 1880. In the three days 19th to 21st, 3.10 in. fell, practically all in 48 hours.

July 21st.

MIDDLESEX.

Fairfield Road, Crouch End.—Severe TS, with heavy R and H the size of large peas or small marbles. Between 2.15 p.m. and 4.15 p.m. 1.90 in. of R fell, and in the 24 hours 2.09 in. Water found its way into the basements of houses where it had never been seen since they were built in 1887.—H. SOWERBY WALLIS.

Aubrey Road, Crouch End.—During the heavy TS here this afternoon exactly 2.00 in. of R fell (between 2 and 5 p.m.), the heaviest R being between 3 and 4.—W. B. BUTLER.

Finsbury Park.—Between 1.15 and 3.45 p.m. there fell 2.10 in. of R, of which, probably, two inches fell between 1.30 and 3.30 p.m. Between 3.45 and 5.30 p.m. there was a further fall of 0.43 in., making the total in less than four hours 2.53 in. At *Lordship Road, Stoke Newington*, in the same time there fell only 1.68 in.—EDMUND L. MORRIS, A.M.I.C.E.

Cazenove Road, Stoke Newington.—After the storm, my rain gauge recorded 3.18 in. For at least ten years no such amount has been measured in North London.—E. J. BENTLEY.

Camden Square is within three miles of all these stations, but the fall there was only 0.01 in.

BERKS.

The Elms, Faringdon.—Heavy TS, 0.30 to 1.25 p.m., in which time the R was 1.20 in. At *Coleshill (Wilts)*, three miles off, there was no R.—W. DUNDAS.

BUCKS.

Addington, Winslow.—TS, a cow and a sheep killed. R .73 in.—J. MATHISON.

SUFFOLK.

Bishop's Hill, Ipswich.—Violent TS, and the heaviest R I have ever seen ; in one hour, between 4.15 and 5.15 p.m., there fell 2.95 in. In the first half hour the fall must have been at the rate of five or six inches an hour.—G. A. BIDDELL, M.I.C.E.

Clare Lodge, Ipswich.—Total R = 1.86 in.—E. R. TURNER, M.I.C.E.
Museum, Ipswich.—Total R 2.05 in.—FRANK WOOLNOUGH.

Nova Scotia House, Ipswich.—The TS began at 4 p.m. Noticing that the R was excessive, I went to my gauge (which holds about 2½ inches) at 4.30 p.m., expecting to find an inch or an inch and a half, but the bottle was nearly full, 2.20 in., which I poured away ; at 5 p.m. I went again and measured 2.00 in. ; at 6.30 p.m., when the storm was over, there was a further 0.82 in., so that there was 4.20 in. in an hour, and 5.02 in 2½ hours. There was much flooding, and some damage. I think that the centre must have been near here. One man declares that he saw a waterspout within 100 yards of this house. In another part of the town two boys and a pony were killed by the L.—G. F. GOWER.

HEREFORD.

Bodenham, Leominster.—R between noon and 2.30 p.m. 1.61 in.—H. C. STURGES.

July 24th.

PERTH.

Coupar Angus Station.—Severe TS ; a house was struck by L and the chimney top demolished. R .49 in.

GALWAY.

Queen's College, Galway.—Great TS, with 1.21 in. of R.

July 26th.

HERTS.

The Lawns, Southgate.—In less than an hour-and-a-half, 2.50 in. of R fell in a TS ; the R commencing about 4.55 p.m. and lasting till about 6.20 p.m. A good sized oak tree about 3 ft. in circumference and about 40 yards from the house was struck by L and split from top to bottom, the bark being peeled completely off.—G. A. CHURCH.

SOME OLD STORMS.

1557.

“ In *Stow's Annals* is the following narration of a remarkable storm. . . ” “ On Sunday, 14th of August, 1557, between the hours of 9 and 10 o'clock in the forenoon, whilst the minister was

reading the second lesson in the parish church of Blythburg,* a town in Suffolk, a strange and terrible tempest of Lightning and Thunder struck through the wall of the same church into the ground, almost a yard deep; drove down all the people on that side of the church, above 20 persons; then renting the wall up to the Revestry, left the door, and returned to the steeple, rent the timber, brake the chains, and fled towards Bungay. The people that were stricken down were found grovelling more than half an hour after, whereof a man and a boy were found dead; the others were scorched."—*Suckling's Antiquities of Suffolk.*

1741, 1745.

The Rev. Laurence Sterne was Vicar of Sutton-on-the-Forest, eight miles north of York. The following entries in the parish register are signed by him:—

1741. Hail fell in the midst of summer as big as a Pidgeon's egg. W^{ch} unusual circumstance I thought fit to attest under my hand.—L. STERNE.

1745, May. A dismal storm of hail fell upon this Town, and some other adjacent ones wh^{ch} did considerable damage to the Windows and Corn. Many of the stones measured six inches in circumference. It broke almost all the south and west Windows of this House and my Vicarage House at Stillington [2 miles further N.]—L. STERNE.

WHIRLWINDS ON JUNE 30TH AND JULY 16TH.

HAY CARRIED AWAY AT NETHER PRIORS, HALSTEAD, N. ESSEX.

TRULY Essex is a wonderful county. Mr. Joseph Last, haybinder, of Halstead, sent information to the branch office of the *Essex County Chronicle* in that town on Wednesday, June 30th, respecting a whirlwind that took place in the hayfield at Nether Priors about noon. The writer stated that a large quantity of hay was taken up into the air and carried out of sight. Twelve men who were at work in the field watched the travelling of the hay in great amazement.

The next note shows where it fell, about three miles further North.

A SHOWER OF HAY AT BELCHAMP ST. PAUL, N. ESSEX.

About eleven o'clock on Wednesday morning a curious phenomenon was witnessed in this neighbourhood. For some minutes the atmosphere was laden with falling hay. Trees, shrubs, houses, all secured a fair portion of well-made meadow hay, which came down

* A village $4\frac{1}{2}$ miles S.E. of Halesworth.

in a very fantastic manner, some quite large bunches being among the single bents. It is supposed to be the effect of a whirlwind on a distant hay field.

A SHOWER OF FROGS IN BIRMINGHAM.

During a storm that raged with considerable fury in Birmingham on Wednesday morning, June 30th, a shower of frogs fell in the suburb of Moseley. They were found scattered about several gardens. Almost white in colour, they had evidently been absorbed in a small waterspout that was driven over Birmingham by the tempest.

WHIRLWIND NEAR HEREFORD.

The haymakers in Mr. Hewitt's meadow at Hampton Park, Friday, July 16th, shortly after noon, were somewhat startled to see a number of the "cocks" suddenly collected together and carried straight up in the air. The cause of this rather unusual scene was a whirlwind. The hay was, after its ærial flight, scattered in all directions, and some fell at a distance away of quite a hundred yards.

OBJECTIONS TO MOUNTAIN OBSERVATORIES.

AN American scientific paper argues that there are many objections to mountain stations. It says that the cost of building is very large. M. Vallot's Observatory on the flanks of Mont Blanc (14,321 feet) cost £15 a cubic meter. The cost of M. Janssen's small observatory building on the summit (15,781 feet) is said to have been £12,000. Again, such establishments are very expensive to maintain. Transportation to the summit of Mont Blanc costs about two shillings per pound, for example. There are difficulties in arranging for an adequate food and water supply (though melted snow is always available on the higher peaks). In the United States (owing to the deplorable policy in the matter of forest conservation) bush fires, which fill the air with haze, are very troublesome. On the highest peaks snow blindness is a constant danger. Mountain sickness (giddiness, nausea, great discomfort, and disorder) is almost always felt. The experiments of Mr. Whymper and others, in the high Andes and elsewhere, show that long residence at high levels may enable one to resist acute attacks of mountain sickness, but no amount of habitude, apparently, can counteract the "diminished living" which results from an insufficient supply of air for breathing. Observers at extreme altitudes must always be subjected to great discomfort, and their abilities must be correspondingly decreased. De Saussure, in his expedition to Mont Blanc, remarks that he required four-and-a-half hours on the mountain to perform experiments which took less than three hours in the valley. Here we have something like a numerical measure of the falling off in ability due to great altitude.—*Manchester City News*, Aug. 7th.

METEOROLOGY IN SCHOOLS.*

WEATHER forecasting has become a branch of study in many American schools, but especially in Boston. About 400 schools in New England now receive the daily weather maps from the U.S. Meteorological Bureau, showing the atmospheric conditions prevailing all over the country. These, as interpreted by the teachers, enable the pupils to comprehend the various factors which enter into the weather forecast. It is contended that this not only adds to an interest in natural phenomena, but is a practical introduction to scientific habits of observation. Of course, it involves instruction in the proper use of thermometers, barometers, and other instruments. Prizes for the best work in this branch of study have been offered in the New England lower schools.—*Tit-Bits*, Aug. 14th, 1897.

[Perhaps in the course of the next century even grown-up persons will have learned enough meteorology to know that it is better to get wet through in a thunderstorm, than to shelter under a tree. Even that does not seem to be generally taught yet.—ED. *M.M.*]

FLOODS IN SOUTHERN EUROPE.

DESCRIBING a perilous railway journey through the Austrian Tyrol after the rain had been falling continuously for four days, a correspondent writes:— Selecting the Innsbruck route, we reached Admont at ten in the morning, five hours late. Gangs of workmen accompanied the train, and were frequently employed removing landslips or repairing the lines, which in many places had been torn away by the raging torrent. At Admont I received the dismal news that we could proceed no further, and after waiting seven hours for instructions from headquarters, we learned that the train must return to Amstetten and proceed via Salzburg. All the passengers feared this retrograde journey, for the waters were still rising and the danger had manifestly increased. We had travelled a few miles only on the return road when our anticipations were realised, for a bridge, a structure of four or five arches, spanning the river and connecting a village near Hieflau, had been washed away since we had passed that morning. The scene in the corridor train itself was amusing and grotesque, for passages of many countries and different tongues were vehemently making themselves understood by frantic gesticulations. We proceeded at a slow pace for several miles, drenched workmen walking in front of the engine, examining the permanent way. One bridge collapsed immediately our train had crossed over it. As we approached Amstetten the state of things was everywhere deplorable. Houses had been washed away and whole villages submerged. It was harvesting time, but there was no harvest. Through tracts of the most charming and fertile country, hundreds of miles in extent, the crops are entirely gone. We steamed into Amstetten Station about eight o'clock on Friday night; so, after twenty-three hours' anxious travel, we had actually accomplished a distance ordinarily covered in two or three hours from Vienna. Bridges had collapsed on the Salzburg and Munich route. The Linz

* See *Met. Mag.*, xxxi., p. 151.

line was flooded and in places washed away. Communication with Vienna was cut off, a railway bridge, with a passenger train, having fallen into the river at St. Polten. So Amstetten had become a veritable place of refuge. Several trains by various routes had returned to this village of some 2,000 or 3,000 inhabitants. For a dismal picture I can recall nothing to equal the sights at this station. Outside it was still raining in torrents. The hotels were full to their utmost capacity. Hundreds of weary and disappointed passengers, of all nationalities, and many families with children, could get no accommodation. Fortunately, a Continental station, with its café and restaurant, is better equipped to deal with such an emergency than would be the case at a wayside station in England. Several benevolent residents did yeoman service in finding rooms and beds for the stranded travellers. Amstetten is a very hospitable place, and it is pleasant to record that this band of gentlemen, to their own credit and to the honour of their town, rendered such acceptable assistance. By far the larger number of wayfarers found shelter for the night in the railway carriages, which the company placed at their disposal. Telegraphic communication was interrupted, and the following day (Saturday) railway traffic was suspended. Newspapers were not obtainable. The only news had its source in the local telephone office. Vienna itself was reported in danger, for the Danube in the preceding twenty-four hours had risen 12 ft. and was still rising. Such a mighty flood had it become that two miles from the bed of the river people were on the roofs of their dwellings, appealing for help, and the fortunate ones being rescued in boats. What I have witnessed along the course of one tributary of the Danube, was taking place in every valley in the Austrian Tyrol, and in Saxony and Bohemia the Elbe and its tributaries were making similar havoc.—*Daily Telegraph*, August 11th.

With reference to the above we hope to give some statistics in our next number, for we hear from Dr. Hellmann that he is preparing an account of the tremendous rainfall in Silesia, Saxony, Bohemia, &c., at the end of July. Some of the stations seem to have had about *twelve inches in four days*.

The only station in the neighbourhood of which particulars are given in the *Daily Weather Report* is Munich, where the mean annual rainfall is about 35 inches ; the daily fall reported thence was—

	July 26th.	27th.	28th.	29th.	30th.	Total.
	in.	in.	in.	in.	in.	in.
Amount.....	0·35	1·22	0·47	0·75	1·42	4·21

REVIEWS.

The Story of the Earth's Atmosphere. By DOUGLAS ARCHIBALD, M.A., F.R.Met.Soc. London, 1897. Sm. 8vo.

ALTHOUGH the publishers (George Newnes, Limited) have not done us the honour of recognising our existence by sending us a copy of this work for review, we present them with one, because we think that our readers ought to know of this little book, which is very much better than either its title or its appearance suggests.

The author is one of the few who, while capable as mathematicians, will condescend, *and are able*, to convey to ordinary mortals the results arrived at by high class research. To all who wish to know the latest opinions as to why various atmospheric phenomena occur we strongly recommend this little book. In one respect it is, we think, unique—there are 208 pages by Douglas Archibald, and we have not seen a single mathematical expression; we do not think that there is even a + or a - in the whole book.

We have noticed very few slips; on page 38 probably Mr. Archibald is referring to something unknown to us, otherwise we think that "actinometer" should be "bolometer," and "Washington" should be "Mount Whitney." On page 134 he gives a new spelling of "Chirapunji;" it used to be Cherra Poonjee; in 1864 Keith Johnston, in *Index Geographicus*, gave Chirra Punji or Chirra Poonjee; then in 1882 Mr. J. Eliot spelled it Cherrapunji; in 1890 Mr. Blanford gave Cherra Poonjee.

Illustrative Cloud Forms for the guidance of observers in the classification of clouds. Issued by the Hydrographic Office, Washington, U.S.A.; oblong, text 7 in. x 4 in., 16 coloured plates, 1897.

WE are not sure that it is desirable that there should be several cloud atlases in existence concurrently; but, probably, administrative difficulties would be raised if in any country copies of the *International Cloud Atlas* were purchased sufficient in number to supply an entire navy. This, probably, is the reason for the appearance of the present artistic little volume.

The Hydrographer (Captain Sigsbee, U.S.N.) in an introductory note points out that the classification, nomenclature and descriptive text are from the *International Cloud Atlas*, but everything else is American. The excellent colour lithography has been done by Messrs. L. Prang and Co. of Boston, and their representative worked in consultation with Mr. Cronan, who painted the cloud pictures which have been reproduced. Mr. Cronan had the further advantage of working from the I.C.A., from a collection of photos and other representations, and with the advice of Mr. Lawrence Rotch, Capt. Sigsbee and Mr. H. H. Clayton.

The result is a very handy little book, which satisfactorily meets its presumed object; some of the plates (vii., x., xi. and xiii.) are

excellent We do not say that iii. is incorrect, but it seems to us to have too much of the horizontal element in it, and we think that Mr. Cronan has not, in the mamnato-cumulus, xiv., quite caught the idea of weight nearly breaking through a textile material (say, sand breaking through sacking) which is the characteristic of a perfect specimen of this cloud. Fig. 26 in the *International Cloud Atlas* is better in that respect, but it indicates rather too much separation— independence—between each mamma. Notwithstanding the extreme roughness of its execution, we think that the little woodcut in Dr. Clouston's *Explanation of the Popular Weather Prognostics of Scotland*, 1867, is more truthful and suggestive than either of its more costly successors.

THE INDEX TO THE "METEOROLOGICAL MAGAZINE."

WE see that it was in our number for March, 1896, that we promised to compile the above; but it was a heavy task, and it was only in July, 1897, that it was finished and the copies were completed, bound and sent to the subscribers.

As we anticipated, the subscription price of 2s. 6d. proved far too little; but as Mr. C. L. Brook (whose letter will be found on p. 24 of our last volume) has sent the very handsome contribution of £10 towards the cost, and, as we hope that a reasonable number of copies will be sold at the full price of 5s., we do not think that there will be any serious loss.

As stated in the Preface, we are greatly indebted to the Rev. T. A. Preston for his help; and, though the Index like most human things is not absolutely perfect, we are glad to hear from many quarters satisfactory assurances of its utility.

ERRATA IN "METEOROLOGICAL MAGAZINE," 1896.

REGULAR TABLES.

Waringstown	February.	Total rain	should be	1·46 in.	not	1·26 in.
Cargen [Dumfries].....	March.	„ „ „	„ „	4·65 „	„	4·56 „
Stroud, Upfield	April.	„ „ „	„ „	1·06 „	„	1·11 „
Omagh, Edenfel.....	„	„ „ „	„ „	2·42 „	„	2·52 „

SUPPLEMENTARY TABLES.

Rendlesham Hall	January.	Total rain	should be	1·30 in.	not	1·24 in.
Northampton, Sedgebrook	March.	„ „ „	„ „	2·79 „	„	2·70 „
Colchester. Lexden.....	„	„ „ „	„ „	2·80 „	„	2·77 „
Lough Swilly, Carrablagh	April.	„ „ „	„ „	2·93 „	„	2·87 „
Killybegs	August.	„ „ „	„ „	4·32 „	„	4·27 „
Lilliesleaf, Riddell	November.	„ „ „	„ „	1·04 „	„	1·14 „

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, FEBRUARY, 1897.

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	58°0	26	27°9	8	48·4	39·0	39·7	86	93·3	22·6	2·75	14	8·2
Malta.....	63·0	22a	43·2	19	60·8	50·8	48·5	75	136·5	...	·49	4	5·5
<i>Mauritius</i>	86·3	15	71·0	24	83·9	75·0	70·7	77	135·4	64·0	3·14	19	7·2
Calcutta.....	91·6	25	53·2	19	82·6	63·8	58·2	63	144·5	43·8	1·59	3	3·0
Bombay.....	83·6	17	63·3	28	81·4	68·1	63·8	69	131·5	51·8	·00	0	0·8
Ceylon, Colombo	90·4	13	70·8	5	88·6	75·0	72·3	78	146·0	68·8	1·68	11	4·7
<i>Melbourne</i>	95·6	18	48·9	22	74·3	57·3	55·3	72	143·0	39·5	2·97	13	6·0
<i>Adelaide</i>	107·3	10	52·9	26	86·3	64·5	53·7	48	163·9	42·5	1·80	8	5·1
<i>Sydney</i>	90·5	24	61·8	25	77·9	64·8	57·7	60	150·3	53·2	·46	7	3·7
<i>Wellington</i>	76·0	21	45·5	6	68·9	55·9	53·9	74	141·0	37·0	5·02	16	4·9
<i>Auckland</i>	82·0	2, 17	56·0	6	75·4	62·3	61·1	76	145·0	54·0	5·38	15	5·2
Jamaica, Kingston.....	92·3	26	65·8	14b	87·5	68·9	65·7	66	...	...	·00	0	2·5
Trinidad	90·0	5, 11	64·0	3, 4b	87·3	67·6	68·4	76	171·0	62·0	·75	11	...
Grenada.....	86·0	2	69·8	28	83·5	72·3	66·2	64	152·0	...	2·03	12	1·7
Toronto	44·0	17	1·0	26	30·8	18·2	21·2	81	58·2	-3·3	2·34	12	7·4
New Brunswick, Fredericton	42·9	7	-18·4	28	29·0	4·3	9·7	66	...	...	1·53	7	4·3
Manitoba, Winnipeg ...	32·2	4	-41·0	25	13·3	-11·4	...	...	...	...	·89	6	4·5
British Columbia, Esquimalt.....	50·6	26	28·2	21	45·4	35·5	37·3	89	...	...	3·63	19	8·1

a—and 23. b—and 15.

REMARKS.

MALTA.—Adopted mean temp. 55°·3, or 1°·5 above the average. Mean hourly velocity of wind 12·8 miles. TS on 9th. Mean temp. of sea 59°·1. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·6 above, of dew point 0°·7 above, and rainfall 3·84 in. below, their respective averages. Mean hourly velocity of wind 16·1 miles, or 4·6 above the average; extremes 29·3 on 22nd and 2·8 on 20th; prevailing direction E. by S. The driest February since 1876, excepting 1885, 2·16 in.; 1893, 2·42 in.; and 1895, 2·97 in. T and I on 20th. L on 27th. T. F. CLAXTON.

Adelaide.—Mean temp. 1°·7 above the average of 40 years; a very hot spell occurring from the 7th to the 18th, the temp. rising above 100° in the shade on 5 days, and over 90° on 10 consecutive days. C. TODD, F.R.S.

Sydney.—Mean temp. 0°·5 above, rainfall 4·91 in. below, and humidity 15 below, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Fine in the early part, with a few light showers; from 9th to 16th wet, the max. rainfall (1·50 in.) being recorded on 13th; from 16th to 22nd, fine with moderate winds, chiefly northerly; remainder of the month showery and dull. Temp. 0°·1 below, and R 1·48 in. above, their respective averages. Slight double earthquake, shock at 9·4 p.m. on 27th. R. B. GORE.

Auckland.—A wet and disagreeable month, the rainfall being nearly two inches above the average. Heavy gale from N.E. on 11th and 12th, and again on 27th and 28th. T. F. CHEESEMAN.

TRINIDAD.—Rainfall ·94 in. below the average of 30 years.

J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,
JULY, 1897.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	·61	XI.	Rhayader, Nantgwilt ...	3·15
II.	Dorking, Abinger Hall .	1·88	„	Lake Vyrnwy .....	...
„	Birchington, Thor	·51	„	Corwen, Rhug	1·30
„	Hailsham	·38	„	Criccieth, Talarvor	1·51
„	Ryde, Thornbrough	·75	„	I. of Man, Douglas	1·56
„	Emsworth, Redlands ...	·57	XII.	Stoneykirk, Ardwell Ho.	1·73
„	Alton, Ashdell	·87	„	New Galloway, Glenlee	2·46
III.	Oxford, Magdalen Col..	1·76	„	Moniavie, Maxwellton Ho.	2·15
„	Banbury, Bloxham	·52	„	Lilliesleaf, Riddell	2·47
„	Northampton, Sedgebrook	·30	XIII.	N. Esk Res. [Penicuick]	2·65
„	Duddington [Stamford].	·13	XIV.	Glasgow, Queen's Park..	2·22
„	Alconbury	·08	XV.	Inverary, Newtown	6·76
„	Wisbech, Bank House...	·60	„	Oban, The Corran	5·11
IV.	Southend	·82	„	Islay, Gruinart School ...	1·00
„	Harlow, Sheering.....	·75	XVI.	Dollar.....	1·73
„	Colchester, Lexden	·47	„	Balquhider, Stronvar...	3·71
„	Rendlesham Hall	·63	„	Ballinluig	1·06
„	Rushall Vicarage	1·22	„	Dalnaspidal H. R. S.....	2·98
„	Swaffham	·71	XVII.	Keith H. R. S.....	1·82
V.	Salisbury, Alderbury ...	·72	„	Forres H. R. S.	·72
„	Bishop's Cannings	1·30	XVIII.	Fearn, Lower Pitkerrie..	·55
„	Blandford, Whatcombe .	·39	„	N. Uist, Loch Maddy ...	3·69
„	Ashburton, Holne Vic...	1·44	„	Invergarry.....	1·24
„	Okehampton, Oaklands.	1·89	„	Aviemore H. R. S.	1·38
„	Hartland Abbey	2·49	„	Loch Ness, Drumnadrochit	2·22
„	Lynmouth, Glenthorne.	1·82	XIX.	Invershin	1·83
„	Probus, Lamellyn	2·38	„	Scourie .....	...
„	Wellington, The Avenue	1·33	„	Watten H. R. S.....	1·51
„	Wincanton.....	·69	XX.	Dunmanway, Coolkelure	2·58
VI.	Clifton, Pembroke Road	1·83	„	Cork, Wellesley Terrace	1·19
„	Ross, The Graig .....	...	„	Killarney, Woodlawn ...	2·26
„	Wem, Clive Vicarage ...	·61	„	Caher, Duneske	1·33
„	Cheadle, The Heath Ho.	·95	„	Ballingarry, Hazelfort...	2·51
„	Worcester, Diglis Lock	·54	„	Limerick, Kilcornan ...	2·02
„	Coventry, Priory Row ..	·25	„	Broadford, Hurdlestown	3·39
VII.	Grantham, Stainby	·38	„	Milton Malbay .....	...
„	Horncastle, Bucknall ...	1·26	XXI.	Gorey, Courtown House	1·69
„	Worksop, Hodsck Priory	·57	„	Athlone, Twyford	3·23
VIII.	Neston, Hinderton	·78	„	Mullingar, B-ivedere ...	2·57
„	Southport, Hesketh Park	1·27	„	Longford, Currygrane...	2·85
„	Broughton-in-Furness ...	2·56	XXII.	Woodlawn	2·46
IX.	Ripon, Mickley.....	1·03	„	Crossmolina, Enniscoe ..	3·73
„	Melmerby, Baldersby ...	1·29	„	Collooney, Markree Obs.	3·67
„	Scarborough, Observat'y	·58	„	Ballinamore, Lawderdale	3·34
„	Middleton, Mickleton ...	1·55	XXIII.	Warrenpoint.....	1·67
X.	Haltwhistle, Unthank...	1·91	„	Seaforde.....	1·33
„	Bamburgh	2·05	„	Belfast, Springfield	2·34
„	Keswick, The Bank	2·49	„	Bushmills, Dundarave..	2·33
XI.	Llanfrechfa Grange	2·21	„	Stewartstown	2·49
„	Llandovery	2·29	„	Killybegs	4·52
„	Castle Malgwyn	2·29	„	Lough Swilly, Carrablagh	2·82
„	Builth, Abergwesyn Vic.	3·33			

JULY, 1897.

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 Night below 32°. In shade. On grass.		
		Total Fall.	Differ- ence from average 1880-9.	Greatest Fall in 24 hours		Max.		Min.						
				Dpth	Date			Deg.	Date	Deg.	Date			
		inches.	inches.	in.										
I.	London (Camden Square) ...	·64	- 2·04	·38	19	8	83·6	24	44·0	8	0	0	0	0
II.	Tenterden	·75	- 1·60	·42	19	7	81·0	17	44·0	8	0	0	0	0
III.	Strathfieldsaye	1·67	...	·56	26	4	...	...	...	...	...	...	...	...
IV.	Hitchin	·80	- 1·92	·60	20	4	81·0	24 ^a	40·0	7	0	0	0	0
V.	Windsor (Addington)	1·53	- 1·76	·73	21	6	81·0	30	38·0	8	0	0	0	0
VI.	Bury St. Edmunds (Westley)	·73	- 1·84	·54	20	4	76·0	24	47·0	8	0	0	0	0
VII.	Norwich (Brundall)	·67	...	·21	24	7	85·0	24	42·1	8	0	0	0	0
VIII.	Weymouth (Langton Herring)	·41	- 1·74	·18	19	7	78·0	31	46·0	8	0	0	0	0
IX.	Torquay (Cary Green)	·88	...	·33	19	6	78·7	16	46·0	8	0	0	0	0
X.	Polapit Tamar [Launceston]	3·68	+ ·27	1·77	20	12	...	...	...	...	...	...	...	...
XI.	Stroud (Upfield)	2·91	- ·66	2·00	20	10	83·0	16 ^b	50·0	4	0	0	0	0
XII.	Church Stretton (Woolstaston)	·99	- 1·98	·45	25	8	80·5	16	44·5	7	0	0	0	0
XIII.	Tenbury (Orleton)	1·50	- 1·36	·50	19	10	86·5	16	37·7	8	0	1	0	1
XIV.	Leicester (Rotherby Hall)	·42	...	·13	25	6	80·0	23 ^c	35·0	8	0	0	0	0
XV.	Boston	1·78	- 1·01	·67	26	7	82·0	30	40·0	8	0	0	0	0
XVI.	Hesley Hall [Tickhill]	·52	- 2·15	·12	1	7	81·0	18 ^d	40·0	11	0	0	0	0
XVII.	Manchester (Plymouth Grove)	1·73	- 2·06	·60	26	12	83·0	18	45·0	6 ^f	0	0	0	0
XVIII.	Wetherby (Ribston Hall)	·46	- 2·72	·19	25	7	...	...	...	...	...	...	...	...
XIX.	Skipton (Arncliffe)	2·74	- 2·90	·62	7	13	...	...	...	...	...	...	...	...
XX.	Hull (Pearson Park)	·40	- 2·19	·22	25	7	80·0	23	40·0	11	0	0	0	0
XXI.	Newcastle (Town Moor)	1·39	- 2·13	·88	20	10	...	...	...	...	...	...	...	...
XXII.	Borrowdale (Seathwaite)	7·88	- 3·11	2·57	8	14	...	...	...	...	...	...	...	...
XXIII.	Cardiff (Ely)	1·41	- 2·65	·54	19	11	...	...	...	...	...	...	...	...
XXIV.	Haverfordwest	3·00	- 1·21	·83	19	14	81·0	16	41·0	8	0	0	0	0
XXV.	Aberystwith (Gogerddan)	2·88	...	1·15	18	11	84·0	15	37·0	10	0	0	0	0
XXVI.	Llandudno	·87	- 2·13	·21	8	7	76·5	31	47·6	11	0	0	0	0
XXVII.	Cargen [Dumfries]	1·60	- 2·33	·36	20	9	81·6	15	40·6	11	0	0	0	0
XXVIII.	Edinburgh (Blacket Place)	1·82	...	·71	20	10	81·0	15	43·8	8	0	0	0	0
XXIX.	Colmonell	1·89	...	·40	8	10	80·0	31	35·0	10	0	0	0	0
XXX.	Lochgilphead (Kilmory)	3·61	- ·69	·58	28	14	...	...	39·0	10	0	0	0	0
XXXI.	Mull (Quinish)	4·99	+ ·94	1·04	23	14	...	...	...	...	...	...	...	...
XXXII.	Loch Leven Sluices	1·80	- 1·82	·30	9	10	...	...	...	...	...	...	...	...
XXXIII.	Dundee (Eastern Necropolis)	2·25	- 1·21	1·60	24	10	82·1	15	41·9	8	0	0	0	0
XXXIV.	Braemar	1·76	- 1·45	·95	24	13	77·7	15	35·4	11	0	0	3	0
XXXV.	Aberdeen (Cranford)	1·74	...	·83	24	14	74·0	23 ^d	35·0	7	0	0	0	0
XXXVI.	Cawdor (Budgate)	1·04	- 2·26	·18	6, 27	13	...	...	...	...	...	...	...	...
XXXVII.	Strathconan [Beaul]	4·30	+ ·80	1·54	5	11	...	...	...	...	...	...	...	...
XXXVIII.	Glencarron Lodge	7·55	...	1·47	6	16	79·9	15	39·6	11	0	0	0	0
XXXIX.	Dunrobin	1·03	- 1·82	·28	25	9	77·8	15	41·0	8	0	0	0	0
XL.	S. Ronaldsay (Roeberry)	1·58	- ·78	·42	5	13	74·0	24	44·0	6, 7	0	0	0	0
XLI.	Darrynane Abbey	1·88	...	·42	24	18	...	...	...	...	...	...	...	...
XLII.	Waterford (Brook Lodge)	1·97	- 1·56	·82	19	16	77·0	16	39·5	8	0	0	0	0
XLIII.	O'Briensbridge (Ross)	3·39	...	·57	23	14	...	...	...	...	...	...	...	...
XLIV.	Carlow (Browne's Hill)	1·53	- 1·99	·39	19	12	...	...	...	...	...	...	...	...
XLV.	Dublin (Fitz William Square)	1·65	- 1·03	·29	26	12	75·1	23	46·1	11	0	0	0	0
XLVI.	Ballinasloe	2·47	- 1·08	·50	23	16	75·0	31	45·0	7	0	0	0	0
XLVII.	Clifden (Kylemore)	4·77	...	1·34	26	16	...	...	...	...	...	...	...	...
XLVIII.	Waringstown	1·37	- 2·15	·55	24	9	85·0	16	42·0	12	0	0	0	0
XLIX.	Londonderry (Creggan Res.)	2·19	- 1·93	·44	24	15	...	...	...	...	...	...	...	...
L.	Omagh (Edenfel)	3·59	- ·13	1·70	24	14	80·0	15	43·0	7	0	0	0	0

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

a—and 30. b—and 18. c—and 24, 30. d—and 24. e—and 12. f—and 7, 10.

METEOROLOGICAL NOTES ON JULY, 1897.

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

ENGLAND.

TENTERDEN.—A dry, hot month, grass very much burnt up, flowers and fruit also felt the effect of east winds and scorching sun, only on one day was the temp. in shade above 80°, against five in 1896. Duration of sunshine almost exactly the same, 249 hours. Other gauges in the district received much less R in the TS of 19th. Sharp TS on 21st. Slight TS on 27th. Fog on 17th and 23rd.

ADDINGTON.—A very fine month, grand weather for haymaking. From 28th June until 19th July, only one little shower fell. The storms on the 20th and 21st were very local. On the 20th, four miles S.E., hay was being carried all the time it rained here, and five miles W. there was just a sprinkling. The TS of the 21st was very sharp. In an adjoining parish some workmen had a narrow escape, a cow being killed under a tree a few yards from where they were standing; a sheep was also killed in Claydon parish. The night of the 5th was cold for July, the thermometer on the grass falling to 35°.

BURY ST. EDMUNDS, WESTLEY.—A very dry, hot month, with much sunshine. Wheat cutting began on the 26th. Barley much injured by want of rain. Heavy TS on 20th. TS on 21st; distant T on 22nd.

NORWICH, BRUNDALL.—Mean temp. 0°·8 lower than the previous July, and rainfall 2·22 in. below the average. T and L on 20th and 26th. T on 21st.

WEYMOUTH, LANGTON HERRING.—With the exception of July, 1885, when only ·25 in. of R fell, the driest July in 23 years. The mean temp at 9 a.m., 64°·8, is 2° above the average. The mean max., 71°·7, has been exceeded only once in 26 years, in 1878, when it was 72°·6. A very fine month; oats carried under favourable conditions. T on the 18th; fog on the 23rd.

TORQUAY, CARY GREEN.—Rainfall 1·85 in. below the average. Mean temp. 63°·0 or 1°·7 above the average. Duration of sunshine 246 hours 25 minutes, being 56 hours 25 minutes above the average; one sunless day.

POLAPIT TAMAR [LAUNCESTON].—A severe TS, with frequent vivid L, heavy T, and torrents of R shortly before 1 p.m. on the 20th. After 45 minutes ·84 in. was measured, and in all probability ·80 in. fell in 30 minutes. In 2 hours 20 minutes 1·29 in. had fallen, and at 8.30 p.m., or in 7 hrs. 30 min., a total of 1·62 in. was registered.

STROUD, UPFIELD.—TSS on 20th, 25th and 26th.

WOOLSTASTON.—Very hot and very dry, little R till the 24th and 25th, when there were repeated short violent storms. Mean temp. 61°·5.

TENBURY, ORLETON.—A very fine, hot month, with a large percentage of bright sunshine. The temp. rose above 70° on 21 days, and above 80° on 6 days. Very little T was heard, and no L seen during the month.

ROTHERBY HALL.—Though July was generally hot and dry, the rainfall here is still 1·60 in. in excess of that for the first seven months of 1896. On the 8th the thermometer on the grass fell to 32°, which is the lowest on record here for July. The mean shade temp. was 59°. T on 21st, 25th, and 26th.

BOSTON.—On the 21st a heavy thundershower occurred, the R being partial. In the town 1·36 in. was registered, others recorded 1·26 and 1·80, and at the Witham Grand Sluice 2·17 in. At Kirton, 4 miles away, no rain fell.

MANCHESTER, PLYMOUTH GROVE.—Unsettled up to the 9th, then fine, summer weather, from 10th to 22nd, and on 30th and 31st. T and L on 5th, TS on 25th. Mean temp. 61°·5.

SKIPTON, ARNCLIFFE.—A dry month.

WALES.

HAVERFORDWEST.—The magnificent weather of June was prolonged, with the exception of small falls of R on 6th and 7th, up to the 18th, and one of the

finest hay harvests known for many years was saved in grand weather. A sudden change took place on the 18th, and R came just in time to save green crops from the devastation of the fly, and the crops generally from failure owing to excessive high temp. and drought. Max. in sun, $132^{\circ}8$ on 16th. Fruit crops a total failure. Prevailing wind S.S.E., N.N.W. and S.E. The night temperatures were unusually high. On 19th and 20th, 1.66 in. of R fell in 36 hours.

ABERYSTWITH, GOGERDDAN.—A very hot, dry month, with a few TSS.

SCOTLAND.

CARGEN [DUMFRIES].—The climatic conditions of the month were the most favourable experienced for many years. Temp. and sunshine approximate very closely to the returns for the Jubilee year 1887, the mean temp. during the month ($60^{\circ}3$) of that year being $0^{\circ}4$ higher than that just recorded; no higher mean temp. for July has been recorded during the intervening years. It is worthy of remark, that in the "seventies" the mean temp. of this month exceeded 60° five times; in the "eighties" only once; while in the "nineties," so far, that figure has not yet been reached. The hours of sunshine are two more than recorded in 1887, and have only once (in 1878) been exceeded during the last 38 years. The rainfall for the month is the least recorded since 1878, and is about one-half of the average. Light easterly winds have been most prevalent. The weather was exceptionally favourable for farm work. Rye grass hay was secured in splendid condition, and good progress was made with an unusually heavy crop of meadow hay. Harvest will be about three weeks later than last year, and will not be general before the latter end of August; an abundant yield of both grain and straw is anticipated. T on 24th and 27th.

EDINBURGH, BLACKET PLACE.—The feature of the month was the very large amount of bright sunshine, 232 hours being recorded. Fog at night on 13th, TSS on 24th, and T on 25th.

COLMONELL.—R 1.74 in. less than, and mean temp. $2^{\circ}1$ above, the average of 21 years.

BRAEMAR.—An excellent, forward, growing month.

ABERDEEN, CRANFORD.—A heavy TS on the 24th.

S. RONALDSAY, ROEBERRY.—A fine month upon the whole, with the exception of two cold snaps. Mean temp. $55^{\circ}7$, or $1^{\circ}1$ above the average of seven years. A slight TS on morning of 25th.

IRELAND.

DARRYNANE ABBEY.—A foggy, misty month, very warm at the end. T between midnight and 1 a.m. on 24th.

WATERFORD, BROOK LODGE.—Broken weather, with spells of east wind and a good deal of fog at night. Heavy T on 20th.

O'BRIENSBRIDGE, ROSS.—Bright from 8th to 16th; close and sultry without sunshine for most part of the latter half. The last two days very warm.

DUBLIN, FITZ WILLIAM SQUARE.—A very favourable month, with sufficient R and of average temp. Mean temp. $61^{\circ}1$, or $0^{\circ}5$ above the average. Temp. reached or exceeded 70° in the screen on 7 days. In July, 1887, the temp. reached or exceeded 70° in the screen on no fewer than 17 days; while in 1888, the maximum for July was only $68^{\circ}7$. TS on the evening of the 21st. Solar halo on the 4th. H on the 6th and 26th. Foggy on the 16th, 21st and 31st.

WARINGSTOWN.—Splendid weather all the month; the best hay harvest remembered; all crops good.

EDENFEL.—After the abnormal and persistent R and unsettled weather of June, July has been somewhat in the nature of a pleasant surprise. After the first week a complete—and what has turned out a permanent—change for the better took place, and with considerable sunshine, warmth and but occasional torrential showers, all crops now afford the promise of great abundance.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXX.] SEPTEMBER, 1897. [PRICE FOURPENCE,
or 5s. per ann. post free.

The Hon. Ralph Abercromby,

1842-1897.

WE should have mentioned in an earlier number the loss which meteorology sustained by the death in Sydney, N.S.W., of Mr. Abercromby, but that the first news came only by telegraph, and we clung to the hope that it might not be true; but unhappily it is, and we shall no more hear the calm, clear voice, always gentle, always instructive.

It is impossible within ordinary limits to enumerate the works and papers issued by Mr. Abercromby between 1874 and 1894—there must be 50 or 60. Some of the important ones, "Weather," "Seas and Skies in many Latitudes," "Instructions for observing Clouds," and "Principles of Forecasting by means of Weather Charts," have been noticed in these pages. Had his physique been equal to his brain power, Abercromby would have taken quite an exceptional position, for, in spite of ill-health, he was a leader who turned out much, and valuable, work. Even when too ill to write himself, Mr. Abercromby manifested his lifelong interest in meteorology by offering prizes for meteorological essays, and by freely distributing copies of the papers which he enabled others to write.

Although he died in Australia, far from his relatives, it is a comfort to think that while fading away, he had the sympathy and care of a brother meteorologist, Mr. H. C. Russell, F.R.S., of Sydney Observatory.

FROMONDUS.

To the Editor of the Meteorological Magazine.

SIR,—I am obliged by your notice in the *Meteorological Magazine* of the article upon Fromondus, by M. l'Abbé Monchamp, which appeared recently in *Ciel et Terre*.

There is one passage in the article which you have not correctly translated. You say "Prof. Monchamp regards the record of the weather kept by Froimont in 1614 and 1625 as 'the earliest kept

in Belgium if not in the world.'” If M. Monchamp had used those words, I certainly should not have allowed them to appear, for every one familiar with meteorological work knows of Tyge Brahe’s *Meteorologiske Dagbog* and of Merle’s *MS*. M. Monchamp wrote, “*Trouverait on beaucoup de séries d’observations météorologiques antérieures à cette époque, même faites sans le secours d’instruments?*” This is very different from what you printed in the *Meteorological Magazine*, and far from suggesting that the author considered Fromont’s observations as the oldest known. (1)

With respect to the remark concerning the zodiacal light, it seems to me more plausible than to attribute the phenomenon to a bolide. But we must not forget that in ancient times exaggeration was frequent. (2)

I can add to your list of editions of Fromondus one more—Anvers, 1634—on the authority of the *Biographie Nationale*, published by the *Académie des Sciences*. (3)

Yours very truly,

A. LANCASTER.

Observatoire Royal de Belgique.

[No one likes to have made a mistake, but we really think that it was fortunate that we did, because it has elicited M. Lancaster’s letter and will perhaps bear further fruit. We have added numerals to the paragraphs of M. Lancaster’s letter, and employ the same in the following comments:—

- (1) Our fault; we overlooked the words which we have now printed in italics, “*beaucoup de*.” While upon this subject, we think it well to inquire, whether it would not be desirable to compile a list of journals of the weather prior to 1650, after which date they became common.
- (2) We cannot accept the idea of a zodiacal light strong enough to dim the midnight brightness of the moon. Our readers have now M. Lancaster’s opinion and our own, and there we must leave the matter. The passage in the original is—“*Et à fido teste nuper audivi, autumno anni 1625, ingentem trabis molem, intempestâ nocte, ab Occasu exortam, paullatimque ad cæli culmen evectam, Lunam clarissimè splendentem infuscasse.*”
- (3) We are very glad to add to the list of editions that mentioned by M. Lancaster. We had consulted his very valuable *Catalogue des ouvrages d’Astronomie, &c.*, but it is not mentioned there; perhaps there is now no copy in existence.

Mr. Prince, of Crowborough, has a copy of edition E, and points out that according to the signatures it is a 4to, and that therefore the entry under F is superfluous. We object to a page 5·4 in. by 3·2 in. being called a 4to; but as it is evident from the signatures that

it was printed in 8's, we suppose that the paper was *half sheets*. However that may have been, this is a capital illustration of the muddle as to sizes of which we complained on p. 102, and it could not have been cleared up had not Mr. Prince sent us the precise space on each page occupied by type.—Ed.]

BUYS-BALLOT.

WE do not often reprint what we have written, but it is seven years since the following note appeared, and we think that no stronger appeal could be made than by this brief narrative of facts.

Buy's=Ballot.

One by one, with saddening frequency, those whose names are known to Meteorologists of all countries are leaving us. On Sunday night, February 2nd, 1890, from his well-loved home at Utrecht, passed away the spirit which gave to the world the useful "Buys-Ballot's Law," by which the author will be remembered long after his many personal friends have themselves been removed. Prof. Buys-Ballot was often in this country; he was a corresponding member of the British Association, and attended its meetings, and he was one of the nineteen honorary members of the Royal Meteorological Society. He was 72 years of age, was an honorary member of the Society of Arts, of the German and of the Austrian Meteorological Societies, and Knight or Commander of Orders in Austria, Netherlands, Portugal and Prussia.

Besides discharging the duties of his Professorship from 1847 to 1887, Dr. Ballot was director, indeed almost creator, of the Royal Meteorological Institute of the Netherlands. In 1883 a new island, discovered by the Dutch Meteorological Expedition, in $70^{\circ} 25' 28''$ N., was named after him as Buys-Ballot's Island, and in 1887, on giving up his professional duties, a sort of International banquet was given in his honour, and he was presented with a gold medal specially struck to commemorate the event. Dr. Ballot's earliest scientific papers were upon chemistry and physics, but for forty years nearly all his time and thought has been devoted to meteorology, and his contributions have appeared not only in Dutch, but in German, French, and English.

The old buildings in which Buys-Ballot worked for 40 years have had to be pulled down. A new Royal Dutch Meteorological Institute has been erected at De Bilt, near Utrecht, and his countrymen, successors and co-labourers desire to place at it a monumental bust to his memory. Nearly all the leading meteorologists in both hemispheres have formed an international committee to co-operate with Buys-Ballot's own countrymen in raising the necessary funds, and we gladly comply with their request to lay the matter before our readers, and shall be happy to acknowledge and forward any donations which any of them may feel inclined to send. Our own personal view of the matter is that no very large sum is required, but that the greater the number of contributors, the more would it be evidence of the esteem in which the deceased was held.

CLIMATOLOGICAL RECORDS FOR THE BRITISH EMPIRE IN 1896.

It will, perhaps, be conducive to the convenience of our readers if we arrange our remarks on the annual summary of our monthly climatological tables under the various headings as set out, while it will not make them much more fragmentary than would be the case under any other arrangement.

Max. shade temp. Adelaide, as is the case in about three years out of four, recorded the highest shade temp., but the reading, though above the average, is not remarkable. The value of $104^{\circ}8$ at Malta appears to be unprecedented; the temp. having risen above 100° in only six out of thirteen years. At Calcutta, 1896 was apparently remarkably warm, as the mean temp. and the mean max. are the highest from 1877 onwards, while the absolute max. ($106^{\circ}8$) was exceeded only in 1895. On the other hand, the absolute min. ($45^{\circ}5$) is the lowest in any year of the same period.

Min. shade temp. and mean min. Greatest total range and greatest daily range. No other station has ever approached Winnipeg in these elements, but the 1896 values are normal, and call for no special comment.

Least total range and least daily range. Grenada, which records these two extremes, has only recently been added to the tables, but the values appear to be normal, and are very similar to those which in former years were obtained at Barbados.

Highest mean temp. Ceylon has every year yielded the highest mean temp., though the average of fifteen years at Bombay is less than a degree lower. The 1896 record of $81^{\circ}5$ has been exceeded only twice in seventeen years, namely, by $81^{\circ}9$ in 1878, and $81^{\circ}7$ in 1895.

Driest and dampest stations. Adelaide has for many years recorded the lowest relative humidity, and Esquimalt, since its inclusion in the tables in 1891, the opposite extreme. The 1896 records, 59 and 87 respectively, are not remarkable.

Max. in sun and min. on grass. These records are, perhaps, so much dependent on the instruments and their exposure, as to be incapable of strict comparison, but Trinidad always yields very high values. In the absence of a grass minimum at Winnipeg, Toronto has always given the lowest radiation temp.

Greatest and least rainfall. The variation in the amounts of rainfall at the stations included in our tables has always been less than the variation between different parts of England in an ordinary year, and the 1896 extremes are not unprecedented, though the Adelaide total (15.17 in.) is much below the average. The Mauritius fall of 68.17 in. is the greatest in any year from 1877 onwards, that, with a total of 60.36 in., being the only other year with more than 60 inches. Curiously, the number of rainy days is the smallest, with two exceptions, in the same period.

Most and least cloud. Esquimalt has for some years recorded the greatest amount of cloud, but does not show a great excess over London. Grenada, apparently, rivals Malta in the clearness of its skies, though some years back the latter station gave a yearly mean of 2·9. The average for the five years, 1884-88, is 3·4, while for the five years 1892-96, the average is 4·5. Is it possible that there has been a change of observer and also of personal equation ?

We received some time since from a gentleman (whose name we could not read, and therefore to whom we could not reply) a criticism of a reprint of one of these articles. The reprint implied that we stated some temperature to be the highest in the world (!) Of course, it is obvious that the extremes refer only to the 18 stations enumerated on p. 122.

SUMMARY.

<i>Highest temp. in shade</i>	111°·2 at Adelaide on January 23rd.
<i>Lowest</i> " "	-45°·2 at Winnipeg on January 4th.
<i>Greatest range in year</i>	135°·7 at Winnipeg.
<i>Least</i> " "	21°·2 at Grenada.
<i>Greatest mean daily range</i> ...	22°·5 at Winnipeg.
<i>Least</i> " " " " ..	9°·3 at Grenada.
<i>Highest mean temp.</i>	81°·5 at Colombo, Ceylon.
<i>Lowest</i> " "	33°·4 at Winnipeg.
<i>Driest station</i>	Adelaide, mean humidity 59.
<i>Dampest station</i>	Esquimalt, " " 87.
<i>Highest temp. in sun</i>	177°·0 Trinidad.
<i>Lowest temp. on grass</i>	-23°·5 at Toronto*.
<i>Greatest rainfall</i>	101·06 in. at Colombo, Ceylon.
<i>Least</i> " " ..	15·17 in. at Adelaide.
<i>Most cloudy station</i>	Esquimalt, average amount 6·9.
<i>Least</i> " " ..	Grenada, average amount 3·6.

* The min. on grass is not recorded at Winnipeg.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE FOR 1896.

STATIONS.	ABSOLUTE.				AVERAGE.				ABSOLUTE.		TOTAL RAIN.		AVER- AGE. Cloud.	
	Maximum.		Minimum.		Max.	Min.	Mean.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.		Days.
	Temp.	Date.	Temp.	Date.										
<i>Those in Italics are South of the Equator.</i>														
England, London	88·7	July 14	23·2	February 26	58·5	43·3	50·9	43·7	80	135·9	19·1	23·52	159	0-10
Malta	104·8	August 11	40·1	{ January 21 February 18 July 5	71·9	59·2	65·5	56·1	77	152·0	33·0	21·96	79	6·3
<i>Mauritius</i>	86·6	Dec. 19, 21	57·0	July 5	79·0	68·7	73·8	64·5	76	138·2	46·6	68·17	175	5·3
Calcutta	106·8	April 15	45·5	December 22	88·1	70·6	79·4	67·4	70	159·5	35·3	53·22	76	5·6
Bombay	95·0	October 29	63·2	December 31	86·7	76·0	81·4	72·5	75	143·7	51·9	87·65	102	4·1
Ceylon, Colombo	93·4	February 27	67·5	February 2	87·1	75·8	81·5	73·0	80	162·0	60·0	101·06	193	...
<i>Melbourne</i>	108·0	January 23	32·9	July 31	67·0	49·5	58·2	48·8	72	155·0	23·0	24·89	124	5·9
<i>Adelaide</i>	111·2	January 23	34·4	July 10	73·8	53·0	63·4	47·4	59	172·0	26·4	15·17	121	4·8
<i>Sydney</i>	108·5	January 13	39·8	July 2	69·6	56·6	63·1	56·5	76	160·9	27·9	42·42	157	4·7
<i>Wellington</i>	79·0	February 22	34·0	{ Aug. 5, 6, 10 October 1	61·5	49·5	55·5	46·6	73	141·0	21·0	57·54	179	4·5
<i>Auckland</i>	84·0	February 8	38·0	August 11	65·9	53·1	59·5	50·1	72	147·0	32·0	37·79	...	5·3
Jamaica, Kingston.....	93·9	July 13	62·7	January 15	87·8	71·9	79·9	69·1	72	...	...	19·01	81	5·0
Trinidad.....	94·0	{ May 19, 20 June 6	61·0	March 15	88·3	70·3	79·3	72·0	80	177·0	60·0	66·45	178	..
Grenada	88·4	October 19	67·2	November 30	82·9	73·6	78·3	70·4	76	161·8	...	99·94	243	3·6
Toronto	91·3	July 12	-17·2	February 17	54·1	36·8	45·4	38·7	75	107·0	-23·5	29·14	144	5·9
New Brunswick, } Fredericton.....	92·7	August 11	-20·0	February 18	50·2	29·0	39·6	32·3	69	...	...	39·17	128	5·2
Manitoba, Winnipeg, } British Columbia, } Esquimalt	90·5	July 1	-45·2	January 4	44·7	22·2	33·4	...	...	...	...	26·29	143	5·7
	86·4	June 26	16·7	November 27	55·3	41·4	48·4	43·6	87	...	...	46·47	157	6·9

HIGH TEMPERATURE ON THE NIGHT OF AUGUST 4TH.

To the Editor of the Meteorological Magazine.

SIR,—The minimum temperature as registered in my Stevenson screen on the night of Wednesday, August 4th [*i.e.*, the min. of August 5th.—ED.] was 65°. This is the highest minimum I have recorded during 11 years; the nearest approach to it being 63°·7 on July 1st, 1894. The maximum during the previous day had been 82°·8, with a strong S.E. wind. It came over partially cloudy during the evening, and about 7 o'clock there was a slight shower, yielding ·01 in.; notwithstanding this shower the temperature at 10 p.m. was 70°. The above readings are certainly very unusual in North Lancashire. The screen is situate about 74 ft. above sea level. The thermometers are by Negretti and Zambra, and have Kew certificates.

Yours faithfully,

SYDNEY WILSON.

Bruna Croft, Garstang, August 5th, 1897.

We confess to having a feeling of ignorance on the subject of high minimum temperatures, and, therefore, on receipt of the above referred to our own records. The minimum at Camden Square on the 5th was 59°·4, a value exceeded by 61°·1 on 6th, and by 60°·4 on 11th.

Looking back over the 40 years, 1858 to 1897, over which the record extends, we find no fewer than 85 instances of min. temp. of 60°, or upwards, in August, an average of rather more than two per annum, while the years in which the August minima were invariably below 60° are 1860, 1862, 1866, 1869, 1872, 1874, 1879, 1881, 1885, 1889, and 1894; in all eleven, or about one year in four. Taking now the highest record in 1897 (61°·1) we find 36 instances, or rather less than one per annum, in which it was exceeded, the most remarkable August being that of 1893, when for nine consecutive days the shade temp. did not fall below 60°.

Min. in shade August, 1893.

9th	60°·0	12th	63°·3	15th	64°·1
10th	63°·9	13th	60°·2	16th	63°·8
11th	61°·8	14th	61°·3	17th	63°·7

In six Augusts there were five or more days on which the temp. did not fall below 60°, namely :—

1868	5 days.	1876	5 days.	1884	6 days.
1875	6 „	1877	5 „	1893	9 „

On fifteen days in the 40 Augusts the min. did not fall below 63°, the records of 64°, or upwards, being :—

Aug. 18th, 1858	67°·0.	Aug. 18th, 1876	65°·8.
„ 7th. 1868	64°·0.	„ 18th, 1893	64°·1

From this it is obvious that the Camden Square minima on August 5th and 6th, 1897, were in no way remarkable, but it must not be for-

gotten (I.) that the reading at Garstang was nearly 4° higher, and (II.) that what is an average reading at London may be a very exceptional one in North Lancashire.

The following table, extracted from the Daily Weather Reports, shows clearly that the nights of August 5th and 6th were very warm over the whole of England, and that the 5th was the warmer. The reading at Liverpool, the nearest station to Garstang, on 6th (64°) is very accordant with the 65° at Bruna Croft, and proves the accuracy of Mr. Wilson's instruments and observations.

The temperatures for the warmer night are given in Roman, for the cooler in italic, type.

Minimum Temperatures in England and Wales, August 5th & 6th, 1897.

	5th.	6th.		5th.	6th.
North Shields	59	<i>58</i>	Oxford	<i>57</i>	<i>59</i>
York	<i>59</i>	60	London, Brixton.....	62	<i>61</i>
Spurn Head	61	61	North Foreland	<i>64</i>	<i>66</i>
Liverpool, Bidston	64	<i>59</i>	Dungeness	63	<i>60</i>
Holyhead	61	<i>59</i>	Hurst Castle	67	<i>64</i>
Loughborough	59	<i>58</i>	Prawle Point	60	<i>60</i>
Yarmouth	62	62		---	---
Cambridge	58	58	Mean.....	61.1	60.3
Pembroke, St. Ann's Head..	60	60			

NOTES OF DAMAGE BY RAIN AND THUNDERSTORMS, EXTRACTED FROM THE NEWSPAPER PRESS.

MONDAY, AUGUST 2ND.

Aberdeenshire.—Severe H storm, doing damage in the parishes of Premnay, Leslie, Keig, Tullynessle and Forbes, comparable to that of the storm in Essex on June 24th, the damage being estimated at more than £2,000. Almost every window facing N. or W. was broken.

THURSDAY, AUGUST 5TH.

Herts.—At Tring Agricultural Society's Show a young man and woman sheltering under a tree were killed by L.

Royston.—Cellars were flooded and poultry drowned, and H stones fell, breaking glass in greenhouses.

Northamptonshire.—The thatched roof of Horspool Farm, Draughton, was fired by L, and the building was destroyed all but the walls.

At Raunds a tree was struck, and at Hargrave trees were struck and a cow was killed.

Hayricks were ignited at Draughton, and heavy H fell.

Huntingdon.—A labourer working in a field at Godmanchester had his left arm struck by L, and had to be removed in a cart.

Rutland.—L struck a house in Braunston Road, Oakham, passed down a chimney, and moved the fire-grate to the centre of the room.

Leicestershire.—At Market Harborough the basements of several houses were flooded.

Derbyshire.—Fletcher's Lace Factory, Osmaston Road, Derby, was struck by L, and the roof much damaged.

Lancashire.—At Liverpool H as large as marbles fell, and at Herculaneum graving dock a man was killed.

St. Helen's.—In 45 minutes 2·28 in. of R fell.

Ramsbottom, near Bury.—A young man named Booth was struck and killed.

Large H fell at Heywood, and a farm house and dwelling were struck by L. A telegraph pole also was struck, and a passing horse bolted, the two occupants of the carriage being thrown out and injured.

Rochdale.—Many buildings flooded, and much damage at Horse Carrs Mills, Shawclough.

At Ashworth a farmer was injured, and at Whitworth a quarryman was killed.

Pennycook, near Blackburn.—A farmer of Leyland was found dead in the road, having been struck by L while driving a trap.

At Chatburn a farmer was struck while in a field and killed instantly. A barn in the same neighbourhood was fired.

SUNDAY, AUGUST 8TH.

Norfolk, Lynn.—A tremendous, and most acceptable, downpour of rain occurred, falling in torrents for two hours in the afternoon, and houses in some parts of the town, especially in the neighbourhood of Windsor Road and Lower Canada, became flooded, some of them to a depth of two feet, in consequence of the sewers being unable to carry off the surplus waters. The tide in the river Ouse, into which the sewers discharge, was high at the time, and consequently the outlets were blocked, hence the mischief.

The rain gauge at the Manure works in Wisbeach Road, recorded 3·48 in. between 9 a.m. on Saturday and 9 a.m. on Monday.

Worcestershire.—At the Waterworks, Worcester, 1·46 in. of R fell, and the cellars of several houses in the low lying parts of the city were flooded.

Droitwich.—A heavy downpour of rain commenced at 8.30 a.m., and continued without intermission till mid-day. High Street was flooded for a length of 50 yards, and many persons had to take refuge in the upper floors of their dwellings. The steam fire engine was employed from 1.30 p.m. to 7.30 p.m., pumping the water from the roadway.

A portion of the embankment of the L. & N.W.R. between Spon Lane and Smethwick was washed away. The G.W.R. at West Bromwich was flooded, the water being three feet deep between the Trinity Road and Spon Lane bridges.

WEDNESDAY, AUGUST 11TH.

Dumfriesshire.—A shepherd was killed by L between Holmshaw and Earls-haugh, in Upper Annandale.

Edinburgh.—About midday, an electric lamp was struck by L at North Bridge, Edinburgh.

Lanark.—Between 4 p.m. and 5 p.m. a house in Barrfield Terrace, Uddingston, was struck, and a tree had its bark stripped off.

Ayrshire.—At Bogside, near Ayr, a brood mare was killed, the tail and hind quarters being scorched.

Saltcoats.—In Quay Street, at the Braes, in Green Street and Vernon Street, houses were flooded.

Dumbartonshire.—The cutting at Dalmuir on the North British Railway, was flooded, and traffic had to be stopped. All the low lying lands were flooded, and much damage was done to the crops. At Dumbarton East Station the water inundated the booking office, and at Burnside and in Bruce Street several houses were flooded.

Vale of Leven.—L struck a gas pipe at Renton Church, ignited the gas and set fire to the flooring.

Stirlingshire.—Water ran down the streets from the higher parts of Stirling like so many streams. At the foot of King Street serious flooding took place.

Kinrossshire.—Three cows were killed at Goudierannet, and twenty sheep at Thomanean. Three ricks were fired in the county. The rain was mixed with H and large pieces of ice, and much damage was done by flooding. Kinross High Street was covered in parts to a depth of several feet, and houses were flooded.

Fife.—Dunfermline. Great darkness, some H and torrents of R for half an hour. At the junction of Bridge Street and Chalmers Street the sewer was unable to carry off the water, which found its way into cellars and shops. At Low Beveridgewell a culvert burst, flooding Harriebrae Mills. At Pilmuir Street houses were flooded to a depth of two feet. At Townhill a house and several trees were struck by L.

Perth.—A cow was killed at Kippenross Park, Dunblane; a tree was struck and telephone wires were broken.

SUNDAY, AUGUST 15TH.

Banff.—The house 30, Market Street, Macduff, was struck by L, the current passed down a vent, and the grate was torn out and dashed six feet across the room.

TUESDAY, AUGUST 17TH.

Selkirk.—In the Yarrow valley and St. Mary's Loch district the rainstorm was exceptionally heavy. The hill burns in the valley and in Moffatdale came down like cataracts, and between St. Mary's Loch and Moffat the coaches had to traverse stretches of water, at some places three feet deep. The Yarrow and Ettrick were in heavy flood, and a bridge over Summerhope Burn, near Rodono Cottage, was swept away, rendering the road to Tibbie Shiel's impassable. Flooding took place at Chapelhope farm, and the road between this place and Oxcleuch was blocked, the burn bringing down with it tons of gravel and refuse. A bridge near the Grey Mare's Tail is also reported to have been swept away. In Moffat district about four o'clock there was an abnormal downpour, which resembled the bursting of a waterspout, and which lasted about twenty minutes. The river Annan rose rapidly, submerging holms below the town, and at the bridge near the railway station the volume of water filled the arch, and fears were entertained for the safety of the structure.

WEDNESDAY, AUGUST 18TH.

Bucks.—A bullock grazing in a field at Taplow was struck by L.

Warwick.—A chimney at 52, Darwin Street, Birmingham, was struck and fell through the roof, causing considerable injury. A building on Alcester Road, also was struck.

Glamorgan.—At Gendros, near Cockett, Swansea, five persons were assembled in a house, when it was struck by L; they were all thrown to the ground, a young woman had her face scorched, and a youth was burnt about the body.

THURSDAY, AUGUST 19TH.

Essex.—At Great Braxted, near Witham, a man named Crisp, was ploughing with two horses, when both man and team were struck dead by the L.

Kent.—Two cottages at Borden were struck by L and burnt down, and the inmates had to escape in their nightclothes. At Sittingbourne three houses were wrecked by L, and at Murston a barn was destroyed and a horse killed.

The steam trawler *Strathisla*, off Wick, had the foremast repeatedly struck by L, and splintered in several places. One compass was rendered useless and the other seriously affected. The mate was stunned by the L.

ELECTRICAL MANIFESTATIONS (?)

The following letter, extracted from the *English Mechanic* of August 20th, 1897, which differs in several particulars from the usual descriptions of ball lightning, at once recalled to our memory a very similar phenomenon, described by Mr. H. S. Eaton, at the meeting of the Royal Meteorological Society, on June 15th, 1887, of which we append an abstract. Other accounts of somewhat similar phenomena will be found in the *Quar. Jour. Roy. Met. Soc.*, XIII. (1887), p. 306.

Lightning Phenomena.—[40200.]—A few days since we had a very heavy thunderstorm. Immediately following one of the earliest flashes of lightning three people in my house saw, at the distance apparently of some 400 yards, a number of globes of fire (about twenty or so) rolling down a precipitous scar on the other side of this valley. These balls or globes appeared to follow each other at very brief intervals; probably several seconds passed from the first to last. Ball lightning has been observed about here during severe storms from time to time, though seldom: but I have never witnessed during a long sojourn, nor do I hear of anyone having seen before, anything at all approaching the phenomenon described. I shall be glad if any of your readers can explain, or to hear if anyone has seen a similar thing.

Aug. 14.

C. F. R.

Note on a Display of Globular Lightning at Ringstead Bay, Dorset, on August 17th, 1876. By Mr. H. S. EATON, M. A., F.R. Met. Soc. Between 4 and 5 p.m. two ladies who were out on the cliff, saw, surrounding them on all sides, and extending from a few inches above the surface to two or three feet overhead, numerous globes of light, the size of billiard balls, which were moving independently and vertically up and down, sometimes within a few inches of the observers, but always eluding the grasp; now gliding slowly upwards two or three feet, and as slowly falling again, resembling in their movements soap bubbles floating in the air. The balls were all aglow, but not dazzling, with a soft, superb iridescence, rich and warm of hue, and each of variable tints, their charming colours heightening the extreme beauty of the scene. The subdued magnificence of this fascinating spectacle is described as baffling description. Their numbers were continually fluctuating; at times thousands of them enveloped the observers, and a few minutes afterwards the numbers would dwindle to perhaps as few as twenty, but soon they would be swarming again, as numerous as ever. Not the slightest noise accompanied the display.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MARCH, 1897.

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	61·7	23	26·8	30	52·3	39·2	39·6	81	101·9	20·5	3·42	17	6·6
Malta.....	79·2	29	44·1	9	64·1	51·5	49·3	79	155·2	41·0	·75	7	4·5
<i>Mauritius</i>	86·0	5, 8	66·1	17	83·9	72·3	67·9	74	135·0	59·6	·88	10	6·0
Calcutta.....	98·9	10	63·9	13	89·9	70·6	64·2	61	154·0	56·9	1·37	3	2·9
Bombay.....	86·0	28	66·1	1	84·3	71·2	68·2	73	135·5	58·1	·00	0	1·0
Ceylon, Colombo.....	93·2	2	73·6	15	90·0	76·5	73·3	76	147·0	68·0	3·66	13	3·2
<i>Melbourne</i>	89·6	13	38·9	20	69·9	51·2	48·8	67	139·9	28·9	1·49	10	6·3
<i>Adelaide</i>	95·5	28	47·9	25	76·8	57·8	50·1	56	156·8	36·7	·58	10	5·8
<i>Sydney</i>	92·9	14	51·8	11	74·6	61·0	57·6	72	145·3	44·8	3·34	17	4·3
<i>Wellington</i>	75·5	15	41·7	31	66·2	53·5	49·4	69	133·0	33·0	2·06	16	4·5
<i>Auckland</i>	79·0	20	49·0	27	71·4	57·0	55·1	72	145·0	45·0	3·29	12	4·8
Jamaica, Kingston.....	91·3	17	65·1	12	86·4	69·6	66·5	70	...	...	·13	1	3·3
Trinidad.....	89·0	10a	64·0	23	86·7	68·8	75·2	77	164·0	63·0	3·96	13	...
Grenada.....	89·8	28	70·0	2	86·3	72·8	77·7	75	155·0	...	6·04	15	5·8
Toronto.....	53·0	30	1·8	1	38·5	24·6	25·7	74	71·0	—2·2	2·97	15	6·0
New Brunswick, Fredericton.....	46·9	31	—14·3	1	34·3	15·4	18·8	63	...	...	4·53	17	6·1
Manitoba, Winnipeg.....	51·9	31	—33·7	15	23·8	—1·5	...	...	...	...	1·58	9	...
British Columbia, Esquimalt.....	53·1	25	27·7	10	44·5	32·5	34·0	86	...	...	4·64	20	7·2

a—and 16, 21.

REMARKS.

MALTA.—Adopted mean temp. 56°·6, or 0°·9 above the average. Mean hourly velocity of wind 11·8 miles. TS on 8th. L on 4 days. Average temp. of sea 60°·8.

J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·1, of dew point 1°·9, and rainfall 7·28 in. below, their respective averages. Mean hourly velocity of wind 10·1 miles, or 0·1 above the average; extremes 23·1 on 22nd and 1·8 on 11th; prevailing direction E.S.E. T on 2nd, L on 3rd, and T and L on 4th. Rainfall ·88 in., against an average for 23 years of 8·16 in., being the least in March during the period 1875-97. T. F. CLAXTON.

CEYLON, COLOMBO.—TSS occurred on the 27th, 29th, and 30th. L was seen on 8 days.

H. O'HARNARD.

Adelaide.—Mean temp. 3°·2 below the average for 40 years. The coldest March, with one exception (1885), in the 40 years. Rainfall ·50 in. below average.

C. TODD, F.R.S.

Sydney.—Temp. 1°·5 below, rainfall 2·04 in. below, and humidity 4·5 below, their respective averages. Severe drought over fully half of New South Wales, the other part having good rains.

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

Wellington.—Up to the 20th generally fine with occasional showers, wind chiefly S.E. and N.W.; the latter part of the month showery. Five days of strong N.W. wind. Slight earthquake on 20th. Temp. 2°·3 below, and R 1·48 in. below, their respective averages.

R. B. GORE.

Auckland.—Rather wet and stormy during most of the month. The rainfall being almost an inch above the average. Mean temp. close to the average; barometric pressure much below.

T. F. CHEESEMAN.

JAMAICA, KINGSTON.—The rainfall throughout the Island gives a better result than the two preceding months, being about two-thirds of the average.

J. F. BRENNAN.

TRINIDAD.—Rainfall 2·09 in. above the average of 30 years.

J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,
AUGUST, 1897.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	2·34	XI.	Rhayader, Nantgwillt ...	6·04
II.	Dorking, Abinger Hall .	3·81	„	Lake Vyrnwy	6·29
„	Birchington, Thor	2·27	„	Corwen, Rhug	3·97
„	Hailsham	3·94	„	Criccieth, Talarvor	4·46
„	Ryde, Thornbrough	4·22	„	I. of Man, Douglas	3·90
„	Emsworth, Redlands ...	4·19	XII.	Stoneykirk, Ardwell Ho.	5·52
„	Alton, Ashdell	4·43	„	New Galloway, Glenlee	7·89
III.	Oxford, Magdalen Col..	3·55	„	Moniavie, Maxwelton Ho.	7·22
„	Banbury, Bloxham	3·93	„	Lilliesleaf, Riddell	3·95
„	Northampton, Sedgebrook	4·79	XIII.	N. Esk Res. [Penicuick]	4·05
„	Duddington [Stamford].	3·00	XIV.	Glasgow, Queen's Park..	5·51
„	Alconbury	2·92	XV.	Inverary, Newtown	8·14
„	Wisbech, Bank House...	3·07	„	Oban, The Corran .....	...
IV.	Southend	2·25	„	Islay, Gruinart School ...	2·63
„	Harlow, Sheering	3·98	XVI.	Dollar	6·17
„	Colchester, Lexden	2·04	„	Balquhider, Stronvar...	11·93
„	Rendlesham Hall	1·95	„	Ballinluig	6·55
„	Rushall Vicarage	3·17	„	Dalnaspidal H.R.S.	9·56
„	Swaffham	3·12	XVII.	Keith H.R.S.	3·45
V.	Salisbury, Alderbury ...	2·74	„	Forres H.R.S.	2·49
„	Bishop's Cannings	4·82	XVIII.	Fearn, Lower Pitkerrie..	2·16
„	Blandford, Whatcombe .	3·50	„	N. Uist, Loch Maddy ...	3·95
„	Ashburton, Holne Vic...	7·83	„	Invergarry	3·43
„	Okehampton, Oaklands..	7·37	„	Aviemore H.R.S.	3·03
„	Hartland Abbey	5·00	„	Loch Ness, Drumnadrochit	2·82
„	Lynmouth, Glenthorne.	4·88	XIX.	Invershin	1·84
„	Probus, Lamellyn	4·09	„	Scourie .....	...
„	Wellington, The Avenue	4·18	„	Watten H.R.S.	2·63
„	Wincanton	4·71	XX.	Dunmanway, Coolkelure	9·32
VI.	Clifton, Pembroke Road	6·37	„	Cork, Wellesley Terrace	4·33
„	Ross, The Graig	3·92	„	Killarney, Woodlawn ...	7·95
„	Wem, Clive Vicarage ...	3·08	„	Caher, Duneske	5·10
„	Cheadle, The Heath Ho.	4·52	„	Ballingarry, Hazelfort...	4·63
„	Worcester, Diglis Lock	4·55	„	Limerick, Kilcornan ...	4·51
„	Coventry, Priory Row ..	3·97	„	Broadford, Hurdlestown	5·84
VII.	Grantham, Stainby	3·72	„	Miltown Malbay	7·05
„	Horncastle, Bucknall ...	3·34	XXI.	Gorey, Courtown House	4·99
„	Worksop, Hodsck Priory	2·16	„	Athlone, Twyford	5·55
VIII.	Neston, Hinderton	2·80	„	Mullingar, B-Ivedere ...	6·51
„	Southport, Hesketh Park	3·26	„	Longford, Currygrane...	5·72
„	Broughton-in-Furness ...	7·09	XXII.	Woodlawn	7·08
IX.	Ripon, Mickley.....	3·31	„	Crossmolina, Enniscoe ..	7·30
„	Melmerby, Baldersby ...	...	„	Collooney, Markree Obs.	6·23
„	Scarborough, Observat'y	3·58	„	Ballanamore, Lawderdale	6·74
„	Middleton, Mickleton ...	4·43	XXIII.	Warrenpoint	5·66
X.	Haltwhistle, Unthank...	3·82	„	Seaforde	4·64
„	Bamburgh	2·27	„	Belfast, Springfield	5·44
„	Keswick, The Bank	8·92	„	Bushmills, Dunlarave..	4·73
XI.	Llanfrechfa Grange	8·22	„	Stewartstown	5·15
„	Llandoverly	6·80	„	Killybegs	6·87
„	Castle Malgwyn	4·59	„	Lough Swilly, Carrablagh	4·11
„	Builth, Abergwesyn Vic.	7·57			

AUGUST, 1897.

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) ...	2.92	+ 1.04	.76	8	16	88.4	5	48.1	13	0	0
II.	Tenterden	3.23	+ 1.37	.62	26	18	85.0	4	50.0	12c	0	0
III.	Strathfieldsaye	3.54	...	.75	31	17	...	...	...	...	...	...
III.	Hitchin	2.07	+ .25	.39	30	15	85.0	4, 5	47.0	12	0	...
IV.	Winslow (Addington)	5.68	+ 3.71	1.04	24	21	87.0	4, 5	47.0	13	0	0
IV.	Bury St. Edmunds (Westley)	4.76	+ 2.56	1.88	25	16	79.0	5	49.0	26	0	...
V.	Norwich (Brundall)	1.27	...	.27	8	15	84.0	4	46.0	26	0	0
V.	Weymouth (Langton Herring) .....	...	...	...	...	...	...	...	...	...	...	...
"	Torquay (Cary Green)	3.31	...	.54	30	20	72.1	5	49.5	27	0	0
VI.	Polapit Tamar [Launceston] ..	5.85	+ 3.37	.90	30	26	79.7	3	46.8	27	0	0
VI.	Stroud (Upfield)	5.59	+ 3.50	.98	30	24	85.0	4	51.0	28	0	...
"	Church Stretton (Woolstaston) ..	3.32	+ .56	.42	7, 18	20	82.0	4	46.0	27	0	0
"	Tenbury (Orleton) .....	...	...	...	...	...	...	...	...	...	...	...
VII.	Leicester (Rotherby Hall) ...	3.34	...	.77	30	21	88.0	5	42.0	3d	0	0
"	Boston	2.27	+ .15	.80	8	15	90.0	4	42.0	26	0	...
"	Hesley Hall [Tickhill]	2.43	+ .27	.65	30	18	90.0	5	43.0	3	0	...
VIII.	Manchester (Plymouth Grove) ..	4.04	+ .95	.90	6	23	89.0	4	42.0	29	0	...
IX.	Wetherby (Ribston Hall) ...	3.52	+ 1.18	.71	24	19	...	...	...	...	...	...
"	Skipton (Arncliffe)	8.78	+ 4.45	2.75	5	22	...	...	...	...	...	...
"	Hull (Pearson Park)	2.79	+ .15	.87	26	15	81.0	5	45.0	3	0	...
X.	Newcastle (Town Moor)	2.87	+ .16	.62	24	17	...	...	...	...	...	...
X.	Borrowdale (Seathwaite)	17.38	+ 8.93	2.42	13	24	...	...	...	...	...	...
XI.	Cardiff (Ely)	7.97	+ 4.36	1.17	30	21	...	...	...	...	...	...
"	Haverfordwest	6.15	+ 2.97	.64	23	22	80.8	3	44.0	27	0	0
"	Aberystwith (Gogerddan)	3.82	...	.44	7	21	86.0	3	38.0	9e	0	...
"	Llandudno	3.03	+ .67	.70	10	21	85.0	3	51.2	29	0	...
XII.	Cargen [Dumfries]	5.66	+ 2.67	.68	29	21	82.0	3, 4	42.0	19	0	...
XIII.	Edinburgh (Blacket Place) ...	4.24	...	.99	4	19	78.1	21	48.6	19	0	0
XIV.	Colmonell	6.21	...	1.10	29	21	87.0	3	44.0	18	0	...
XV.	Lochgilthead (Kilmory)	5.51	+ .95	.62	29	20	...	...	47.0	9f	0	...
"	Mull (Quinish)	4.12	...	.62	16	21	...	...	...	...	...	...
XVI.	Loch Leven Sluices	4.60	+ 1.66	1.00	12	14	...	...	...	...	...	...
XVI.	Dundee (Eastern Necropolis) ..	3.25	+ .68	.45	13	22	79.6	7	43.8	19	0	...
XVII.	Braemar	5.06	+ 1.73	.66	28	25	76.3	1	37.2	19	0	3
"	Aberdeen (Cranford)	3.07	...	.83	11	20	74.0	4	43.0	21g	0	...
"	Cawdor (Budgate)	2.43	+ .18	.55	11	18	...	...	...	...	...	...
XVIII.	Strathconan [Beaul]	2.98	...	.54	14	11	...	...	...	...	...	...
"	Glencarron Lodge	5.15	...	.72	17 ^a	21	78.0	5	41.0	22	0	...
XIX.	Dunrobin	2.57	+ .17	.44	11	15	68.0	2, 5	44.0	23	0	...
"	S. Ronaldsay (Roeberry)	2.32	...	.58	11	17	70.0	4	47.0	22h	0	...
XX.	Darrynane Abbey	5.73	...	.60	29	27	...	...	...	...	...	...
"	Waterford (Brook Lodge)	5.45	+ 2.03	.76	23	23	79.0	2	43.0	20	0	...
"	O'Briensbridge (Ross)	5.56	...	.62	7	25	...	...	...	...	...	...
XXI.	Carlow (Browne's Hill)	5.74	+ 2.77	.77	20	22	...	...	...	...	...	...
"	Dublin (Fitz William Square) ..	3.79	+ 1.27	.90	7	23	76.8	4	49.2	19	0	0
XXII.	Ballinasloe	7.00	+ 3.82	1.13	29	24	74.0	2, 3	48.0	23	0	...
"	Cliffden (Kylemore)	14.46	...	1.90	30	25	...	...	...	...	...	...
XXIII.	Waringstown	4.79	+ 1.68	.98	29	18	82.0	1	40.0	10	0	...
"	Londonderry (Creggan Res.) ..	4.15	+ .03	.49	10	25	...	...	...	...	...	...
"	Omagh (Edenfel)	6.11	+ 2.62	1.10	10b	21	78.0	1	45.0	9	0	...

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

a—and 20. b—and 29. c—and 13, 16, 26. d—and 26, 29. e—and 22, 24. f—and 18, 21, 26. g—and 31. h—and 23.

METEOROLOGICAL NOTES ON AUGUST, 1897.

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

ENGLAND.

TENTERDEN.—Hot and dry at first, showers in third week were helpful to grass and hops, but prevented completion of harvest, which was still further delayed by heavier rains towards the end of the month. Sunshine 225 hours 40 mins., or more than 50 per cent. above last year. Mean max. temp. 2° higher, and min., both in screen and on grass, 5° higher. Min. on 5th 63°. TS on 8th from 4 to 5 p.m., and on 19th, 3 to 4 a.m. TSS around on 25th, sharp at 1 to 1.30 p.m.

ADDINGTON.—The greatest August rainfall during the last 27 years. The month began with a high max. temp., lasting until the 5th, on which day a heavy TS passed over us; a fine young cedar of Lebanon on the lawn and close to the Manor was split by L from top to bottom. The remainder of the month was very unsettled. On the 30th, at 5 p.m., a heavy downpour of rain gave 20 in. in ten minutes. Dense fog on the morning of the 25th.

BURY ST. EDMUNDS, WESTLEY.—The wettest August I have recorded during the last 40 years. The nearest to it was 1881 with 4.73 in. Nevertheless most of the corn is well harvested. On the 25th we had a very heavy TS with much H, which did great damage to the mangolds and turnips, but it did not extend over a large area. The month has been hot, the max. temp. has not been below 63°. TSS on the 5th, 18th and 25th; distant T on 13th and 19th.

NORWICH, BRUNDALL.—Mean temp. 63.4, being the highest in any August since 1893, and in any month, with that exception, since July, 1887. The rainfall was, in this neighbourhood, very partial, and we still felt the effects of the drought at the end of the month. Out of the 15 days on which rain was recorded, 12 gave less than a tenth of an inch. At the Norwich Cemetery the total was 2.15 in. against our 1.27 in. T and L on 5th, 19th, 22nd and 31st. T on 8th, 18th and 28th. L on 24th. TSS on 25th at 10.30 a.m., at 2 and 4 p.m. Solar halo on 26th, p.m.

POLAPIT TAMAR—A wet month, the total exceeding double the average. The total for the first eight months of the year is 26.86 in. as against 12.92 in. for the corresponding period in 1896, i.e., more than twice as much. The first few days of the month were very seasonable, hot and dry, but the last were very wet and stormy.

STROUD, UPFIELD.—TS on 6th, about 5 p.m., from S.W., .23 in. of rain fell. Small TS on 18th, from 5.30 to 6.30 p.m., .50 in. of R falling, and heavy TS to the N. and S. of us. T on 5th, 8th, 23rd, and L and T on 31st from 11 a.m. to noon.

WOOLSTASTON.—The first week was very hot and sultry, but after a heavy storm of T and L on the 6th the weather broke up, and the temp. fell considerably, R falling nearly every day for the rest of the month.

ROTHERBY HALL.—The weather during the first fortnight in August was very hot, and the rain which fell after the 18th was very acceptable, following the almost continuous dry weather of the previous eight weeks. There was T on seven days during the month, with no fewer than five TSS on the 24th. The rainfall was .88 in. above the average for 1880-9. Exactly 15 inches fell here during the first eight months of 1897, against 12.58 in. for the same period of 1896. Mean shade temp. 61°

SKIPTON, ARNCLIFFE.—A very wet month, the record of the 5th being the highest which has been recorded on one day for many years. The TS on the 5th very severe. Two cattle were killed, and three ash trees struck. Can any of your readers tell us why ash trees are more frequently struck than others?

WALES.

HAVERFORDWEST.—The first five days of August were very fine, and great heat prevailed, with a very large share of sunlight hastening the ripening of

the corn. The weather changed on the 6th, and very heavy showers fell (principally at night) and in a very short time, at 1.30 a.m. on the 8th, .33 in. fell in 35 minutes, and this was not a solitary instance. This kind of weather continued for several days. The weather improved a little after the 17th, although showery; the 19th very fine and breezy, but R fell heavily at night, three-tenths in 25 minutes. From that date to the end of the month, with an occasional fine day, the weather became worse and worse up to the end; the excessive R, coupled with the high night temp., is causing much anxiety about the harvest, which, but for this disastrous weather, would have been a very good one. In August, 1879, 7.59 in. fell, since that period we have had nothing to equal 1897.

ABERYSTWITH, GOGERDDAN.—Very showery after the first week.

SCOTLAND.

CARGEN [DUMFRIES].—The favourable weather experienced in July continued only during the first four days of this month. Upon the 3rd and 4th the thermometer reached 82°, the highest point registered during the summer; on the 5th there was a sudden fall of temp., and R was registered on every day, except six, during the remainder of the month. The readings of the bar. never exceeded 30 in. after the 4th, and the mean bar. pressure has only once been lower since observations were commenced at this station in 1860. The mean temp. 59°·8 is 1°·5 higher than the average for August, and has only once, in 1893, been higher since 1880; during the first nine days the mean reading exceeded 65°, from 10th to 31st it was only 57°·6. The rainfall is very considerably above the average, and has only been greater in six during the last 38 years. The weather has proved disastrous to the corn crop, hardly a stack having been as yet secured. Turnips are showing signs of a singular disease, taking the form of a rot in the upper portion of the bulb, no doubt occasioned by the constant wet weather following an unusually vigorous growth in the early stages of the crop. Potatoe disease is also prevalent. T and L at 7 p.m. on 4th, and all day 5th. T at 11 p.m. on 14th, and on 25th.

EDINBURGH, BLACKET PLACE.—A sunny, warm and wet month. Mean pressure .178 in. below, temp. 2°·6 above average. R .76 in. above mean. Bright sunshine 181 hours, and only one sunless day. First 12 days very hot, mean temp. 63°·6. Severe TSS on 4th, 5th, 6th, and 7th.

COLMONELL.—R 2.21 in., and mean temp. 2°·5 above, the average of 21 years. T and L on 4th, and T on 14th and 24th.

MULL, QUINISH.—The weather broke up on the 13th, and until the end of month has been very unsettled, with wind continually from S. and S.W.

BRAEMAR.—A very broken, unsettled month.

ABERDEEN, CRANFORD.—Strong winds from 12th to 20th, and little sun.

S. RONALDSAY, ROEBERRY.—Very fine, slight TSS on the 2nd and 17th.

IRELAND.

O'BRIENSBRIDGE, ROSS.—Great injury to corn, hay and potatoes by constant R.

DUBLIN, FITZ WILLIAM SQUARE.—A changeable, showery, windy month, but tolerably warm, in fact, great heat prevailed during the first week, which was in all respects summerlike. Mean temp. 60°·8, or 1.1 above the average. High winds were noted on 16 days. T on 14th. L and T on the 18th.

EDENFEL.—The warm summerlike period which commenced on the 9th of July, and was only broken during that month for a short spell in its fourth week, continued with but little intermission until the 9th of August, and it would in consequence be difficult to exaggerate the resulting abundance and luxuriance of all vegetation. But from the 10th of August to the end there was nothing but rainy, unsettled, and more or less tempestuous weather, continuing through the first week of September, so that potatoes, cereals and the ungathered hay are all in serious danger. The rainfall of the year to 31st August 33.27 in. is 10.76 in. above the average, and far in excess of the record for any similar period during the past 33 years.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXXI.]

OCTOBER, 1897.

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

WEATHER MAPS AND EARLY SYNCHRONOUS METEOROLOGICAL OBSERVATIONS.

In the United States *Monthly Weather Review* for May, 1897, there appears a letter of unique interest with respect to the above-mentioned subjects.

Prof. Henry, the Secretary of the Smithsonian Institution, being anxious to organise a meteorological service in the United States, wrote on June 5th, 1850, to Mr. Glaisher, enquiring what was being done in this country. Mr. Glaisher wrote a long reply, and that reply has been found among the Smithsonian archives by Prof. Cleveland Abbe, and printed in the above-mentioned *Weather Review*.

As we have here Mr. Glaisher's own statement at the very time when the work was being arranged, the letter is so important that we reprint it *verbatim*, and will add a few comments at the end.

MY DEAR SIR,—In reply to your letter of June 5 I beg to say that I shall have great pleasure in sending you copies of the forms I use in collecting meteorological observations, and the results of my experience are entirely at your service. In your letter you have not indicated the channel through which you wish the papers to be sent, and, therefore, I shall forward them through the Royal Society.

With the papers I shall send you will find a few copies of an address of a new Society, which myself with a few gentlemen have formed. It is under the presidency of S. C. Whitbread, Esq.

At the meeting of the council of this Society, held a few days since, I did myself the pleasure of reading the letter with which you have favored me, and it was resolved that a form for collecting observations, drawn up by myself, and now in the printer's hands, should be sent to you, and the council expressed a wish to co-operate with the Smithsonian Institution as far as possible. Hitherto, there has been no fund devoted to meteorology in England, and I have borne all the expenses, excepting that each gentleman has furnished himself with his instruments; government, however, has published the results in the reports of the Registrar General, some of which I send.

We hope now to collect much more information than I have hitherto done, and if the system adopted by you be similar to that adopted by us, their united results will be more valuable.

Among the forms sent you will find one very simple, and which is used daily at about 50 different railway stations at the hour of 9 a.m., Greenwich time. The different railway companies have agreed that the station masters shall take these observations, and that they shall be brought to London the same day, free of expense. The proprietors of a London newspaper, the *Daily News*, incur the expense of sending a messenger to the several railway termini at about 2 a.m., and all the returns thus collected are immediately printed, so that the weather of the day previous, at one time, all over the country and parts of Scotland are publicly known. On receiving the paper I lay all these returns on a map, using a long, narrow-headed arrow to indicate the direction of the wind, and other symbols for the other information, and thus daily I know the weather, direction of the wind, etc., the whole being exhibited to the eye. Several gentlemen, whose names you will see in a form headed "Simultaneous observations taken at 9 a.m.," have agreed to co-operate with me, and to take all the observations taken by the railway station masters, as well as others, with their full sets of instruments. It is believed by these arrangements, that very important information, with respect to the passage of storms in particular, will thus be collected. I have already more than one year's observations and daily maps in an unbroken series.

Previous to commencing these observations I visited every station, determined its meridian, fixed a compass card, and instructed the station master, remaining with him till I felt certain he would take the observations well.

The method I have adopted with respect to the observations of general phenomena is first to superintend the making of the instruments, then their selection. I determine their index errors by carefully examining and comparing every instrument with a standard. I visit the different locations in which they are placed, and examine the positions of the instruments themselves.

On receiving the returns I first examine every one by itself; second, I divide them into groups, including the observations from one known good observer, and then I compare every result in every return with the corresponding result in the standard return, taking into account difference of elevation, etc.; next, I form groups according to latitude, and another according to the longitude, by these means I usually detect any errors, and I believe very few escape. After this I proceed to their combinations, etc.

The British Meteorological Society intends in future having monthly returns, including every observation, and for which a form is now being set up, I shall, therefore, be more certain of the accuracy of the results.

I should be glad to have some arrangements made with the captains of steam vessels between America and England, thus connecting the observations taken in both countries, and I think this may ultimately be done.

I have the honour to be, Sir, with much respect and esteem,

Yours very truly,

JAMES GLAISHER.

13, Dartmouth Terrace, Blackheath, Kent, July 8th, 1850.

The sudden advent of a forgotten document like this, naturally induces reference to previous statements respecting the matters therein mentioned. The first paper with which comparison has to

be made is Mr. Symons's *History of English Meteorological Societies*; (1) in it no modification whatever is needed.

The next papers are, "The first Daily Weather Map, sold in the Great Exhibition of 1851"; (2) "The First Daily Weather Map"; (3) *Scientific Weather Forecasting*. (4) Here Mr. Glaisher's letter gives additional information, showing, as it does, that the first reports were not (as we supposed) telegraphed, but were sent by train. With that exception, there seems nothing in either article which requires modification; but perhaps it will tend to clearness if we state, in chronological order, the facts as regards the British Isles:—

1848.—In the latter part of this year, or the early part of 1849, Mr. Glaisher received from nearly all the railway companies a free pass over their lines. He provided himself with a supply of compass cards, and travelled over the country, teaching the railway clerks how to observe the weather. At the same time he visited many private observers and inspected their stations, because from the beginning of 1847 he had organized and contributed to the Registrar General's Reports the series of tables which he has continued to furnish for every subsequent quarter for fifty years!

With regard to this inspection of stations—Is there any record of its (1) proposal or (2) execution at an earlier date?

1849, June 14th.—First collection of reports from the railway termini by the *Daily News*, insertion in its issue of the weather table for the previous day at 13 stations, and preparation by Mr. Glaisher in MS. of the first current weather map.

1851.—Similar information collected by the Electric Telegraph Company, and on August 8th issue of the first printed Daily Weather Map.

1860, September 6th.—Issue, by Admiral FitzRoy, of first Daily Weather Report at the cost of the English Government.

1872, March 11th.—Issue of first Daily Weather Map at the cost of the English Government.

The letter is very remarkable considering its date—before Maury, and *a fortiori* before the Brussels Conference, or the appointment of FitzRoy, or Le Verrier's action in consequence of the Black Sea storm. One cannot help regretting that lack of funds prevented England from reaping the advantage of Mr. Glaisher's broad and correct views, and that we are therefore ten or twenty years behind where we might have been. But as regards Mr. Glaisher personally—the Nestor of meteorologists, as Prof. Abbe happily names him—it must be some little consolation to know that his early efforts are thoroughly appreciated on both sides of the Atlantic.

(1) *Quar. Jour. [Roy.] Met. Soc.*, Vol. VII. (1881), pp. 65–98.

(2) *Met. Mag.*, XXXI. (1896), p. 113.

(3) *Met. Mag.*, XXXII. (1897), p. 33.

(4) *Science Progress, N.S.*, I. (1896), p. 1.

TRUE TIME.

WE have received, and reprint at once, the following circular. But for the signature, and for the fact that we can remember no table or book which gives the information desired, we should not have believed it possible that there was any difficulty in knowing, in London, what time was being indicated by the office clock of any telegraph station in the world. However, this information appears not to be forthcoming, and as Prof. Milne requires to be able to identify with certainty seismometric and telegraph cable disturbances all the world over, we are sure that his enquiry should receive all assistance possible. We are glad to hear that the Marquess of Salisbury has promised to forward some of the applications through the Foreign Office, so that they may receive proper attention. Possibly this revelation of ignorance may be one step onward towards the attainment of that evident *desideratum*, Universal Time.

BRITISH ASSOCIATION,
BURLINGTON HOUSE, LONDON, W.

SIR,—It is, I think, remarkable that there appears to be no publication which shows the corresponding value in Greenwich Mean Time, of the local time employed throughout the World.

Such a table is indispensable in order to determine accurately the instant of occurrence of earthquakes, sea waves, magnetic phenomena, the despatch of telegrams, and many other events, the sequence of which in absolute time has to be determined.

Although application has been made to the Royal Observatory at Greenwich, to the Royal Geographical Society, to the Central Telegraph Office in London, to the Offices of Cable Companies, and to other possible sources of information, very little has been obtained.

As a Secretary of the British Association Committee whose names are appended, I desire to publish in their forthcoming report a table showing the differences between Greenwich mean time as used in England and Scotland and that of the Civil Times used in various parts of the world.

By Civil Time I mean the time used by Railways, Telegraphs, and for ordinary public affairs.

If different times are used in various parts of your country, I trust that you will be able to give information relating to the same.

Feeling assured of the value of the table it is intended to compile, I sincerely trust that you will favour me with a full and explicit statement of the time generally employed in your country. If it is mean time, state the meridian; the observatory, or the place to which this refers; and also, as a check against any misunderstanding, please state distinctly the equivalent of December 1st, 9 a.m. G.M.T. in the local time, or times adopted in your own country.

I have the honour to remain, sir,

Your obedient servant,

JOHN MILNE.

SEISMOLOGICAL INVESTIGATION COMMITTEE.

BRITISH ASSOCIATION.

LORD KELVIN, F.R.S.
 Dr. J. T. BOTTOMLEY, F.R.S.
 Professor G. H. DARWIN, F.R.S.
 Major L. DARWIN.
 G. F. DEACON.
 Professor C. G. KNOTT.
 Professor R. MELDOLA, F.R.S.
 Professor J. PERRY, F.R.S.
 Dr. ISAAC ROBERTS, F.R.S.

Professor W. G. ADAMS, F.R.S.
 Sir F. J. BRAMWELL, Bart., F.R.S.
 HORACE DARWIN.
 Dr. C. DAVISON, *Secretary*.
 Professor J. A. EWING, F.R.S.
 Professor G. A. LEBOUR.
 J. MILNE, F.R.S., *Secretary*.
 Professor J. H. POYNTING, F.R.S.
 G. J. SYMONS, F.R.S., *Chairman*.

SUNLESS DAYS AND THE DAY-DISTRIBUTION OF
 SUNSHINE IN SUMMER.

How many sunless days have we in London in the year, the months, the seasons? I will try to answer this question, on the basis of twenty years' observations at Greenwich (1877-96).

By a "sunless day" is to be understood one giving no record in the Campbell-Stokes instrument, in which, as is known, a strip of millboard is charred by solar rays focussed by means of a glass globe.

The total of sunless days in those twenty years I find to be 1,849; giving an average of (say) 92 in a year. About one-fourth of our days are sunless. In winter, of course, there is a large preponderance. The monthly averages are as follows:

Jan.	17·9	April.....	3·7	July.....	1·7	Oct.	8·5
Feb.....	11·3	May.....	2·5	Aug.....	2·1	Nov.....	12·9
March	5·9	June	2·6	Sept.....	3·6	Dec.....	19·3

Thus, December has most, and July least. (It may here be noted that the month with most bright sunshine is May.) Spring has 12·1 sunless days; summer, 6·4; autumn, 25·0; winter, 48·5. In the series, summer, spring, autumn, winter, each of the last three has about twice as many sunless days as the season before it.

Consider next the numbers in years and half-years:—

	Sunless	Sunless	Sunless		Sunless	Sunless	Sunless
	days	days	days		days	days	days
	in year.	Apl.—Sep.	Oct.—Mar.		in year.	Apl.—Sep.	Oct.—Mar.
1877.....	86	16	—	1888.....	98	23	83
1878.....	84	7	67	1889.....	105	19	70
1879.....	106	17	85	1890.....	97	14	81
1880.....	78	14	67	1891.....	79	18	79
1881.....	92	17	80	1892.....	98	14	71
1882.....	84	9	69	1893.....	80	10	80
1883.....	82	20	67	1894.....	97	27	64
1884.....	92	18	71	1895.....	90	13	73
1885.....	102	15	74	1896.....	103	22	86
1886.....	104	19	93				
1887.....	92	17	78	Totals	1849	329	1438

The year with most sunless days in this period is 1879, then follow 1889, 1886, 1896, &c. On the other hand, 1880 comes lowest, then 1891, 1893, &c. The most sunless summer half is 1894; the most sunless winter half, 1885-86.

Let us now restrict our attention to the five months May to September, and consider how the 153 days of this period are to be distributed in respect of bright sunshine. The total days in those 20 summer seasons (3,060) are arranged in grades differing by one hour's bright sunshine (0 to 1, 1 to 2, &c., each grade including the lower, but not the upper limiting value). Thus we have the following table:—

Hours Sunshine.	Days in May—Sep. in 20 yrs.	Average.	Hours Sunshine.	Days in May—Sep. in 20 yrs.	Average.
0—1	609	30·4	9—10	167	8·3
1—2	258	12·9	10—11	147	7·3
2—3	261	13·0	11—12	115	5·7
3—4	225	11·2	12—13	100	5·0
4—5	253	12·6	13—14	76	3·8
5—6	221	11·0	14—15	8	·4
6—7	233	11·6	15—16	1	—
7—8	204	10·2			
8—9	182	9·1	Total	3060	(say) 153

It will be seen that the grade 0 to 1 stands high above the others. About 20 per cent. of those days have sunshine less than one hour, or none. On the other hand, about 14 per cent. have 10 hours, or more. There are eight cases (in those 20 years) of 14 to 15 hours' sunshine, and there is one (in 1887) over 15.

A. B. M.

SO-CALLED SULPHUR-RAINS.

AMONG the superstitions engendered by ignorance of the laws of meteorology we must include the "showers of sulphur." Without absolutely denying that the wind may be able to carry to great distances real sulphur coming from volcanoes, it is certain that the majority of such showers are due to quite another cause. At Bordeaux the phenomenon of the so-called sulphur shower is quite frequent; it is seen every year in April and May, chiefly with fine rain and west winds. Objects are covered by this rain with a very fine yellow powder, which collects in hollow places. This powder has no odour and is impalpable; but if it be examined with the microscope it may be shown to consist of kidney-shaped bodies swelled at both extremities. The origin of this yellow powder is not doubtful. Bordeaux is encompassed toward the south and west by vast pine forests. At the period of flowering the pollen is carried by the wind up to the clouds, whence it falls with the rain. The special form of the corpuscles collected is absolutely identical with that of grains of vegetable pollen.—*Revue Scientifique*.

HIGH TEMPERATURE AT NIGHT, AUG. 4TH.

To the Editor of the Meteorological Magazine.

SIR,—Your *Met. Mag.* for September to hand. I can confirm the fact of the high night temperature. Here at the altitude of 1,148 ft., as in England, the highest minima occurred during the two nights of 4th to 6th of August: 4th-5th, 61°·4; 5th-6th, 61°·5.

They occur in the first decade of August, of which the daily mean temperature is 65°·8; whilst that of the third decade of July is 63°·7, and that of the second decade of August, 62°·6.

But these high minima fall far short of those of other years, as you may judge from my table of 12 years' observations:—

DATE.	Maximum of the day before.	Minimum.	Lowest Minimum in between.
1886 } July 20	87 ^o ·1	66 ^o ·4	} 46·9
1886 } Aug. 30	74·5	66·4	
1887 } July 30	85·5	66·2	} 48·0
1887 } Aug. 6	83·7	65·7	
1888 } July 22	73·8	60·8	} 46·0
1888 } Aug. 10	80·8	69·6	
1889 } July 10	83·1	63·0	} 46·9
1889 } Aug. 4	76·1	59·7	
1890 } July 31	80·1	64·6	} 50·9
1890 } Aug. 9	77·2	61·0	
1891 } July 17	72·3	58·6	} 46·4
1891 } Aug. 14	71·1	60·1	
1892 } July 30	80·4	61·3	} 45·7
1892 } Aug. 17	90·9	72·1	
1893 } July 20	77·4	61·5	} 46·4
1893 } Aug. 16	83·1	68·4	
1894 } July 23	81·7	65·1	} 46·9
1894 } Aug. 24	72·7	62·6	
1895 } July 25	78·1	66·6	} 48·7
1895 } Aug. 21	81·0	66·2	
1896 } July 20	76·1	62·1	} 45·3
1896 } Aug. 15	71·2	54·7	
1897 } July 24	74·5	59·7	} 50·7
1897 } Aug. 5	81·7	61·5	

You will notice that the difference between the minimum and the maximum of the day before is very variable, from 20°·7 in July, 1886, to 8°·1 in August, 1886. I have even seen this difference to be only 1°·8 in the middle of summer: on August 23rd, 1894, the maximum was 62°·6, and the minimum of the next day, 60°·8.—Yours truly,

V. RAULIN.

Montfauçon (Meuse), Sept. 18th, 1897.

To the Editor of the Meteorological Magazine.

SIR,—Referring to the letter in your last issue by Mr. Sydney Wilson, and to your list of high minimum temperatures, I may add

that the minimum reading on August 5th at Malvern, 500 ft. above sea level, was $68^{\circ}6$. The maximum of the 4th being $83^{\circ}8$. The minimum readings throughout the month were so high, that it brought the mean to within $1^{\circ}7$ of that of July, although the latter month was upon the whole far hotter.—Yours faithfully,

C. S. PRINGLE.

Weston-super-Mare, 18th Sept., 1897.

A THERMO-HYGROGRAPH-CARRYING KITE 10,016 FT. ABOVE SEA LEVEL.

WE have not been able to keep our readers fully informed as to the progress of kite work in the United States. Suffice it now to say that Mr. A. Lawrence Rotch has invoked the aid of a small steam engine to wind in his kites, and has sent us the cutting which we reprint below; and we think that in so doing we ought to congratulate him on his success in the experiment; as to that of the prediction, we know nothing:—

“BLUE HILL OBSERVATORY, Sept. 19th.—All kite records were broken here this afternoon when the topmost kite of seven, all of the Hargrave type, on four miles of wire, attained an altitude of 10,016 feet above the sea level, or 9386 feet above the summit of the hill.

“The first kites were sent up about noon, and the greatest height was reached at 4.17 p.m., but several of the kites were in the air for an hour after sunset.

“The day was particularly favourable for the flight, the air being clear, while at the surface the wind blew in strong puffs from the south. As the kites rose, however, they ran into a more westerly current, until just after the last one was sent up, the highest was almost at right angles to the lowest, causing the wire to make a long sweeping curve to the eastward.

“As usual, an aluminium box containing an instrument for recording pressure, temperature and humidity, was swung 130 feet below the topmost kite. It remained higher than a mile during five hours.

“At the highest point the thermometer recorded a temperature of 38° , while at the same time it was 63° at the surface of the earth.

“At a height of 4000 feet the relative humidity rose rapidly, but sank again at a mile, where it was quite low. At 7000 feet it again rose, and soon reached a point where there was almost complete saturation of the air. From there upwards the atmosphere became drier, until at the highest point there was scarcely any moisture recorded. At the ground the relative humidity all the afternoon was quite low.

“The entire flight was made without a mishap, the kites going up easily, and, after getting above the southerly wind, remaining very steady.

"It took the steam engine a little over two hours to reel in the four miles of wire, and the last kites reached the ground at 6.40 p.m.

"From observation obtained in the upper atmosphere it does not appear that any sudden change in the temperature is probable for a day or so, the decrease in the temperature with height being about the average."

TREES DAMAGED BY LIGHTNING.

DURING the TS in the N. of London on July 21st, a poplar in Clissold Park, Stoke Newington, was damaged in a rather unusual way. The tree, a large one, stood on the edge of a gravel walk; and a low (9 inch) rail of 1 inch iron, which divided the footpath from the adjoining grass (and which was supported for most of its length by dwarf iron posts) had been driven into the tree so as to support the extremity of the rail. There was, therefore, virtually a long horizontal conductor connected to earth at every 8 ft., ending in the tree. When the storm-cloud came near, there was an explosive discharge, *not* at the top of the tree, nor even at any of its branches, but from about six inches above where the rail entered, up to about 4 ft. 6 in. above the ground; there the outer rough bark was blown off for about 3 ft. high by 1 ft. broad; along the middle of this the inner soft bark had been grooved (as is often the case with poplars) and separated from the trunk of the tree. We did not see the tree for two days, and doubtless the edges had been touched, but we noticed one feature to which we desire to call special attention, so that others may see whether the fact we noticed is, or is not, exceptional. The frayed edges on one side of the groove were attached by their upper extremities, and those on the other side by their lower ones—not without exception, but probably six fragments out of seven followed this rule. Of course, this suggests the passage of two currents in opposite directions; we express no opinion, and make no assertions; we merely record what we saw, and ask all who see a tree which has been grooved by lightning, to examine the edges carefully, and report the result. It is, we think, not much use looking at oaks, as they seem to be generally burst asunder as by an internal explosion.

EXPERIMENTS TO DRIVE AWAY HAIL.

WE have heard often enough that loud and continued explosions produce rain, and the recollection of rain-making experiments based upon this apparent connection is still with us. Now comes a report from Mr. Germain, United States Consul at Zürich, on the prevention of hailstorms by the same means that have been used to encourage a downfall of rain. It appears that Mr. Albert Stiger, burgomaster of Windisch-Freistritz (Lower Steirmark, Austria), owns extensive vineyards situated on the southern slopes of the Bacher Mountains,

a locality often visited by destructive hailstorms. To protect his vines from hail, he decided to try the shooting or explosive system to scatter the clouds and drive away approaching hail or heavy rain storms. Six stations were therefore erected on the six most prominent summits surrounding the locality, and commanding a territory of about two miles in extent. These stations sheltered ten heavy mortars each. Upon the slightest indication of a storm the mortars were immediately manned and loaded with 120 grams of powder each—about $4\frac{1}{4}$ ounces—and shooting commenced simultaneously and continued regularly out of the sixty mortars until the clouds were scattered and the storm had blown over. These experiments were anxiously watched by the citizens of Windisch-Freistritz last summer. Threatening black clouds made their appearance over the summits of the Bacher Mountains; at a given signal all the mortars were fired off, and the continuous detonations in a few moments caused a sudden reaction in the movements of the clouds. It is said that the clouds opened up funnel-like, the mouth of the funnel began to rise in the form of consecutive rings, expanding gradually until all of the cloud scattered and entirely disappeared. There was no hail, or even a sudden downpour of rain. The same experience was gone through six times during the summer, and proved a successful preventive in each case. We await the views of Austrian meteorologists upon these experiments; meanwhile, rainmakers who have put their trust in explosions must hide their diminished heads before the rain-dispersers.—*Nature*.

SAND STORM ON THE NILE.

MERAWI, *Sept. 22nd.*

THE great heat of the last ten days, due to the prevalence of the south wind, culminated yesterday in a great storm. All the morning the sky had been unsettled, and finally the clouds gathered, the air became perfectly still, and the birds ceased singing. The heat was intolerable, it was impossible to remain in one's tent, and many of the force sought relief by bathing their heads in water.

Suddenly, about three o'clock in the afternoon, two distinct dust walls were seen approaching, one from the south and one from the east. At the same time the wind began sighing in the trees. In five minutes it had increased to a hurricane, the two walls of sand united, and came on straight towards the middle of the camp. The noise resembled the sound of a big drum, and this, together with the rushing wind, produced a tremendous and awe-inspiring roar. The sand made a peculiar sound, like the rending of cloth. For half-an-hour the storm continued with unabated fury. By the end of that time the eyes, nostrils and mouths of all in camp were full of sand. Tents were blown down, and the river was lashed into furious waves. So suffocating were the clouds of sand that in many cases acute nausea ensued, while everyone suffered extreme discomfort.

THE BRITISH ASSOCIATION AT TORONTO.

EVERYBODY has seen in the newspapers how heartily the British Association was welcomed in Britain beyond the Sea; we, therefore, need say nothing on that head.

As regards Meteorological papers and reports we have been favoured with some yards of newspaper cuttings, but we have not room to print them *in extenso*, and doubtless the important papers will be published in the volume of the Association, which we are glad to find is issued much more promptly than it used to be. In these circumstances, we think that the best plan is to quote the summary of the Meteorological work given by our American contemporary, *Science*.

In the meteorological department the following papers were read:—

John Hopkinson, "Monthly and Annual Rainfall at Ten Stations in the British Empire, 1877 to 1896." It appears doubtful, however, whether so limited a series of observations can be taken as representative of the pluviology of the Empire.

Dr. Van Rijckevorsel, on the "Temperature of Europe." From certain peculiar maxima and minima exhibited by the curves of daily temperature, he considers that the continent may be divided into two regions in which a different type of weather prevails.

Prof. R. F. Stupart (Director of the Meteorological Service of Canada), on the "Climatology of Canada."

F. Napier Denison on the "Great Lakes as a Sensitive Barometer." From a comparison of simultaneous records of changes of level in the Great Lakes and of smaller undulations in the atmospheric pressure by means of a sensitive barograph, the author concludes that the larger differences are due to difference of atmospheric pressure over the extremities of the lake, but may be greatly augmented by the action of the wind on the surface of the water. The smaller undulations appear to be due to atmospheric waves caused by currents in different strata travelling in opposite directions, as shown by Helmholtz.

Papers were also contributed by A. Lawrence Rotch and by Prof. Marvin, on the "Exploration of the Air by Kites," showing how it was possible, by means of recording instruments sent up to great elevations attached to a kite, to obtain information with regard to the temperature and hygrometric condition of the air, which would be of use in forecasting. It appears, however, that there is still much to be done in improving the recording hygrometer.

There seem to have been also the following other papers which (perhaps intentionally) the reporter for *Science* ignores; we add the titles without comment.

DR. J. EDKINS.—Slow Refrigeration of the Chinese Climate.

R. G. HALIBURTON.—November Meteors and November Flood Traditions.

DR. OTTO HÜHN.—Meteorites, Solid and Gelatinous.

PROF. PERCIVAL LOWELL.—Atmosphere in its Effects on Astronomical Observation.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, APRIL, 1897.

STATIONS. <i>(Those in italics are South of the Equator.)</i>	Absolute.				Average.				Absolute.		Total Rain.		Aver. Cloud.	
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.		
	Temp.	Date.	Temp.	Date.										
England, London	67·3	27	27·8	11	55·3	39·6	89·9	0·100	78	108·9	20·7	1·57	16	6·8
Malta.....	78·8	24	47·0	3	66·6	54·8	51·5	77	146·2	44·0	1·85	9	5·8	
<i>Mauritius</i>	84·5	1	64·2	17	81·7	69·9	64·9	72	130·5	56·0	1·75	14	5·3	
Calcutta.....	103·7	17	67·6	4	97·2	75·0	67·0	57	159·6	59·0	·83	4	2·7	
Bombay.....	93·5	27	71·0	4	88·7	77·6	73·9	74	141·5	61·2	·00	0	2·0	
Ceylon, Colombo.....	92·2	...	71·2	9	89·5	75·9	74·5	81	146·0	70·0	10·97	17	5·5	
<i>Melbourne</i>	84·4	17	37·6	23	68·5	48·5	48·2	68	133·5	25·0	·64	7	5·0	
<i>Adelaide</i>	90·9	4	44·7	29	74·5	54·4	48·0	57	146·0	34·7	·93	8	4·3	
<i>Sydney</i>	88·0	12	50·8	22	74·6	59·8	54·7	71	137·8	40·6	6·66	9	3·7	
<i>Wellington</i>	67·5	5	40·0	24	61·5	50·5	48·0	74	130·0	29·0	6·92	12	4·5	
<i>Auckland</i>	75·0	14	45·0	19	67·3	53·4	50·2	69	138·0	42·0	2·12	9	4·3	
Jamaica, Kingston.....	89·5	12	69·8	27	86·9	72·1	68·6	70	...	...	2·00	7	1·6
Trinidad.....	94·0	28 ^a	65·0	11	90·3	68·7	68·6	70	169·0	63·0	·26	4	...	
Grenada.....	86·4	22	71·0	22	84·5	74·6	72·6	83	150·6	...	2·06	13	0·9	
Toronto.....	71·1	23	29·9	20	51·2	34·7	34·9	70	85·5	15·0	2·14	14	6·7	
New Brunswick, Fredericton.....	70·8	25	11·7	20	49·9	28·5	30·3	65	...	...	2·67	13	6·5
Manitoba, Winnipeg.....	71·6	17	11·0	19	51·0	28·4	...	...	...	...	1·01	10	5·7
British Columbia, Esquimalt.....	70·7	15	32·2	2	56·6	40·6	45·6	83	...	...	1·04	11	5·6

a—and 29.

REMARKS.

MALTA.—Adopted mean temp. 59°·3, or 0°·3 below the average. Mean hourly velocity of wind 13·2 miles. TSS on 3rd and 10th; L on 5 days. J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·0, of dew point 3°·3, and rainfall 3·47 in., below their respective averages. Mean hourly velocity of wind 12·8 miles, or 2·3 above average; extremes, 30·6 on 6th, and 1·9 on 4th; prevailing direction E.S.E. L and T on 27th. T. F. CLAXTON.

CEYLON, COLOMBO.—Thunderstorms occurred on 14 days. H. O. HARNARD.

Adelaide.—Mean temp. just the average of 40 years. This was another very dry month, the total rainfall being ·84 in. below the average. C. TODD, F.R.S.

Sydney.—Rainfall ·36 in. above, temp. 2°·3 above, and humidity 7·2 below, their respective averages. Mean temp. for the month the highest recorded since Sydney Observatory was built. H. C. RUSSELL, F.R.S.

Wellington.—Generally fine up to the 13th, with occasional showers. Wind N.W. and frequently strong. The wind changed to S.E. on night of 14th, followed by heavy rain and strong S.E. wind on 15th and 16th; 3·06 in. and 3·04 in. of rain being recorded on the 16th and 17th, causing floods. Remainder of month fine. Mean temp. 1°·0 below, and rainfall 3·39 in. above, their respective averages. R. B. GORE.

Auckland.—An unusually fine and calm month. Rainfall quite one inch below the average of 30 years; mean temperature slightly below the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—The rainfall throughout the island shows a marked excess, and nearly every station had falls much in excess of the average. J. F. BRENNAN.

TRINIDAD.—Rainfall 1·77 in. below the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,
SEPTEMBER, 1897.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	2·11	XI.	Rhayader, Nantgwilt ...	6·26
II.	Dorking, Abinger Hall .	2·61	„	Lake Vyrnwy	4·90
„	Birchington, Thor	2·01	„	Corwen, Rhug .....	...
„	Hailsham	3·82	„	Criccieth, Talarvor	4·10
„	Ryde, Thornbrough	2·42	„	I. of Man, Douglas	5·44
„	Emsworth, Redlands ...	2·74	XII.	Stoneykirk, Ardwell Ho.	4·50
„	Alton, Ashdell	2·53	„	New Galloway, Glenlee	4·58
III.	Oxford, Magdalen Col..	2·21	„	Moniavie, Maxwelton Ho.	3·91
„	Banbury, Bloxham	1·97	„	Lilliesleaf, Riddell	2·84
„	Northampton, Sedgebrook	2·16	XIII.	N. Esk Res. [Penicuick]	3·05
„	Duddington [Stamford].	2·71	XIV.	Glasgow, Queen's Park..	3·39
„	Alconbury	2·81	XV.	Inverary, Newtown	6·10
„	Wisbech, Bank House...	3·48	„	Oban, The Corran .....	...
IV.	Southend	2·54	„	Islay, Gruinart School ...	2·82
„	Harlow, Sheering.....	3·50	XVI.	Dollar	3·47
„	Colchester, Lexden	2·98	„	Balquhiddy, Stronvar...	5·49
„	Rendlesham Hall	2·34	„	Ballinluig .....	...
„	Rushall Vicarage	3·69	„	Dalnaspidal H.R.S.....	5·49
„	Swaffham	4·03	XVII.	Keith H.R.S.....	3·46
V.	Salisbury, Alderbury ...	2·71	„	Forres H.R.S. ...	1·99
„	Bishop's Cannings	2·50	XVIII.	Fearn, Lower Pitkerrie..	1·16
„	Blandford, Whatcombe ..	2·96	„	N. Uist, Loch Maddy ...	...
„	Ashburton, Holne Vic...	4·77	„	Invergarry.....	6·30
„	Okehampton, Oaklands.	6·31	„	Aviemore H.R.S.	2·91
„	Hartland Abbey	5·15	„	Loch Ness, Drumnadrochit	4·48
„	Lynmouth, Glenthorne.	6·69	XIX.	Invershin	3·48
„	Probus, Lamellyn	4·67	„	Scourie .....	...
„	Wellington, The Avenue	3·24	„	Watten H.R.S.....	3·44
„	Wincanton.....	4·12	XX.	Dunmanway, Coolkelure	4·45
VI.	Clifton, Pembroke Road	3·82	„	Cork, Wellesley Terrace	2·02
„	Ross, The Graig	2·60	„	Killarney, Woodlawn ...	3·93
„	Wem, Clive Vicarage ...	2·05	„	Caher, Duneske	2·87
„	Cheadle, The Heath Ho.	3·78	„	Ballingarry, Hazelfort...	2·76
„	Worcester, Diglis Lock	2·12	„	Limerick, Kilcornan ...	3·14
„	Coventry, Priory Row ..	2·37	„	Broadford, Hurdelestown	2·79
VII.	Grantham, Stainby	2·54	„	Miltown Malbay	4·10
„	Horncastle, Bucknall ...	2·43	XXI.	Gorey, Courtown House	2·50
„	Worksop, Hodsock Priory	2·02	„	Athlone, Twyford	2·03
VIII.	Neston, Hinderton	4·23	„	Mullingar, Belvedere ...	2·54
„	Southport, Hesketh Park	3·99	„	Longford, Currygrane...	1·87
„	Broughton-in-Furness ...	6·12	XXII.	Woodlawn	2·12
IX.	Ripon, Mickley.....	1·83	„	Crossmolina, Enniscoe ..	3·02
„	Melmerby, Baldersby ...	1·64	„	Collooney, Markree Obs.	2·58
„	Scarborough, Observat'y	3·09	„	Ballinamore, Lawderdale	1·89
„	Middleton, Mickleton ...	2·78	XXIII.	Warrenpoint.....	2·52
X.	Haltwhistle, Unthank...	...	„	Seaforde.....	2·57
„	Bamburgh.....	2·20	„	Belfast, Springfield	2·92
„	Keswick, The Bank	6·16	„	Bushmills, Dundarave..	2·86
XI.	Llanfrechfa Grange	5·02	„	Stewartstown	1·40
„	Llandoverly	4·99	„	Killybegs	4·96
„	Castle Malgwyn	4·81	„	Lough Swilly, Carrablagh	4·14
„	Builth, Abergwesyn Vic.	7·42			

SEPTEMBER, 1897.

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 $\frac{1}{10}$ or more fell.	Max.		Min.		In shade.	On grass.
				Dpth	Date		Deg.	Date	Deg.	Date		
I.	London (Camden Square) ...	2.75	+ .24	.68	29	13	70.6	29	38.1	19	0	0
II.	Tenterden	2.43	- .48	.55	29	16	70.0	26	37.0	19	0	...
III.	Strathfieldsaye	1.32	...	.45	1	11	...	...	...	...	...	...
III.	Hitchin	1.90	- .60	.49	1	13	67.0	11 ^a	36.0	9	0	...
IV.	Winslow (Addington)	3.33	+ .66	1.99	29	13	68.0	2 ^a	33.0	19	0	1
IV.	Bury St. Edmunds (Westley)	2.93	+ .23	.73	29	14	65.0	26	38.0	19	0	...
V.	Norwich (Brundall)	3.94	...	.92	18	16	69.0	2	39.0	4	0	0
V.	Weymouth (Langton Herring) .....	...	...	...	...	...	...	...	...	...	...	...
VI.	Torquay (Cary Green)	3.09	...	.84	8	15	66.5	21	42.0	19	0	0
VI.	Polapit Tamar [Launceston].	6.03	+ 2.32	1.38	8	20	68.5	14	36.8	12 ^e	0	...
VII.	Stroud (Upfield)	2.69	- .22	.77	29	14	67.0	15 ^b	40.0	18	0	...
VII.	Church Stretton (Woolstaston)	2.49	- .01	.48	5	17	68.0	28	38.0	10	0	1
VII.	Tenbury (Orleton) .....	...	...	...	...	...	...	...	...	...	...	...
VII.	Leicester (Rotherby Hall) ...	2.35	...	.45	5	22	66.0	12 ^c	34.0	19	0	7
VIII.	Boston	3.12	+ .35	1.08	29	12	70.0	12	34.0	19	0	...
VIII.	Hesley Hall [Tickhill]	1.99	- .17	.49	1	13	69.0	24	36.0	9, 12	0	...
VIII.	Manchester (Plymouth Grove)	4.01	+ .54	.91	2	12	69.0	27	34.0	9, 18	0	3
IX.	Wetherby (Ribston Hall) ...	2.65	+ .19	.45	1	14	...	...	...	...	...	...
IX.	Skipton (Arnccliffe)	6.42	+ 1.66	1.22	1	18	...	...	...	...	...	...
X.	Hull (Pearson Park)	3.21	+ .77	.67	29	14	69.0	24	35.0	9	0	...
X.	Newcastle (Town Moor)	2.75	- .03	.80	1	13	...	...	...	...	...	...
XI.	Borrowdale (Seathwaite)	11.99	+ .26	3.42	23	18	...	...	...	...	...	...
XI.	Cardiff (Ely)	5.91	+ 2.17	1.37	29	13	...	...	...	...	...	...
XI.	Haverfordwest	5.09	+ .69	1.04	1	20	66.9	12	36.2	12	0	3
XI.	Aberystwith (Gogerddan) ...	7.20	+ 2.93	1.25	4	19	67.0	27	28.0	9 ^f	...	...
XII.	Llandudno	3.62	+ 1.40	1.00	1	17	66.2	14	39.0	10	0	...
XIII.	Cargen [Dumfries]	3.40	- .16	.66	1	16	71.6	13	34.0	9	0	...
XIII.	Edinburgh (Blacket Place) ..	1.64	...	.33	1	20	69.1	13	38.0	18 ^e	0	0
XIV.	Colmonell	3.90	...	.90	1	17	72.0	13	30.0	9	...	...
XV.	Lochgilthead (Kilmory)	6.30	+ 1.17	.90	16	19	...	...	35.0	7	0	...
XVI.	Mull (Quinish)	5.84	+ .81	1.18	3	22	...	...	...	...	...	...
XVI.	Loch Leven Sluices	3.00	+ .21	.70	2	15	...	...	...	...	...	...
XVII.	Dundee (Eastern Necropolis) ..	1.25	- 1.26	.25	1	17	70.4	12	35.3	7	0	...
XVII.	Braemar	1.78	- 1.08	.44	1	21	64.2	13	28.5	8	3	15
XVIII.	Aberdeen (Cranford)	1.52	...	.43	29	22	71.0	12 ^d	32.0	3	1	...
XVIII.	Cawdor (Budgate)	2.49	- .26	.39	1	25	...	...	...	...	...	...
XVIII.	Strathconan [Beaul]	5.42	+ 1.74	1.94	27	12	...	...	...	...	...	...
XIX.	Glencarron Lodge	11.21	...	2.15	25	24	64.2	13	33.6	9	0	...
XIX.	Dunrobin .....	...	...	...	...	...	...	...	...	...	...	...
XX.	S. Ronaldsay (Roeberry)	5.99	+ 3.33	2.25	29	24	60.0	14	41.0	17	0	...
XX.	Darrynane Abbey	2.99	...	.90	7	18	...	...	...	...	...	...
XXI.	Waterford (Brook Lodge) ...	3.29	+ .37	1.43	1	12	72.0	14	37.0	12	0	...
XXI.	O'Briensbridge (Ross)	3.31	...	.49	4	16	...	...	...	...	...	...
XXII.	Carlow (Browne's Hill)	3.19	+ .37	1.24	1	17	...	...	...	...	...	...
XXII.	Dublin (Fitz William Square) ..	2.58	+ .61	1.17	1	16	67.7	23	40.9	18	0	0
XXIII.	Ballinasloe	2.15	- .64	.56	4	18	65.0	13 ^d	38.0	12	0	...
XXIII.	Clifden (Kylemore)	5.44	...	1.56	4	18	...	...	...	...	...	...
XXIII.	Waringstown	2.21	- .95	.61	1	15	73.0	13	34.0	9	0	7
XXIII.	Londonderry (Creggan Res.) ..	2.60	- 1.18	.30	4	24	...	...	...	...	...	...
XXIII.	Omagh (Edenfel)	2.27	- 1.11	.47	5	21	66.0	13	35.0	9	0	...

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

a—and 13, 26. b—and 27. c—and 26, 27. d—and 14. e—and 19. f—and 10, 11, 18.

METEOROLOGICAL NOTES ON SEPTEMBER, 1897.

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

ENGLAND.

TENTERDEN.—The 1st and 5th were rough and wet, and the 2nd, 4th, 19th, 23rd and 24th were also windy. Fine weather prevailed in the middle of the month and there were two or three lovely days towards the end. Duration of sunshine 140 hours. T on 17th; TS at night on 29th.

ADDINGTON.—A good deal of very fine weather during the month. Rather wet until the 5th, after that date very little R until the evening of the 29th, when a very heavy storm of R, T, and L occurred, 1.99 in. of R falling, mostly between 4 p.m. and 8.30 p.m. For a long time the lightning was almost continuous in the S.E. On 30th, the brook overflowed the meadows. A slight frost on the 19th blackened a few tender things in low situations. Fogs on 27th and 30th.

BURY ST. EDMUNDS, WESTLEY.—A month of the usual September weather. Cold days from 17th to 20th, the max. temp. on 19th being only 49°. Heavy TS at night on 29th, with incessant L, and very high wind.

NORWICH, BRUNDALL.—Mean temp. 2° below, and R 1.28 in. above, the average, and .31 in. in excess of September, 1896, but the number of rainy days was 16 against 21 in the previous year. S.W. gale on 2nd. L on 3rd and 29th. TS and H showers on 4th. T and L on 6th, T, L, and heavy R on 29th.

TORQUAY, CARY GREEN.—Rainfall .70 in. above the average. Mean temp. 56° F, or 1°.9 below the average. Duration of sunshine 156 hours 35 minutes, being 1 hour 15 minutes above the average; four sunless days.

POLAPIT TAMAR.—A very wet month, especially the first eight days; the first few days were also rather stormy. The middle and latter portions of the month were generally calm and fine. The total rainfall for the first nine months of the year exceeds the whole fall for the year 1896. T and H on 3rd.

WOOLSTASTON.—The early part of the month was cold and wet, the latter part warmer and more genial. Mean temp. 54°.9. Vivid L on 29th.

ROTHERBY HALL.—The weather during the month was mild, with a fair amount of sunshine, the R falling chiefly in the night. The little frost (the thermometer on the grass falling once to 23°) did only slight damage to the gardens. The rainfall was .24 in. below the average for ten years, 1880-89. Mean. temp. in shade 52°.

HULL, PEARSON PARK.—TSS on 1st and 6th.

SEATHWAITE.—On 23rd and 24th, 4.86 in. of R fell, causing a flood on the latter date.

WALES.

HAVERFORDWEST.—There were 20 wet days this September, but it was neither so wet nor so stormy as last year, although during the first six days strong winds prevailed with low pressure, and much R. Between the 9th and 18th there was fine bright weather, with a great fall of night temp. from the 10th to the 13th, the grass readings on three nights being below 32°. The unusual number of rainy days seriously interfered with the late harvest, and it is feared that much corn has been spoiled.

SCOTLAND.

CARGEN [DUMFRIES].—A cold, although on the whole not ungenial month. Barometrical pressure and hours of sunshine are both slightly above the average for 38 years. The mean temp. is $1^{\circ}9$ below that average. In the first six days 1.84 in. of R fell, considerably more than half the total for the month. Seven exceptionally fine days, 7th—13th, were followed by broken weather during the remainder of the month, and although R was recorded on ten out of the remaining seventeen days, no heavy fall (except $.46$ in. on 23rd) occurred, and sharp breezes, chiefly westerly, prevented very serious interference with harvest operations, which, except in the higher districts, were concluded before the end of the month. The grain crop proved fairly satisfactory.

COLMONELL.—R $.12$ in. below, and mean temp. $1^{\circ}3$ above, the average of 21 years.

ABERDEEN, CRANFORD.—A warm month, with light winds.

S. RONALDSAY, ROEBERRY.—A wet month. Mean temp. $50^{\circ}5$, or $1^{\circ}1$ below the average of 7 years.

IRELAND.

WATERFORD, BROOK LODGE.—Dense fog on 11th, thick fog on 15th, and fogs on 12th and 13th. T in the afternoon on 30th.

O'BRIENSBRIDGE, ROSS.—Moderate R and a fortnight of bright weather.

DUBLIN, FITZWILLIAM SQUARE.—The month began badly, but proved favourable after the first few days, which were cold and wet. The mean temp. $54^{\circ}5$ is $1^{\circ}3$ below the average. High winds were noted on 11 days, but attained the force of a gale only on the 23rd. The atmosphere was foggy on 6 days. H fell on 3 days. A solar halo was seen on the 7th.

WARINGSTOWN.—An unusual difference was observed between the minima in shade, and on grass, amounting on the night of the 7th, 8th, 10th, 11th, and 18th, to 10° , while on the night of the 9th the shade min. was 34° , and the grass min. 25° . French beans, and some other plants were injured, but dahlias and heliotrope did not suffer.

EDENFEL.—The weather of September, although on the whole fickle and uncertain, tended to retrieve the disaster that impended over the harvest generally, and it would be impossible to over estimate the value to the country of the fineness of the second and part of the last week. As a result an average crop of cereals was saved in fair order, and the deficiency of potatoes—very serious in some localities—has been to some extent compensated for by the abundance of other green crops and grass. Orchard fruit is the worst crop remembered.

SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CCCLXXXII.] NOVEMBER, 1897. [PRICE FOURPENCE,
or 5s. per ann. post free.

THE RAINFALL OF OCTOBER, 1897.

THE rainfall of October, 1897, has been so exceptionally small that we feel justified in devoting a considerable amount of space to a discussion of the details.

In table I. we have tabulated all records received up to date which show a total fall for the month of less than an inch. These number 61 out of a total of rather under 240, or fully one-quarter.

It will at once be seen that these stations are distributed over the S., S.E., E., and N.E. of England, stretching west as far as Torquay, and northwards to the borders of Yorkshire. Of course the adoption of an arbitrary limit of an inch is open to the objection that it does not represent a uniform ratio to the average, but on the other hand it represents a uniform quantity of water for the supply of springs and streams.

The main results of the table will perhaps be most readily grasped by summing the values for the different counties, as follows:—

				in.
Middlesex	5	stations	giving a mean of	.73
Surrey	4	”	”	.60
Kent	11	”	”	.32
Sussex	10	”	”	.34
Hants.....	6	”	”	.49
Berks.....	1	”	”	.70
Herts.....	3	”	”	.69
Essex	5	”	”	.51
Suffolk	3	”	”	.59
Norfolk.....	5	”	”	.88
Devon.....	1	”	”	.94
Lincoln.....	3	”	”	.82
Notts.....	2	”	”	.98
Derby.....	2	”	”	.96

It must be borne in mind that these figures do not represent the mean rainfall of the month over the different counties, but they probably indicate very fairly the relative intensity of the drought, and accepting the results we find the lowest values for the seaboard counties in the extreme S.E., Kent .32 in., Sussex .34 in., Hants .49 in., Essex .51 in., Suffolk .59 in., while Surrey .60 in. is much above the adjoining coast counties. Similarly Lincoln .82 in. gives a lower value than Notts .98 in., and Derby .96 in., inland.

TABLE I.—October Rainfalls of less than an inch.

STATIONS.	October, 1897.	Previous driest October.		Dura- tion of Record.	Other Octobers with less than 1·00 in.	
		Amount	Year.		Amount	Year.
I. London, Camden Square	in. ·56	in. ·80	1879	years. 40	in. ·99	1884
„ Willesden Green, Strode Road ...	·76	...	...	3		
„ Muswell Hill	·74	·77	1879	26		
„ Finchley, Etchingam Park.....	·69	1·24	1888	13		
„ Uxbridge, Harefield Park.....	·91	...	...	7		
II. Abinger Hall	·72	·85	1879	19		
„ Farnham, Great Down Seale	·58	...	...	8		
„ Reigate, Woodhatch Lodge.....	·52	1·08	1890	18		
„ Wallington	·58	1·16	1890	14		
„ Tenterden	·24	·82	1879	34		
„ Hythe	·33	·68	1866	33		
„ Folkestone, Cheriton Road	·22	...	...	6		
„ Tunbridge Wells, Camden Park ...	·32	1·40	1884	14		
„ Seven Oaks, Riverhead Vicarage..	·24	·58	1884	33		
„ Birchington, Thor	·28	...	...	6		
„ Sheppey, Leysdown	·20	1·24	1890	13		
„ Bickley, Elmhurst	·41	...	...	1		
„ „ The High Field	·37	1·04	1879	20		
„ Bromley, Widmore Road	·45	...	...	2		
„ Chislehurst, Southlaund	·44	...	...	4		
„ Chichester, Westgate	·50	·92	1879	66		
„ Steyning	·48	1·35	1890	30		
„ St. Leonard's, The Grove.....	·07	1·12	1879	21		
„ Hailsham	·30	·88	1879	25		
„ Isfield Place	·29	...	...	2		
„ Uckfield	·38	·77	1879	56		
„ Lindfield, Wood Knoll	·39	...	...	4		
„ Crowborough, The Observatory ...	·36	1·08	1879	27		
„ East Grinstead, Felbridge Place...	·40	...	...	3		
„ Ticehurst	·20	1·19	1890	15		
„ Ryde, Thornbrough	·44	1·24	1890	16		
„ „ St. John's Park	·43	...	...	5		
„ Emsworth, Redlands	·54	·99	1884	14		
„ Liss, Lingwood	·64	...	...	6		
„ Alton, Ashdell	·76	·86	1884	32		
„ Strathfieldsaye Gardens	·11	...	...	3		
„ Wantage, Letcombe Regis	·70	1·04	1879	21		
III. Broxbourne, Stafford House.....	·60	1·12	1884	18		
„ Great Berkhamstead, Rosebank..	·86	1·15	1888	13		
„ Hitchin, Wratten	·62	·61	1879	48	·92	1861
					·81	1871
					·97	1876
					·80	1888
IV. Southend Water Works	·15	·89	1890	17		
„ Manor Park, Albany Road	·42	...	...	7		
„ Harlow, Sheering	·77	·85	1879	34	·96	1871
„ Colchester, Hill House, Lexden ...	·48	...	...	9		
„ Saffron Walden, Newport.....	·71	·64	1879	22	·95	1888
„ Ipswich, Bishop's Hill	·47	·67	1879	26	·96	1888
„ Rendlesham Hall	·46	·55	1879	19	·78	1888

TABLE I.—October Rainfalls of less than an inch (continued).

STATIONS.	October, 1897.	Previous driest October.		Duration of Record.	Other Octobers with less than 1·00 in.	
		Amount	Years.		Amount	Year.
	in.	in.		years.	in.	
IV. Bury St. Edmunds, Westley	·85	·36	1866	41	{ ·53 1861 ·95 1871 ·81 1876 ·98 1879	
„ Harleston, Rushall Vicarage	·69	·91	1879	24		
„ Wymondham	·91	...	...	9		
„ Denver	·88	·55	1888	13		
„ Norwich, Brundall	·94	...	...	5		
„ Swaffham	·99	1·00	1888	20		
V. Torquay, Cary Green	·94	...	...	6		
VII. Grantham, Stainby	·84	..	...	9		
„ Boston	·91	·48	1888	31	{ ·71 1879 ·85 1890	
„ Horncastle, Hemingby	·70	·67	1888	17		
„ Worksop, Hodsock Priory	·97	·64	1888	23	·84	1879
„ Hesley Hall [Tickhill]	·99	·54	1888	23	{ ·96 1879 ·94 1884 ·86 1890	
„ Derby, Midland Railway	·97	·60	1888	15		
„ Duffield	·95	...	...	3		

TABLE II.—Rainfall of October, 1897, compared with that of the previous 25 or more Octobers.

DIVISION AND STATION.	1897.	Average.		1897 Per cent. of average.	Number of previous Octobers with less than	
		Amount.	Years.		1·00 in.	1897.
	in.	in.				
I. Camden Square ...	·56	2·71	40	21	2	0
„ Muswell Hill	·74	3·06	26	24	1	0
II. Tenterden	·24	3·58	34	7	1	0
„ Hythe	·33	4·19	33	8	1	0
„ Seven Oaks	·24	3·52	33	7	1	0
„ Chichester	·50	3·65	44	14	1	0
„ Steyning	·48	4·26	30	11	0	0
„ Hailsham	·30	4·06	25	7	1	0
„ Uckfield	·38	4·00	56	9	1	0
„ Crowborough	·36	4·38	27	8	0	0
„ Alton	·76	3·71	32	21	1	0
III. Hitchin	·62	2·69	48	23	5	1
IV. Sheering	·77	2·71	34	28	2	0
„ Ipswich	·47	2·70	26	17	2	0
„ Westley	·85	2·63	41	32	5	3
VII. Boston	·91	2·57	31	36	3	3
MEAN	·53	3·40	35	16	1·7	0·4

TABLE III.—Relation of the Rainfall of October, 1897, to the average, 1880-89.

STATIONS.	1897.	Per cent. of average 1880-89.	STATIONS.	1897.	Per cent. of average 1880-89.
	in.			in.	
<i>Middlesex</i> —			<i>Cornwall</i> —		
Camden Square	·56	19	Probus	1·69	31
Muswell Hill.....	·74	24	Polapit Tamar	1·50	30
<i>Surrey</i> —			<i>Gloucester</i> —		
Abinger Hall.....	·72	19	Clifton	1·22	34
Reigate	·52	15	Lechlade.....	1·39	51
<i>Kent</i> —			Stroud.....	1·56	51
Tenterden	·24	6	Cheltenham	1·48	50
Hythe.....	·33	7	<i>Hereford</i> —		
Sevenoaks	·24	7	Ross	1·84	56
<i>Sussex</i> —			<i>Shropshire</i> —		
Chichester	·50	15	Woolstaston	1·10	29
Steyning.....	·48	11	<i>Stafford</i> —		
St. Leonards	·07	2	Cheadle	1·11	32
Hailsham	·30	7	<i>Worcester</i> —		
<i>Hants</i> —			Diglis Lock	1·72	61
Ryde	·44	11	Lincombe Lock.....	1·19	41
Alton	·76	21	<i>Warwick</i> —		
<i>Herts</i> —			Coventry	1·81	57
Kensworth.....	·89	26	<i>Leicester</i> —		
Hitchin	·62	20	Rotherby Hall	1·36	44
<i>Buckinghamshire</i> —			<i>Lincoln</i> —		
Addington.....	1·24	40	Boston	·91	29
<i>Oxford</i> —			Bucknall	·70	22
Oxford	1·32	47	<i>Notts</i> —		
Banbury.....	1·64	54	Hodsock Priory	·97	31
<i>Northampton</i> —			Hesley Hall	·99	32
Castle Ashby.....	1·43	47	<i>Derby</i> —		
Sedgebrook	1·41	46	Derby.....	·97	29
<i>Cambridge</i> —			<i>Cheshire</i> —		
Wisbech	1·12	35	Hinderton	1·39	42
<i>Essex</i> —			<i>Lancashire</i> —		
Sheering	·77	26	Manchester	1·76	52
Newport.....	·71	23	Southport	1·87	53
<i>Suffolk</i> —			<i>York</i> —		
Ipswich	·47	15	Ribston Hall.....	1·57	50
Rendlesham	·46	14	Arncliffe.....	2·97	49
Bury St. Edmunds	·85	26	Ripon	1·72	46
<i>Norfolk</i> —			Hull	1·37	37
Rushall Vicarage	·69	19	<i>Northumberland</i> —		
Swaffham	·99	29	Unthank Hall	1·72	48
<i>Wilts</i> —			Newcastle	1·22	39
Alderbury	1·56	48	<i>Cumberland</i> —		
Bishops Cannings.....	1·46	45	Seathwaite.....	8·72	82
Mildenhall.....	1·59	49	Keswick	4·34	78
Swindon.....	1·47	47	<i>Wales (inc. Monmouth)</i> —		
<i>Dorset</i> —			Llanfrechfa	1·72	41
Blandford	1·44	34	Cardiff, Ely	1·91	42
<i>Devon</i> —			Llandovery	2·18	44
Holne Vicarage.....	2·33	33	Haverfordwest	1·96	38
Druid House	2·28	36	Gogerddan	1·81	34
Oakhampton	1·63	28	Nantgwillt.....	2·17	33
Barnstaple.....	1·39	27	Llandudno.....	1·46	43
Lynmouth	1·06	18			

Of the 61 stations included in the table, no fewer than 40 have records extending over periods ranging between ten and sixty years, which gives good evidence for determining how far the returns for 1897 are unparalleled. Of these 40 stations, 31 show a wholly unprecedented value for October, 1897; while the remaining 9 stations show between them 17 precedents distributed over the following years:—

	1861.	1866.	1876.	1879.	1884.	1888.	1890.
	in.	in.	in.	in.	in.	in.	in.
III. Hitchin.....	...	...	...	·61	...	...	...
IV. Newport .....	...	...	...	·64	...	...	...
,, Westley	·53	·36	·81	...	...	...	...
,, Denver .....	...	...	...	...	...	·55	...
VII. Boston .....	...	...	...	·71	...	·48	·85
,, Hemingby .....	...	...	...	...	...	·67	...
,, Hodsock .....	...	...	...	·84	...	·64	...
,, Hesley .....	...	...	...	·96	·94	·54	·86
,, Derby .....	...	...	...	...	...	·60	...
Instances each year	1	1	1	5	1	6	2

Eleven out of these 17 precedents come from Div. VII., where the 1897 fall for the 9 stations in table I. averages ·90 in., and where obviously the drought was not intense. On the other hand, the following 9 long records show no October fall smaller than that of 1897.

I. Camden Square	40 years.	II. Steyning	30 years.
II. Tenterden	34 ,,	,, Uckfield.....	56 ,,
,, Hythe.....	33 ,,	,, Alton	32 ,,
,, Seven Oaks	33 ,,	IV. Sheering.....	34 ,,
,, Chichester.....	66 ,,		

The latter columns of the table show the driest October previously recorded at each station, the period over which each record extends, and all other Octobers in which the fall was less than an inch. These give one of the strongest illustrations of the very exceptional character of the drought, for while there are 27 entries below ·50 in. for October, 1897, there are only two instances for all the other Octobers in the table numbering, wet and dry included, nearly 1,000. Namely, ·36 in. at Bury St. Edmunds in 1866, and ·48 in. at Boston in 1888. It should be mentioned that to avoid burdening the table with unimportant figures the “previous driest” is not given for stations at which the record does not extend over ten years.

Table II. gives a summary of the results for stations at which the records extend over 25 or more years, and in addition the percentage which October, 1897, bears to the average of the whole period, the number of instances of less than an inch of rain in October at each station, and the instances of any other October drier than 1897. It shows that at six stations the 1897 fall is less than 10 per cent. of

the average; and at only three is above 25 per cent. The Kent stations average 7 per cent., and the Sussex stations average 10 per cent.

At only three stations out of the sixteen has the fall been less in any other October than in that of 1897, viz. :—

Hitchin.....	October, 1897	^{in.} ·62	excelled in 48 years by	^{in.} ·61	in 1879
Westley.....	„ „	·85	„ „ 41 „ „	{	·53 „ 1861
					·36 „ 1866
					·81 „ 1876
Boston	„ „	·91	„ „ 31 „ „	{	·71 „ 1879
					·48 „ 1888
					·85 „ 1890

At the first of these stations, Hitchin, in a period of nearly half-a-century, the 1897 fall has been once—shall we say equalled—while at the other two, Westley, near Bury St. Edmunds, and Boston, the 1897 falls are decidedly large, so that the amounts for the six Octobers with smaller falls are not so remarkable as dozens of the 1897 returns, only two of them being below half-an-inch. It would perhaps be difficult to justify the line of means at the bottom of table II., but it is a ready method of getting a gross value, and according to it the 1897 falls average 16 per cent. of the mean of 35 years, and the October fall will be less than an inch once in 21 years, while the 1897 value averages just over half-an-inch.

Table III. gives for 72 stations in England and Wales the rainfall of October, 1897, expressed as a percentage of the average for the month during the ten years 1880-89. It, like table I., emphasizes the fact that the deficiency was greatest in the extreme S.E., and greater on the S. and E. coasts than inland.

Taking the average of the records for each county, Kent heads the list with only 7 per cent. of the average, and Sussex follows with 9 per cent. Hampshire, Surrey and Suffolk show 16, 17 and 18 per cent. respectively. Middlesex 22, Herts 23, Essex 24, and Norfolk 24, complete the list of counties with less than a quarter of the average. Less than one third of the average fall is indicated for Lincoln 26 per cent., Devon 28, Shropshire 29, Derby 29, Cornwall 30, Stafford 32, and Nottingham 32. The counties recording from one-third to half the average are Dorset 34 per cent., Cambridge 35, Bucks 40, Cheshire 42, Leicester 44, Northumberland 44, York 45, Northampton 47, Wilts 47, Gloucester 47, and Oxford 50. Hereford, Worcester, Warwick, and Lancashire show values of from 50 to 60 per cent., while Cumberland foots the list with 80 per cent. A larger number of stations in each county would probably modify to some extent the foregoing values, but if they are plotted on a map it will be seen that they are much more accordant than might reasonably have been expected.

The Welsh stations give remarkably uniform results, ranging only from 33 per cent. of the average at Nantgwilt, Radnorshire, to 44 per cent. at Llandovery, Carmarthenshire, the average for all the stations in the Principality being 39 per cent.

The general distribution over the country will perhaps be most readily indicated by grouping the stations under the divisions used in *British Rainfall*, when we get the following results.

Division				
I.	Middlesex	22	per cent.	of the average 1880-89
„	II. South Eastern Counties....	11	„	„
„	III. South Midland „ ...	39	„	„
„	IV. Eastern Counties.....	22	„	„
„	V. South Western Counties...	36	„	„
„	VI. West Midland „ ...	46	„	„
„	VII. North „ ...	31	„	„
„	VIII. „ Western „ ...	49	„	„
„	IX. Yorkshire	45	„	„
„	X. Northern Counties.....	62	„	„
„	XI. Monmouth and Wales.....	39	„	„

Again very accordant values, lowest in the S.E., very small in the E., small along the S., S.W., and N.E. coasts, and increasing N. Westwards, but with rather unduly high values for the west midland counties.

The rapid increase of the 1897 fall, with increased distance from the sea coast already referred to, is very marked, and is well exhibited by the following:—

COAST STATIONS.		INLAND STATIONS.	
County.	Station.	Per cent. of aver.	Station.
<i>Hants</i>	Ryde.....	11	Alton.....
<i>Suffolk</i>	Rendlesham....	14	Bury St. Edmunds. 26
<i>Devon</i>	Lynmouth.....	18	Oakhampton..... 28
<i>Gloucester</i>	Clifton.....	34	Lechlade..... 51
<i>York</i>	Hull.....	37	Arncliffe..... 49
<i>Northumberland</i> ..	Newcastle.....	39	Unthank Hall 48

In Sussex the difference between Coast and Inland stations is marked by the rapid increase from E. to W.

AUSTRIAN HYDROGRAPHY.*

It is a very strong and remarkable statement to make, but, to the best of our belief, it is true, that no Government Department ever started so nearly perfect an organization as that presided over by K. K. Oberbaurath Ernst Lauda.

Generally, early publications are more or less of an experimental character; and it is by degrees only that completeness is reached; but Herr Lauda's first volume will rank with, if not surpass, anything that we have ever seen for any country in the world. As for England, we have absolutely nothing to put beside these splendid Austrian volumes.

* Jahrbuch der K. K. hydrographischen Central-Bureau Jahrgang I.-III., 1893-95. Braumüller, Wien, 1895-97. 3 vols., large 4to, 562, 552, 1330 pages and numerous maps.

Beiträge zur Hydrographie Oesterreichs 4to 68 pages, and atlas on the scale of $\frac{1}{750,000}$ (about 12 miles to an inch).

The last being by far the largest of the three annual volumes, and of course giving the latest details as to the organization, we will base our remarks upon it. It consists of fifteen parts issued in a portfolio. The first part is a general introduction, with a map (about 2 ft. by 1½ ft.) on the scale of 35 miles to an inch of the principal river basins, showing also isohyetal lines for each 200 mm. (8 inches) of annual rainfall in the year 1895. It deals exclusively with details of the organization, and gives lists of the localities at which the observations are made. There are 2261 rainfall stations, and 28 additional ones for recording the depth of snow; and there are 872 stations at which the level of the water in the rivers and streams is measured daily.

Parts I. to XIV. deal with the several principal watersheds. Each part is alike in treatment, and, as it might be imagined that Part I.—Das Donau-Gebeit (The Watershed of the Danube)—was exceptionally good, we take Part IV.—Das Drau-Gebiet, or, as Englishmen would call it “The Watershed of the Drave.” [*Why* it is not the rule for all countries to accept the local orthography of place-names we know not. To us it seems very absurd to write Vienna when we mean Wien, or Londres when we mean London; but it will be put right some day.]

This Part (IV.) deals with an area of about 12,000 square miles (about twice the size of Wales) which is roughly accordant with the district of Carinthia, has the Carnic Alps for its S.W. boundary, and the towns of Klagenfurt and Graz near its centre.

In this area there are 111 rain gauge stations at the following altitudes above sea level :—

14 between 656 and 1312 ft.	14 between 3281 and 3937 ft.
27 „ 1312 „ 1969 „	7 „ 3937 „ 4593 „
27 „ 1969 „ 2625 „	4 „ 4593 „ 4921 „
16 „ 2625 „ 3281 „	2 „ 5906 „ 7218 „

The level of the water in the rivers was observed at 74 stations; temperature of water and of air at a few of them.

First in the part comes a list of the stations, with the latitude, longitude, and altitude of each, and the observer's name and profession (mostly clergy or schoolmasters); then follow tables of the daily rainfall at each station, and various analyses, and a carefully prepared summary of them. The wettest station is Raibl (lat. 46° 30', long. 13° 35' E., altitude 2461 ft.), where the total in 1895 was 90·83 in., which was about 5 inches above its average; but the most remarkable feature was the rain at that station on October 8th and 9th, 1895, viz., 5·91 and 7·37 (*i.e.*, 13·28 inches in two days). The editor throws no doubt upon the record, and we see that at many drier stations the fall was between 5 and 7 inches.

Of course, on turning to the latter portion of the work, where the daily height of the water in the rivers is given, we expected to find this enormous rainfall produce a marked effect; and so we do, rises of 5 to 10 ft. being reported at most stations.

These water levels are given in the same detail as the rainfall, and we are glad to note that many of the observers did not content themselves with their usual daily observation on the day of the flood (generally October 10th), but took extra readings so as to obtain the true maximum.

Lastly we must mention the exquisitely beautiful large-scale shaded rainfall map given in each part.

Although it occurs in another section (Part. IX.), we ought not to omit to mention the enormous rainfall in some parts of Dalmatia ; we therefore give it in tabular form.

Place.....	Crkvice.	Jankov vrh.	Sa. Croce.	Goli vrh.	Jablanica gornja.
Latitude N.....	42° 34'	42° 35'	42° 29'	42° 32'	43° 40'
Longitude E. of Gr.	18° 38'	18° 40'	18° 42'	18° 44'	17° 46'
Altitude	3599 ft.	3343 ft.	558 ft.	4301 ft.	630 ft.
	in.	in.	in.	in.	in.
1895, January ...	52·09	16·42	16·50	8·35	15·75
February ...	36·93	21·58	16·38	14·69	10·55
March	17·05	16·73	10·16	6·61	10·35
April	13·82	17·60	11·38	13·15	8·94
May	11·54	15·35	5·63	4·84	7·01
June	3·74	3·78	(5·59)	6·06	1·85
July	4·17	4·10	3·58	4·17	3·39
August.....	·98	·43	·39	·83	2·01
September .	·32	1·06	1·42	·51	2·12
October ...	21·10	(33·34)	16·61	29·61	15·28
November..	7·13	4·09	3·66	6·89	5·71
December ..	39·92	41·07	16·54	9·61	15·43
Total for 1895 ...	208·79	(175·55)	(107·84)	105·32	98·39
„ „ 1894 ...	109·34	...	58·27	80·28	52·84
„ „ 1893 ...	159·26	131·93	80·00	108·39	(62·37)

NOTE.—Italic figures indicate results partly observed and partly computed.

It would require weeks of work to justify the expression of an opinion as to the accuracy of the thousands of figures in these volumes, but our impression is that the work is very good. We have noticed only two doubtful entries, both in the first year, 1893. On page 53 the daily rain record for the Schmelz Reservoir at Vienna on January 22nd is 3·2 mm ; it probably should be 23·2 mm, as all the other stations near Vienna had between 15 and 27 mm. And on p. 373 of the same volume we think that the river level at Primiero on February 4th should have been - 20, not - 30 ; very probably the observer reported - 30, but we do not believe it to be correct.

The whole work is so exceptionally good that we can suggest but few directions in which improvement seems desirable. We have seen no reference to the pattern of rain gauge used, to the height of

the funnels above the ground, or to the time of observation either of the rainfall or of the rivers. Details on these points are desirable.

There seems a little vagueness in the reference to average rainfall. The fall in the year 1895 is for several stations compared with the average, but we are not told of what years the average is computed, or whether it is of synchronous years at all stations.

It is perhaps not unreasonable to hope that a Bureau which is doing such splendid current work, and doing it so sumptuously, will before long take up the subject of old observations and give us an authoritative and exhaustive statement as to the rainfall of bygone years, so that we may have the best available information as to the secular variation of the fall of rain in the Austrian Empire.

There is no reference to the volume of water discharged by the rivers, or to the relation between it and the rainfall. Apparently the existing organization could give information of great importance as to the flow from large areas, and we hope that before long it will do so.

REVIEW.

The Great Meteoric Shower of November, by W. F. DENNING, F.R.A.S
(Reprinted from *The Observatory*.) Taylor & Francis, Red Lion Court. 1897, 8vo. 52pp., 1 plate.

ALL who wish to know the history of the great meteor shower which (whatever it may be in the early hours of November 15th and 16th, 1897) will probably be grand on November 14th and 15th, 1898, should obtain this pamphlet.

Mr. Denning is a recognized leader in this class of work, and as such his words carry great weight. We see that on page 31 he says that one observer must have made a mistake when he said that "the largest of the 1866 shower was not twice the apparent brilliancy of Sirius"; but as Mr. Denning quotes without criticism somewhat similar statements by such authorities as Backhouse, Hind, and Baxendell, there is no need for us to do more than shrug our shoulders and leave Mr. Denning to believe in "half the size of the moon" if he likes. Those who saw the shower know that the startling feature was, not the magnitude of the individual meteors, but their great number.

The pamphlet would have been improved by an index or table of contents, and we see no reference to efforts to photograph the area surrounding the radiant, and very little respecting the curious and frequent appearance of end-on meteors, *i.e.*, those directed precisely towards the observer, who sees first a point of light which increases in magnitude, becoming hazy at the edges, and then suddenly dies out; but there is so much in the pamphlet that is useful and interesting that few will go without the best publication on the subject.

INCREASED CLOUDINESS OF MALTA.

To the Editor of the Meteorological Magazine.

SIR,—In the *Meteorological Magazine* for September last (p. 121), touching upon the increased cloudiness of Malta registered during the last five years, you ask whether the change may not be due to a change of observers. The same question occurred to me some time ago, and set me to hunt up our record to see whether the variation in readings was really due to a change in the weather. The result of my search completely vindicated the observers. It is quite true that changes of observer have taken place. Previous to the winter of 1890-91, the Rev. J. Scoles, S.J., took all the observations. Towards the end of 1890 I assisted him, taking the morning observations, whilst he took those in the evening. In September, 1893, the Rev. R. Stevenson, S.J., took all the observations, and has done so ever since. Numerous comparisons shewed that my estimate of cloud agreed with that of the Rev. J. Scoles, and that the Rev. R. Stevenson's agreed with mine. The change then has been one of weather, more or less coincident with a change of observer. The spring and summer months here are characterised by sunny blue skies and very little cloud. Most of our cloudiness occurs in the autumn and winter months. During these latter months, east and southerly winds (warm, with high dew point) bring, almost invariably, overcast skies. A high average dew point for these months may then be taken to indicate the prevalence of these winds, and consequently of cloudiness. [*e.g.* As I write, a mild "sirocco," or S.E. wind is blowing, temp. 69°·5, dew point 67°·8, and the sky is completely overcast]. The following table, drawn up from our record, shews that, during the last five years, the dew point for the autumn and winter months has been very notably higher than during the five years preceding.

MEAN DEW POINT.

	Five years (1887-91).			Five years (1892-96).	
January.....	45·4	45·0	October.....	60·4	62·8
February.....	45·1	47·7	November.....	53·6	55·3
September.....	65·3	66·0	December.....	48·8	49·1

As personal equation will not account for this remarkable rise in dew point, I think that this table shews that there was, in all probability, as much cloud in the sky as the observers estimated. Again, our record of wind direction is explicit as to the unusual prevalence of southerly winds (called here "Venti bassi") during the last, as contrasted with the preceding, five year period.

I am, yours sincerely,

J. F. DOBSON, S.J.

St. Ignatius' College, Malta, October 18th, 1897.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MAY, 1897.

STATIONS. <i>(Those in italics are South of the Equator.)</i>	Absolute.				Average.				Absolute.		Total Rain.		Aver. Cloud.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
England, London	78·0	18	33·9	13	63·7	43·2	41·1	67	124·7	27·1	1·08	9	4·8
Malta.....	79·3	30	50·1	17	70·7	58·0	55·1	76	150·9	45·5	1·41	8	5·3
<i>Mauritius</i>	82·5	20	57·4	21	78·5	66·7	61·6	71	127·6	49·1	·66	6	4·4
Calcutta	104·6	9	70·2	30	95·6	79·0	75·2	68	161·7	66·9	3·78	6	3·8
Bombay.....	93·3	28	77·8	2	90·7	80·7	76·3	74	146·7	70·7	·00	0	3·3
Ceylon, Colombo	92·2	5	75·0	26	89·7	79·7	75·6	80	143·0	73·0	8·30	19	6·8
<i>Melbourne</i>	70·9	12	33·5	21 ^c	60·5	43·5	42·8	69	120·0	23·2	1·97	8	5·7
<i>Adelaide</i>	72·2	16	41·5	21	65·0	48·7	44·9	67	133·0	31·6	2·09	12	5·2
<i>Sydney</i> .....	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>Wellington</i>	65·5	7	35·0	21 ^e	60·4	47·8	44·8	70	114·0	23·0	1·97	11	4·1
<i>Auckland</i>	70·0	3	40·5	24	63·1	50·6	47·6	71	124·0	34·0	6·63	19	5·8
Jamaica, Kingston.....	90·4	8 ^a	69·9	18	87·9	73·6	72·2	72	...	...	3·47	11	4·9
Trinidad	91·0	4 ^b	68·0	4	91·0	72·0	71·9	74	173·0	66·0	5·58	14	...
Grenada.....	87·0	16	72·4	19 ^d	84·7	74·8	70·6	75	148·0	...	5·88	25	2·0
Toronto	73·0	18	34·9	2	61·0	44·1	43·5	69	88·5	27·2	3·02	12	6·8
New Brunswick, Fredericton	74·3	14	28·5	9	61·1	40·3	40·6	69	...	...	6·54	18	7·2
Manitoba, Winnipeg...}	88·0	4	23·0	31	67·8	38·3	...	...	...	...	1·59	11	4·5
British Columbia, Esquimalt	83·4	28	39·2	2	63·1	45·2	46·7	81	...	...	·62	7	4·9

a—and 23. b—and 8, 11, 12, 13. c—and 22. d—and 26. e—and 30.

REMARKS.

MALTA.—Adopted mean temp. 62°·9, or 1°·2 below the average. Mean hourly velocity of wind 12 miles. Average sea temp. 66°·0. TSS on 4th and 24th; L on 28th; H on 24th. Slight earthquake shocks on 27th. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·8, of dew point 2°·6, and rainfall 3·62 in., below their respective averages. Mean hourly velocity of wind 11·7 miles, or 1·5 above average; extremes, 28·1 on 29th, and 1·6 on 1st; prevailing direction E.S.E. Rainfall the least in May since 1875, excepting 1880, when ·49 in. fell. T. F. CLAXTON.

CEYLON, COLOMBO.—Thunderstorms occurred on 5 days. L on the 27th.

R. V. ALLEN.

Adelaide.—Mean temp. 0°·8 below, and rainfall ·80 in. below, the average of 40 years. The drought appears to be gradually breaking up, fair rains having fallen over a large portion of the colony. C. TODD, F.R.S.

Wellington.—Generally fine weather, with occasional showers and variable winds, up to the 26th; showery for the remainder of the month. Strong winds on five days from W. and N.W. L on 30th; S on hills on 30th and 31st; H on 30th. Temp. 2°·1 above, and rainfall 2·91 in. below, the average. R. B. GORE.

Auckland.—A wet and stormy month, the rainfall being 1·75 in. over the average, and the highest recorded in May since 1883. Mean temperature slightly under the average of 30 years. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Heaviest rainfall on 5th when 1·75 in. fell in 1 hr. 45 min., between 7 and 9 p.m. TSS from the middle to the close of the month. J. F. BRENNAN.

J. H. HART.

TRINIDAD.—Rainfall 1·93 in. above the average of 30 years.

SUPPLEMENTARY TABLE OF RAINFALL,
OCTOBER, 1897.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	·91	XI.	Rhayader, Nantgwillt ...	2·17
II.	Dorking, Abinger Hall .	·72	„	Lake Vyrnwy	1·80
„	Birchington, Thor	·28	„	Corwen, Rhug	1·34
„	Hailsbam	·30	„	Criccieth, Talarvor	1·26
„	Ryde, Thornbrough	·44	„	I. of Man, Douglas	2·32
„	Emsworth, Redlands ...	·54	XII.	Stoneykirk, Ardwell Ho.	2·44
„	Alton, Ashdell	·76	„	New Galloway, Glenlee	3·80
III.	Oxford, Magdalen Col.	1·32	„	Moniavie, Maxwellton Ho.	3·12
„	Banbury, Bloxham	1·64	„	Lilliesleaf, Riddell	1·80
„	Northampton, Sedgebrook	1·41	XIII.	N. Esk Res. [Penicuick]	1·85
„	Duddington [Stamford].	1·05	XIV.	Glasgow, Queen's Park..	1·71
„	Alconbury	1·01	XV.	Inverary, Newtown	4·93
„	Wisbech, Bank House...	1·12	„	Oban, The Corran .....	...
IV.	Southend	·15	„	Islay, Gruinart School ...	1·73
„	Harlow, Sheering.....	·77	XVI.	Dollar	1·45
„	Colchester, Lexden	·48	„	Balquhiddier, Stronvar...	5·33
„	Rendlesham Hall	·46	„	Ballinluig	2·92
„	Rushall Vicarage	·69	„	Dalnaspidal H.R.S.....	5·06
„	Swaffham	·99	XVII.	Keith H.R.S.....	1·59
V.	Salisbury, Alderbury ...	1·56	„	Forres H.R.S.	1·00
„	Bishop's Cannings	1·46	XVIII.	Fearn, Lower Pitkerrfe..	1·73
„	Blandford, Whatcombe .	1·44	„	N. Uist, Loch Maddy ...	2·80
„	Ashburton, Holne Vic...	2·33	„	Invergarry	4·32
„	Okehampton, Oaklands .	1·63	„	Aviemore H.R.S.	1·50
„	Hartland Abbey	1·39	„	Loch Ness, Drumnadrochit	1·86
„	Lynmouth, Glenthorne.	1·06	XIX.	Invershin	3·93
„	Probus, Lamellyn	1·69	„	Scourie .....	...
„	Wellington, The Avenue	1·23	„	Watten H.R.S.....	3·22
„	Wincanton.....	1·53	XX.	Dunmanway, Coolkelure	7·91
VI.	Clifton, Pembroke Road	1·22	„	Cork, Wellesley Terrace	4·84
„	Ross, The Graig	1·84	„	Killarney, Woodlawn ...	5·92
„	Wem, Clive Vicarage ...	1·38	„	Caher, Duneske	3·88
„	Cheadle, The Heath Ho.	1·11	„	Ballingarry, Hazelfort...	2·82
„	Worcester, Diglis Lock	1·72	„	Limerick, Kilcornan ...	2·04
„	Coventry, Priory Row ..	1·81	„	Broadford, Hurdlestown	...
VII.	Grantham, Stainby	·84	„	Miltown Malbay	3·73
„	Horncastle, Bucknall ...	·70	XXI.	Gorey, Courtown House	2·83
„	Worksop, Hodsck Priory	·97	„	Athlone, Twyford	2·76
VIII.	Neston, Hinderton	1·39	„	Mullingar, Belvedere ...	2·87
„	Southport, Hesketh Park	1·87	„	Longford, Currygrane...	2·97
„	Broughton-in-Furness ...	3·57	XXII.	Woodlawn	2·97
IX.	Ripon, Mickley	1·72	„	Crossmolina, Enniscoe ..	3·67
„	Melmerby, Baldersby ...	2·09	„	Collooney, Markree Obs.	2·56
„	Scarborough, Observat'y	1·64	„	Ballinamore, Lawderdale	3·13
„	Middleton, Mickleton ...	1·80	XXIII.	Warrenpoint.....	2·60
X.	Haltwhistle, Unthank...	1·72	„	Seaforde.....	3·25
„	Bamburgh.....	1·32	„	Belfast, Springfield	2·18
„	Keswick, The Bank	4·34	„	Bushmills, Dundarave..	2·24
XI.	Llanfrechfa Grange	1·72	„	Stewartstown	3·50
„	Llandoverly	2·18	„	Killybegs	3·07
„	Castle Malgwyn	3·06	„	Lough Swilly, Carrablagh	2·68
„	Builth, Abergwesyn Vic.	2·78			

OCTOBER, 1897.

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) ...	.56	— 2.33	.14	18	9	67.2	17	31.9	7	1	7
II.	Tenterden .....	.24	— 3.79	.09	2, 18	7	66.0	19	33.5	8	0	4
III.	Strathfieldsaye .....	.11	...	.04	25	5	...	...	...	...	...	...
IV.	Hitchin .....	.62	— 2.45	.19	18	13	65.0	17	30.0	6	3	...
V.	Winslow (Addington)	1.24	— 1.85	.41	18	9	66.0	17 ^b	28.0	6	3	6
VI.	Bury St. Edmunds (Westley) .....	.85	— 2.42	.39	2	8	63.0	17	37.0	...	0	...
VII.	Norwich (Brundall) .....	.94	...	.29	19	15	66.6	17	32.4	7	0	6
VIII.	Weymouth (Langton Herring) .....	...	...	...	...	...	...	...	...	...	...	...
IX.	Torquay (Cary Green) .....	.94	...	.50	15	8	62.9	2	40.3	7	0	0
X.	Polapit Tamar [Launceston]	1.50	— 3.43	.56	14	14	66.2	19	30.3	7	2	3
XI.	Stroud (Upfield)	1.56	— 1.47	.55	15	11	64.0	1, 17	37.0	6 ^f	0	...
XII.	Churchstretton (Woolstaston)	1.10	— 2.67	.55	15	10	63.5	18	38.0	12 ^g	0	0
XIII.	Tenbury (Orleton) .....	...	...	...	...	...	...	...	...	...	...	...
XIV.	Leicester (Rotherby Hall) ...	1.36	...	.53	15	21	72.0	30	25.0	6	5	23
XV.	Boston .....	.91	— 2.20	.33	2	12	64.0	17	32.0	26	1	...
XVI.	Hesley Hall [Tickhill] .....	.99	— 2.11	.28	2	12	67.0	17	32.0	6, 26	1	...
XVII.	Manchester (Plymouth Grove)	1.76	— 1.61	.55	14	7	66.0	29	34.0	11	0	1
XVIII.	Wetherby (Ribston Hall) ...	1.57	— 1.56	.62	14	6	...	...	...	...	...	...
XIX.	Skipton (Arncliffe)	2.97	— 3.06	.90	14	11	...	...	...	...	...	...
XX.	Hull (Pearson Park)	1.37	— 2.28	.43	2	7	65.0	17	30.0	13 ^h	2	7
XXI.	Newcastle (Town Moor)	1.22	— 1.90	.53	14	5	...	...	...	...	...	...
XXII.	Borrowdale (Seathwaite)	8.72	— 1.87	1.64	16	15	...	...	...	...	...	...
XXIII.	Cardiff (Ely)	1.91	— 2.63	.39	14	12	...	...	...	...	...	...
XXIV.	Haverfordwest	1.96	— 3.19	.71	14	16	62.9	17	32.8	13	0	7
XXV.	Aberystwith (Gogerddan) ...	1.81	— 3.54	.60	2	10	68.0	28	26.0	23	8	...
XXVI.	Llandudno	1.46	— 1.93	.54	2	15	66.0	17	42.0	13	0	...
XXVII.	Cargen [Dumfries]	2.88	— .38	.76	14 ^a	8	64.0	22	26.0	14	2	...
XXVIII.	Edinburgh (Blacket Place) ...	1.27	...	.48	14	10	64.5	17	29.7	14	2	4
XXIX.	Colmunnell	2.60	...	.52	16	12	70.0	6	27.0	13	...	...
XXX.	Lochgilthead (Kilmory)	3.98	— .81	.74	16	15	...	...	25.0	13	2	...
XXXI.	Mull (Quinish)	3.59	— 1.70	.58	17	15	...	...	...	...	...	...
XXXII.	Loch Leven Sluices	1.70	— 1.26	.70	16	7	...	...	...	...	...	...
XXXIII.	Dundee (Eastern Necropolis)	2.20	— .04	1.05	15	14	61.0	3	29.7	14	2	...
XXXIV.	Braemar	2.74	— .87	.90	17	15	64.2	22	24.0	26	8	20
XXXV.	Aberdeen (Cranford)	2.58	...	1.44	16	17	64.0	21 ^c	29.0	13	2	...
XXXVI.	Cawdor (Budgate)	1.13	— 1.60	.28	15	11	...	...	...	...	...	...
XXXVII.	Strathconan [Beaully]	4.23	— .42	.96	15	8	...	...	...	...	...	...
XXXVIII.	Glencarron Lodge	6.11	...	.91	10	18	65.0	27	29.6	14	1	...
XXXIX.	Dunrobin	3.14	— .17	1.20	15	14	62.0	20	31.0	14	3	...
XL.	S. Ronaldsay (Roeberry)	3.03	— .70	.48	15	17	57.0	21 ^d	36.0	14	0	...
XLI.	Darrynane Abbey	4.34	...	.93	13	20	...	...	...	...	...	...
XLII.	Waterford (Brook Lodge) ...	3.52	— .30	.90	16	14	64.0	1	33.0	12	0	...
XLIII.	O'Briensbridge (Ross)	3.70	...	.49	17	15	...	...	...	...	...	...
XLIV.	Carlow (Browne's Hill)	3.01	— .28	.79	14	13	...	...	...	...	...	...
XLV.	Dublin (Fitz William Square)	2.11	— 1.27	.64	14	14	62.9	17	36.1	12	0	0
XLVI.	Ballinasloe	3.07	+ .08	.74	16	19	59.0	17 ^e	37.0	12	0	...
XLVII.	Clifden (Kylemore)	4.95	...	1.44	16	13	...	...	...	...	...	...
XLVIII.	Waringstown	2.63	— .08	.86	14	14	65.0	21	29.0	12	1	7
XLIX.	Londonderry (Creggan Res.)	3.30	— .37	1.03	15	16	...	...	...	...	...	...
L.	Omagh (Edenfel)	3.43	+ .33	1.05	14	15	61.0	20	32.0	12	1	3

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

a—and 16. b—and 18, 30. c—and 22. d—and 28. e—and 20. f—and 7, 12.
g—and 13. h—and 14.

METEOROLOGICAL NOTES ON OCTOBER, 1897.

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

ENGLAND.

TENTERDEN.—By far the driest October recorded; 1879, with $\cdot 87$ in., being the only other year out of 35 without an inch of R; 1890, with $1\cdot 21$ in., was the last dry October. Ground remarkably dry, and ponds and wells very low. Mean temp. 5° higher than in 1896. Dews heavy, especially at the end of the month, but weather beautiful and like spring. Total sunshine 157 hours.

HITCHIN.—The driest October since 1878, and the second driest October in our record, which extends to 1849.

ADDINGTON.—A fine October; some days very fine, particularly the 30th, which was quite summer-like, bright and warm, while the 31st was foggy and cold, with a max. temp. 18° lower. Small rainfall, and little frost after that of the 6th, which cut off tender plants. Grand weather for the land; seed-corn got in in fine condition, and root crops well secured. Foggy on six days.

BURY ST. EDMUNDS, WESTLEY.—A very beautiful autumnal month, and the driest October since 1876. From the 14th very mild and summer-like, with foggy mornings and sunny days. Dense fog on 31st.

NORWICH, BRUNDALL.—The finest October for many years, and the driest since 1879. Rainfall $2\cdot 11$ in. below the average. Mean bar. pressure $30\cdot 187$ in. Mean temp. $50^{\circ} 6$. Dense fog on 19th. Wet fogs from 26th to 31st.

TORQUAY, CARY GREEN.—Rainfall $3\cdot 41$ in. below the average. Total R of the ten months $\cdot 89$ in. above the average. Mean temp. $54^{\circ} 2$, or $3^{\circ} 1$ above average. Duration of sunshine 97 hours 45 minutes, being 18 hours 35 minutes below the average. Ten sunless days.

POLAPIT TAMAR.—Uncommonly dry; the smallest rainfall for October during the past 17 years. Very calm generally throughout the month, and warm for the time of year. Prevalent winds easterly. Gale on 17th. Thick fog at night on 19th.

WOOLSTASTON.—A beautiful, bright, sunny, autumn month, with no frost and but little rain, except on the 15th, when it fell heavily. Mean temp. $50^{\circ} 3$.

ROTHERBY HALL.—The driest October since 1888, when only $\cdot 51$ in. fell, the R being $1\cdot 70$ in. below, or considerably less than half, the average of ten years. Although R fell in small quantities on 21 days, there were mild, bright intervals, and the autumnal tints have been more beautiful than usual. The ground was so hard that the customary first meet of the Quorn hunt (Nov. 1st) had to be postponed. Mean temp. $49^{\circ} 0$.

MANCHESTER, PLYMOUTH GROVE.—The rainfall of the month is the smallest in October for 31 years, with the one exception of October, 1888, when the rainfall was the same. Dense fog on 1st. T and L on the 10th. Fine autumn weather from the 16th to the end of the month, and very mild for the season.

ARNCLIFFE.—A very dry month, with little frost.

HULL, PEARSON PARK.—Fogs on 7 days, and all day on 30th.

WALES.

HAVERFORDWEST.—Since October, 1850 and 1879, there have been no very dry Octobers; in the first-mentioned year the fall was $2\cdot 09$ in., and in the second $2\cdot 27$ in.; thus it will be seen that October, 1897, had the least R of the series commencing 1849. Although the rainfall was small, there was a great deal of broken weather, and it was very wet from the 13th to 19th, with moderate gales from 15th to 17th. The last week was fine, with bright days and hoar frost on some nights. The month generally was mild, and the shade temp. did not fall below 32° . Fog on 7th, 19th, 20th and 28th.

ABERYSTWITH, GOGERDDAN.—Beautiful weather throughout the month, bright, and some days very hot. The finest October remembered.

SCOTLAND.

CARGEN [DUMFRIES].—The month was characterised by very marked deviations from the means of 38 years; the bar. pressure being greater by $\cdot 269$ in., the temp. higher by $1^{\circ}6$, than the averages; while there was $1\cdot 61$ in. less R and 44 hours more sunshine. The mean reading of the bar. for the month has only once been exceeded, in October 1879. Temp. has been higher and R less in 6 years since 1860, while only in 1870 and 1872 has more sunshine been recorded. The 14th was remarkably cold, the temp. not rising above 42° , and falling as low as 26° ; on the 15th the mean temp. was $47^{\circ}5$, and continued to rise until it reached $57^{\circ}6$, on the 17th; for the seven days 16th to 22nd inclusive, the mean was $53^{\circ}1$. $2\cdot 42$ in. of R fell in the four days 14th to 17th, but no R fell after the 17th. Light easterly winds were prevalent. L on 23rd, and T on 29th.

EDINBURGH, BLACKET PLACE.—Mean pressure $30\cdot 106$ in., the highest in October since 1866. Mean temp. $2^{\circ}0$ above the average. Fog on 6 days, the greatest number in October since 1827, with six fogs, but in 1786 seven fogs were recorded. S.W. gale on 16th and 17th.

COLMONELL.—Rain $2\cdot 33$ in. below, and mean temp. $4^{\circ}6$ above, the average of 21 years.

MULL, QUINISH.—Wet and stormy till the 18th, then high temp. and constant sunshine. Laburnums in flower on 23rd, and ripe raspberries picked on 28th.

BRAEMAR.—Changeable and disagreeable to the 18th, but from thence finer weather could not be desired.

ABERDEEN, CRANFORD.—Warm for October, the min. temp. being above 50° on several nights.

S. RONALDSAY, ROEBERRY.—The first half of the month was wet, the second half very fine. Mean temp. $48^{\circ}5$, or $2\cdot 5$ above the average of 7 years.

IRELAND.

DARRYNANE ABBEY.—A fairly dry month, except from 11th to 18th inclusive, when $3\cdot 03$ in. of R fell, $2\cdot 70$ in. of which was on 13th, 14th, 15th and 16th. Nearly all the fall of $\cdot 83$ in. on the 16th was after 6.30 p.m. L and a heavy peal of T on 15th.

WATERFORD, BROOK LODGE.—A very mild month, although there was a good deal of easterly wind. T and L between 10 and 11 p.m. on 15th.

O'BRIENSERIDGE, ROSS.—Perfect weather from 17th to 28th; the days bright, warm and calm, and the nights fine, but chilly.

DUBLIN, FITZWILLIAM SQUARE.—Quite unlike the cold Octobers of 1894, 1895 and 1896, this month was strangely genial and fine; the temp. of the air actually rose towards the close, thus reversing the seasonal change for the time of year. The weather of the second week was, indeed, rough and wet; but this only accentuated the quietness and mildness of the beginning and end of the month. The mean temp., $52^{\circ}3$, is $2^{\circ}6$ above the average. The temp. in screen did not fall to 36° , or on the grass to 32° . L was seen on the 15th. High winds occurred on 9 days, attaining the force of a gale on 10th, 16th and 17th. Fog on 9 days; H on 10th; lunar halo on 7th; solar halo on 28th.

WARINGSTOWN.—A very fine month, with only a week's rain in the middle. Unusually warm; sub-tropical plants in sheltered situations being still uninjured at the end.

EDENFEL.—With the exception of the second week, when rains of a torrential character fell on three days, the month was one of the most remarkable Octobers on record, not only from the absence of R at other times, but from the frequently clear, and always calm and mild, atmosphere prevailing throughout.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXXIII.] DECEMBER, 1897. [PRICE FOURPENCE,
or 5s. per ann. post free.

A WET DAY IN A WET DISTRICT.

To the Editor of the Meteorological Magazine.

SIR,—When a man in any part of Britain finds over six inches of rain collected in his gauge in a day, it shows no unreasonable inquisitiveness if he asks his neighbours how they fared. Such was my position on the morning of 13th November, 1897, and I think your readers will care to see the result of my enquiry. There was nothing to call a storm—certainly no thunder storm—anywhere, only the rain kept pegging away (in my case for 23 hours out of the 24), as if it meant business, and indeed it was not idle the next day, for I measured 1·00 in. for 13th November.

I give, in the subjoined table, the record for 12th November: at 14 stations in “the Lake District,” and add the number of days on which the same gauges have registered 3·00 in., or more, in a day, during the 7 years 1890–96, and the highest day’s record in the same period. But, as these stations are in a wet district, I add also the average yearly rainfall at each for the same period. Seven years is, of course, an utterly inadequate period to give an average rainfall, but it serves to show the relative wetness of these stations, and for several of them no longer average is available. The figures for 12th November are very high, and I believe in most cases are the highest recorded since observations began, but to show how far the rainfall was excessive for the locality I have cast out how many average days rainfall that of 12th November amounted to, at each place. The highest equivalent in days is 28, or in other words, less than 8 per cent. of a year’s rainfall fell on 12th. I think you have stated that 20 per cent., or in dry places 25 per cent., of a year’s record may fall in a day, but those figures, fortunately, do not apply to this district,—if they did we should have no roads left.

Yours, &c.,

STEPHEN A. MARSHALL.

Skelwith Fold, near Ambleside.

Rainfall in the Lake District, November 12th, 1897.

STATIONS.	Rainfall 12th November, 1897.	Average yearly rainfall, 1890-96.	No. of average days rainfall to equal that of 12th Nov., 1897.	No. of days in 7 years, 1890-96, giving 3'00 in., or more.	Highest day's record in those 7 years.	Fall on Nov. 12th, per cent. of yearly mean.
<i>Lancashire—</i>	in.	in.			in.	
Hawkshead (Esthwaite Lodge).....	4·22	68·67	22	2	3·70	6·2
Duddondale (Seathwaite Vicarage).	4·07	80·25	19	2	3·80	5·1
Skelwith Fold.....	6·03	80·53	27	3	3·18	7·5
<i>Westmoreland—</i>						
Skelwith Bridge.....	6·35	81·92	28	2	3·56	7·8
Ambleside (Lesketh How).....	4·45	78·03	21	0	2·97	5·7
Elterwater (Birch Hill) ..	4·57	90·75	18	8	4·24	5·0
Dungeon Ghyll.....	5·90	112·27	19	18	4·90	5·3
Loughrigg (High Close).....	4·33	83·37	19	6	3·60	5·2
Grasmere (Pavement End).....	4·38	89·00	18	9	4·15	4·9
Patterdale.....	4·55	82·15	20	3	4·15	5·5
<i>Cumberland—</i>						
Borrowdale (Seathwaite).....	8·03	131·39	22	27	6·79	6·1
„ (Rosthwaite).....	6·94	101·43	25	10	5·33	6·8
„ (Grange).....	5·93	88·84	24	—	4·45	6·7
Derwentwater (Barrow House).....	3·98	72·19	20	1	3·01	5·5

[In the above letter Mr. Marshall has given the essential features of this remarkable rain, and the only addition which we can at present make to it, is to mention that in the much drier district round Cockermouth, the fall was between 4 and 4½ in., which of course was, relatively, even more remarkable. We are sorry to hear of one gauge having been washed away by a flood, and still more sorry (because it could have been prevented) to hear of two others having been allowed to run over. The following cutting gives a popular account of the rain. A few days later there were falls in North Wales (on 14th and on 18th) exceeding 4 in., but these must stand over for *Brit. Rain.*, 1897.—ED.]

HEAVY STORM IN KENDAL.—Until last week, for almost a whole month, there was no rain in the neighbourhood of Kendal, the fading autumn being remarkable in its mildness. In fact not since 1872 has there been such an autumn. As if to make amends for this long inaction a severe storm overwhelmed the district on Friday. Throughout the day the rain came down pitilessly—not in the half-hearted manner of the earlier showers which indicated the change, and between eight o'clock on Friday morning and eight o'clock the following morning no less than 2·73 in. of rain was registered by Messrs. Rhodes' rain gauge, only a third of an inch less than the whole quantity which fell in October. Naturally the Kent rose rapidly, and on Saturday morning had overflowed its banks, the footpath on Waterside being covered with water. On the shingle on New Road a number of swingboats had been erected for the Martinmas fair, but not a vestige of them remained this morning, the whole body being washed towards the estuary of the river. Other damage was done of a minor nature, and during the morning it was evident that the country above had not altogether escaped, hugh limbs of trees, &c., rolling along with the surging water. Between Kendal and Burneside many fields were flooded.—*Westmoreland Gazette.*

THE GREAT METEORIC SHOWER OF NOVEMBER.

To the Editor of the Meteorological Magazine.

SIR,—When a man writes upon a scientific subject he at once assumes a serious responsibility, and it behoves him to be careful in presenting the truth in all the statements he makes and the figures he quotes. Now, when I said in my pamphlet on “The Great Meteoric Shower of November” that one of the observers of the shower in 1866 must have made a mistake when he said “the largest of the meteors was not twice the apparent brilliancy of Sirius,” I did so on the best of evidence, and the statement can easily be substantiated. You take serious exception to it. Very well. There is a mass of observations in the *Monthly Notices Roy. Ast. Soc.*, Vol. 27; *British Association Report*, 1867; *Proceedings of the Meteorological Society* for November 21st, 1866; *Astronomical Register*, December, 1866, &c., &c., which distinctly proves one thing, and that is that some of the meteors were considerably brighter than Venus ever is, and far and away superior in lustre to twice that of Sirius. My pamphlet furnishes ample evidence on the point from the descriptions published at the time. I have not mentioned my own observations, but I may say that during the night I saw several meteors which momentarily lit up the sky and landscape with flashes more intense than the light of any planet. Taken as a whole, the meteors of November, 1866, were considerably brighter than the August Perseids; they were also brighter than the Andromedes of Biela’s comet in 1872 and 1885, and brighter also than the average of members of ordinary meteoric streams.

You suggest that an index would have improved the pamphlet. So it would; but it was only a reprint, and extras were avoided to save expense. As to the stationary meteors, I have devoted a long paragraph to them on p. 27, and it is quite sufficient for the purpose, for the Leonid shower presents a hundred points besides end-on meteors. You say there is no reference to efforts to photograph the area surrounding the radiant. There is such a reference on p. 46, brief though it is, but I refrained from enlarging on the subject of meteoric photography, as it is a department in which I can boast of no experience whatever, and it is sometimes just as well not to assume to teach before one has played the part of pupil.—Yours faithfully,

W. F. DENNING.

Bristol, Dec. 7th, 1897.

[It is strange that Mr. Denning does not see that this letter does not carry matters farther than his pamphlet, for he has not disposed of either of the authorities we quoted—viz., Backhouse, Baxendell, and Hind—but he will probably be gratified by our printing the letter, and we have no objection to so doing. The concluding statements are excellent illustrations of the difficulty of finding what there is in a book without an index. We cannot devote any more space to the subject.—ED.]

TEMPERATURE VARIATIONS IN NOVEMBER.

To the Editor of the Meteorological Magazine.

SIR,—The variations in the temperature at 9 a.m. during the past week have been so extraordinary that I think they are worthy of record :—

November 14th	.....	55·1	} a fall of 17·0
„ 15th	.....	38·1	
„ 16th	.....	39·5	} a rise of 14·8
„ 17th	.....	54·3	
„ 18th	.....	52·9	} a fall of 21·4
„ 19th	.....	31·5	
„ 20th	.....	46·3	} a rise of 14·8

This changeable weather has been very trying to the delicate and to old people, accompanied, as it has been, by considerable fog.

Yours very truly,

RICHARD TYRER.

Cheltenham, November 23rd, 1897.

Although at Camden Square the fluctuations of temperature in November, 1897, were not quite so great as at Cheltenham, they appeared to be sufficiently so to call for a study of back years to see how far they were exceptional, and the following table is believed to contain all cases in the 39 years, 1858–96, which approximate to the 1897 values. It will be seen that in five out of these eight November weeks the total range was greater than in 1897.

TABLE I.—*Weeks in November with great Variation of 9 a.m. Temperature at Camden Square.*

1897		1895		1893		1883		1867		1866		1865		1861	
Date.	Reading.	Date.	Reading.	Date.	Reading.	Date.	Reading.	Date.	Reading.	Date.	Reading.	Date.	Reading.	Date.	Reading.
14	54·8	14	48·2	22	39·1	4	45·2	1	61·2	8	55·0	14	38·2	23	38·5
15	42·8	15	45·3	23	30·4	5	42·5	2	45·8	9	45·0	15	51·8	24	30·4
16	42·2	16	60·9	24	35·0	6	55·0	3	35·0	10	35·0	16	36·0	25	42·4
17	54·1	17	49·2	25	45·2	7	36·9	4	49·5	11	54·6	17	54·3	26	54·7
18	55·0	18	34·0	26	46·3	8	40·4	5	43·0	12	47·0	18	42·6	27	43·6
19	35·4	19	38·8	27	30·3	9	49·6	6	38·8	13	52·9	19	50·0	28	36·5
20	44·3	20	47·0	28	50·0	10	38·4	7	41·2	14	43·8	20	54·0	29	52·7
Total Range	19·6	...	26·9	...	19·7	...	18·1	...	26·2	...	20·0	...	18·3	...	24·3

It is not easy to adopt any rigid system of comparison between such variable data, but the seven calculations set out in the columns of the second table were assumed to give a fair indication of the variableness of each period, and every instance in which any four of the columns equalled or exceeded 1897 is set out in the table.

TABLE II.—*Sum of the Variations of 9 a.m. Shade Temperature at Camden Square in November weeks showing excessive range.*

YEAR.	Greatest Variation in one direction.		Cumulative Variations in both directions.				
	Between 2 days.	Between 3 days.	3 days.	4 days.	5 days.	6 days.	7 days.
1897	19°·6	19°·6	28°·5	32°·4	41°·3	45°·0	53°·9
1895	15°·6	26°·9	27°·3	42°·5	47°·3	55°·5	58°·4
1893	19°·7	19°·7	35°·7	36°·8	47°·0	51°·6	60°·3
1883	18°·1	18°·1	30°·6	34°·1	43°·3	54°·5	57°·2
1867	15°·4	26°·2	26°·2	40°·7	47°·2	51°·4	53°·8
1866	19°·6	20°·0	29°·6	39°·6	47°·2	53°·1	62°·2
1865	18°·3	18°·3	34°·1	47°·7	59°·4	66°·8	70°·8
1861	16°·2	24°·3	24°·3	35°·4	46°·7	58°·7	66°·8

In 1897 the greatest difference between any two consecutive 9 a.m. readings is 19°·6, while in 1866 it is the same (19°·6), and in 1893 slightly greater (19°·7); but taking periods of several days, 1866, 1865 and 1861 far exceed 1897 for variability of 9 a.m. temperature. Thus in one week in 1865 the 9 a.m. temperatures show a total zigzagging of 70°·8, while the 1897 fluctuations add to only 53°·9, which is with one exception the smallest value for a whole week in the table.

THE DROUGHT OF OCTOBER AND NOVEMBER, 1897.

To the Editor of the Meteorological Magazine.

SIR,—In your interesting paper on the dryness of October, 1897, I see no mention of Somersetshire; but the deficiency of rain here, at a point 8 miles W. from the Wiltshire boundary, and 5 miles N. from that of Dorset, though we did just pass the one inch, was, for a western county, more remarkable than that in many of the places which you did name; and now that an even drier November has followed it, the result seems worthy of record.

October yielded here 1·04 in. in 10 days, of which ·80 in. fell in four days (15th to 18th). November yielded ·96 in. in ten days, of which ·66 in. fell in the last four days, and a third part of that really in December. There was absolute drought from early morning of October 19th to late evening of November 7th, *i.e.*, more than 19 days. N.B.—A few heavy drops, not enough to measure, fell in the evening of October 29th. Partial drought could be reckoned till evening of November 27th, *i.e.*, more than 39 days with ·30 in. of rain. The total for the two months thus goes down as exactly two inches!

H. A. BOYS, M.A.

North Cadbury Rectory (250 ft. above sea), Dec. 1st, 1897.

P.S.—The first frost *at all* felt in my garden this autumn was on November 26th.

To the Editor of the Meteorological Magazine.

SIR,—A dry November has followed a still drier October, 0·86 in. of rain having fallen here in October, and 0·95 in. in November. The average for the 10 years, 1887-96, is, for October, 3·31 in., and for November, 2·97 in., together 6·28 in., so that this year the fall in the two months was under 29 per cent. of the average for the last 10 years. Previously the least fall in October was 1·01 in. in 1888, in November, 1·14 in. in 1889, and for the two months together 4·03 in., in 1890. The remarkable circumstance is not, therefore, the small rainfall in *either* of these months, but that *both* the consecutive months which are usually about the wettest in the year should have been so dry.

Yours faithfully,

JOHN HOPKINSON.

The Grange, St. Albans, 6th December, 1897.

GALE ON NOVEMBER 28TH, 1897.

THE above ought not to pass without record in these pages. Although with many statements as to its severity we cannot agree, there is no doubt that very many lives were lost, and hundreds of thousands of pounds worth of property destroyed. The mischief, however, was due to tidal action rather than to that of wind. In London the barometric pressure fell fast (0·30 in. in 4 hours, noon to 4 p.m. on Sunday 28th), but this rate is by no means unprecedented, and we have known the wind much stronger. Confirmation thereof is afforded by the very trifling structural damage in the metropolis; one hoarding blown down, and a few slates and chimney pots carried away.

In the centre, E. and N. of England the gale was heavier, many chimneys and a few partly built premises, trees, and telegraph posts were blown down; but the damage was not comparable with that of the storms of March 24th, 1895, and of March 3rd, 1897.

Over the North Sea, and Southwestward, as far as Boulogne, the wind force was no doubt great, but the chief source of mischief was due to the intensity of the storm occurring at nearly the time of high water spring tide. Hence the Eastern coasts and both sides of the mouth of the Thames suffered severely, buildings being wrecked or flooded at Southwold, Ipswich, Harwich, Ramsgate, Margate, Herne Bay, Whitstable, Sheerness, Southend, Purfleet, Woolwich, and other places.

As is usual with such storms, there was some electrical disturbance. The first was at 8 p.m. on 27th, a single brilliant flash and very loud T at Durness, Sutherland. There was a TS in South Lincoln in the afternoon of 28th, and L was seen at various points along the coast from Suffolk to Yorkshire; later in the evening the TS became severe in South Nottinghamshire (the church of All Saints', Nottingham, was struck) and in the East Riding of Yorkshire. The L and T did not entirely cease until the early hours of the 29th.

REMARKABLE HAILSTONES.

ABOUT 5 o'clock in the afternoon of August 10th I was at Manassas depôt, in Prince William County, Va., near the famous battlefield, waiting for a train. There was some pretty severe thunder and lightning for a half-hour or so, and then came a heavy shower of rain, during which there was the most remarkable fall of hail I have ever witnessed. I hurried out in the rain to examine the stones and picked up several. These were nearly square flattish blocks, say from $\frac{3}{4}$ to 1 inch in length and breadth, and from $\frac{1}{4}$ to $\frac{1}{2}$ an inch in thickness. They suggested, by both shape and size, the ordinary "chocolate caramels" of the confectioner. There were some 8 or 10 persons, I think, in the station house with me, and several of these, observing my interest and enthusiasm, began to pick up the larger stones and bring them in to me and to my friend, Professor Hargrove, of Luray, Va. Soon larger and larger ones were thus collected, and I sought for means of measuring or weighing them. No rule or scales could be found, and so we set ourselves, several of us, conjointly and carefully to estimate the dimensions. I recorded at the time one as being, honestly estimated, "2 inches long, $1\frac{1}{2}$ inches wide and $\frac{3}{4}$ of an inch thick," these being rather the average than the extreme dimensions.

It then occurred to me to make an outline drawing of the largest by laying it flat upon a page of my pocket memorandum and carefully running a pencil around it. I secured in this way, a rather rough but fairly accurate outline of two. These outlines have been exactly copied (including some lines due to a slipping of the block or to a different inclination of the pencil) and are given in the accompanying cuts. The extreme lengths of these will be found to be, respectively, about $2\frac{1}{2}$ and 3 inches; their extreme breadths about $1\frac{1}{2}$ and 2 inches. The thickness of No. 1 was recorded at the time as being by estimate $\frac{3}{4}$ inch; that of No. 2 as being 1 inch. I estimate their volumes as about $1\frac{1}{2}$ cubic inches for No. 1, and nearly 3 cubic inches for No. 2. The drawing of No. 2 was done more hastily, as just in the midst of it my train rushed in and I had to leave. But I took my trophy with me, and, with perhaps pardonable enthusiasm, paraded it through the cars, and, exhibiting it to the passengers, asked expressions of opinion from them as to its size relatively to that of a popular object of comparison, a guinea egg. Perhaps 20 or 30 passengers agreed, without dissent, that it was as large or larger. Some said, "It is as large as a hen's egg;" all agreed, also, that they had never seen so large a hailstone before. Upon breaking it to pieces, I found a sort of nucleus of somewhat less transparent ice at the centre, but observed no concentric layers or other marked structure of any kind; it was quite solid and tolerably transparent throughout. Both of these stones were characterized by blunt points or projections, as shown in the figures; and the sides also, while flat in the main, were uneven, with low, rounded elevations and depressions of the same sort, the general thickness being fairly uniform.

I think that very few of these stones or blocks fell. Perhaps they would have been a yard or two apart as they lay on the ground. I think it likely also that the storm of hail was of brief duration, say 10 or 15 minutes, and that it embraced a very limited area.

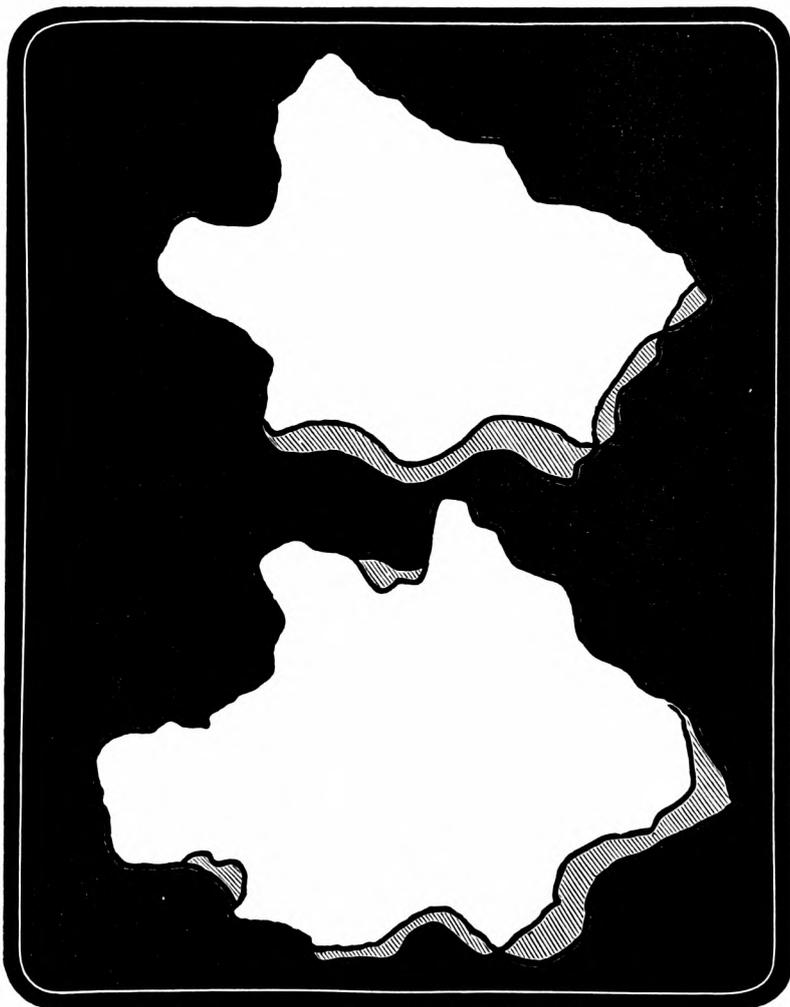
It was, perhaps, about over when I took the train, as I infer from the fact that I have seen no account of it in the papers; and I found at the next station, only 5 miles off, that the road was dry and dusty.

I regret exceedingly that no more accurate observations seem to have been made of what must have been a most notable hailstorm, and I diffidently submit my own crude and imperfect account in the hope that thereby something further may be elicited in regard to it.

CHARLES H. WINSTON.

Richmond College, Va., August 25th, 1897.

[*Science, September 17th, 1897.*]



Natural size of Hailstones which fell at Manassas, Virginia, U.S.A.
(Lat. 38° 41' N., Lon. 77° 33' W.), August 10th, 1897.

ROYAL METEOROLOGICAL SOCIETY.

THE opening meeting of the session was held on Wednesday evening, at the Institution of Civil Engineers, Mr. E. Mawley, F.R.H.S., President, in the chair.

The following candidates were elected Fellows of the Society—Charles Aburrow, A.M.I.C.E., William Berridge, Ronald Stanley Clarke, Lawrence Gibbs, A.M.I.C.E., Sholto Henry Hare, F.R.H.S., Henry George Hollingworth, F.R.G.S., F.R.A.S., Major Henry King, Arthur Newsholme, M.D.

Mr. R. H. Curtis reported the Results of a Comparison between the Sunshine Records of a Campbell-Stokes Burning Recorder and a Jordan Photographic Recorder.

The paper opens with a history and description of the two forms of recorder, and sets out the following conditions as requisite for a satisfactory comparison :—

- (1)—Care must be taken that the instruments are in proper adjustment, and are fair examples of the types.
- (2)—They should occupy positions similar in every respect, and such as to give an absolutely clear horizon.
- (3)—The comparison should extend over a period sufficiently long to test them under varying seasons; and to detect any circumstance which might unfairly prejudice either instrument.

The observations were all made by Mr. E. T. Dowson, at Geldeston, Norfolk, in a position fulfilling the above requirements.

The curves from both instruments were measured independently by the author, and by three gentlemen, all experienced in dealing with sunshine traces, but neither tabulator saw the measurements of the others, nor did he know when tabulating the cards of one instrument what had been recorded for the same days by the other instrument.

The final values adopted for the twelve months, June, 1896,—May, 1897, are—

Tabulators.	A. Hours.	B. Hours.	C. Hours.	D. Hours.
Campbell-Stokes recorder...	1,500	1,500	1,522	...
Jordan recorder.....	1,363	1,412	1,416	1,454

The conclusions drawn from the figures are :—

The Campbell-Stokes records are capable of being measured with a very fair degree of accuracy.

The records of the Jordan instrument afford room for greater difference of opinion as to what ought to be tabulated, but when the whole of the photographic trace which can be distinctly seen, is carefully measured, the amount will approximate sufficiently to that of the Campbell-Stokes instrument to allow of records obtained from both forms of instrument being compared *inter se*.

A section on the capabilities of the Campbell-Stokes recorder shows that it will register up to 15 minutes of the time of sunrise and sunset, while at Geldeston 94·5 per cent. of the possible duration was recorded on May 30th, 1881, and the same percentage at Jersey, on June 23rd, 1896.

The paper also discusses at some length the question how much of the trace of each instrument should be measured, photographic chemicals, effect of age on plates, and effect of washing to fix the trace. It gives for 12 years records for May at 7 Observatories, the results of tabulation at the Observatories and at the Meteorological Office, to show the effect of personal equation. It gives also a suggested specification for the Stokes recorder fixing density and size of sphere, and concludes with an appendix on the faulty instrument at Greenwich.

The President (Mr. Mawley) proposed a vote of thanks to Messrs. Dowson and Curtis. He was surprised to hear that the Jordan recorder gave a smaller value than the Stokes. He did not think that the Greenwich ball, which had a milk and water like appearance, could have been put up in that condition, but his own, which had been in use for 17 years, shows no sign of deterioration.

Mr. Ellis described the various instruments which had been used at various times at Greenwich, and gave a critical examination of the records to show the falling off in recent years.

Mr. Marriott spoke of the defects which he most frequently found in sunshine recorders when inspecting stations, and described his methods of testing their adjustment and exposure.

Mr. Kendrick spoke, as a scientific expert on glass, describing the composition of a ball supplied to Greenwich Observatory, the most suitable glass for the spheres, and the chemical action which is likely to take place and cause deterioration in some qualities of glass.

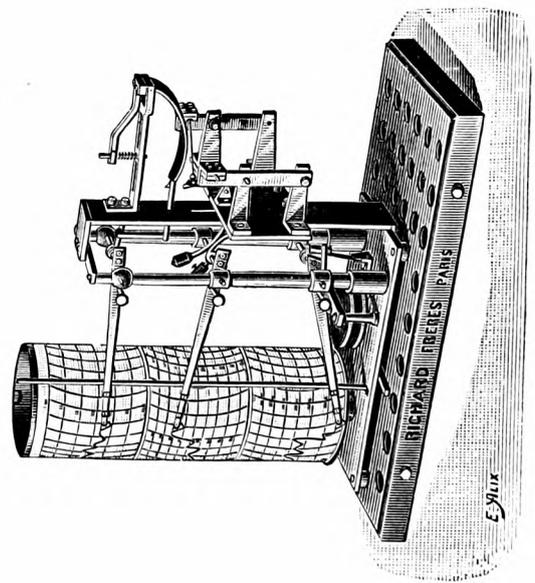
Mr. Davis said, that in the Argentine, glass spheres had remained perfect for 10 years. Stations at the foot of the Cordilleras recorded from 70 to 75 per cent. of the possible duration of sunshine, while those in the region of the great rivers recorded from 56 to 58 per cent.

Mr. Jordan, speaking of the photographic recorder, said that it was wrong to ignore any trace, no matter how faint. It cannot record too much, the faintest trace being necessarily due to the sun's rays, and as washing reduces faint traces it is all the more necessary to record everything. Experiments at Kew, and elsewhere, gave identical results for the two instruments, and he was, therefore, surprised at the results in the paper.

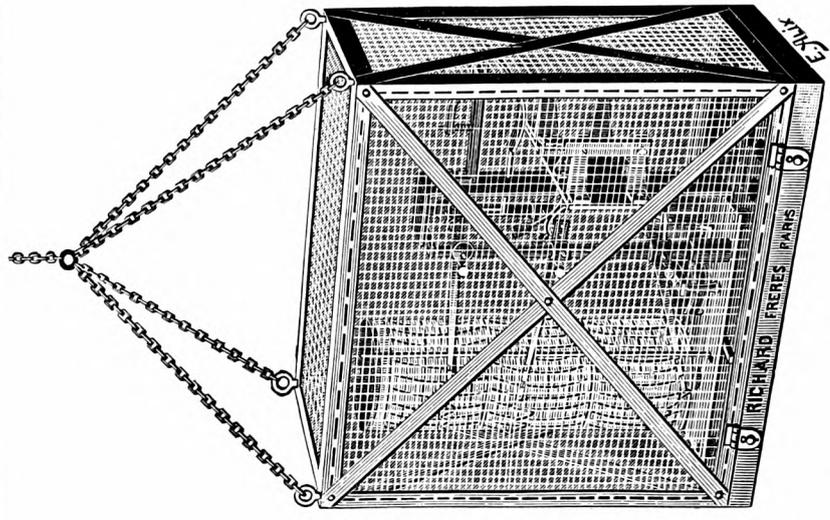
Mr. Gaster considered both the burning and photographic recorders excellent, and vastly superior to the estimates before they came into use. In the paper the measurements of the Jordan traces had been unduly restricted. The Jordan was introduced because the Campbell did not record the faintest sunshine, and originally the traces of the Jordan instrument were measured before washing, but the result was

RICHARD'S BAROGRAPH, HYGROGRAPH,
AND THERMOGRAPH.

(For use with Kites or a Balloon.)



THE INSTRUMENT.



In its Cage.

[See page 175.]

so large that comparison was impossible, and, therefore, washing was introduced to make the records of the two instruments fit.

Mr. Brodie thought that the apparent agreement of the two instruments disappeared if the monthly values were examined, instead of the totals for the year; for in one winter month the Jordan gives 30 per cent. less, though on a fine winter day even the Stokes does not record enough.

Mr. Dixon hoped this excellent work would be continued, but it was impossible that the results of the two should agree, owing to the different absorption by the atmosphere, of the heat and of the actinic rays.

Mr. Symons read some remarks by Mr. Dowson on the different effect of an equal amount of washing, on the morning and afternoon traces of the Jordan record.

REVIEW.

Instruments de Précision. Ancienne Maison RICHARD FRÈRES, JULES RICHARD, Fondateur et successeur. Catalogue No. 1 Météorologie. 4to, Paris, 1897. 40 pp. and numerous engravings.

(See *Frontispiece.*)

THE catalogues of this firm are always interesting, for, the ingenuity of their instruments is remarkable, and the engravings are usually excellent; we mention this because the two which we have asked M. Richard to lend us are the weakest in the whole book.

We asked for these two because England is being left hopelessly in the rear in the exploration of the upper strata of the air—England, which, through Mr. Welsh, was the first to organise elaborate scientific work in balloons; which, through Mr. Glaisher, carried the same work to a point never before reached; England, which (through a Scotchman, Dr. Wilson) began the use of kites for scientific purposes in 1749; which, through the Rev. George Fisher and Admiral Back, used them in the Arctic regions in 1822–23 and 1836–37; which, through Mr. Douglas Archibald, was the first to send anemometers to great altitudes by means of kites—England and all the English colonies are doing absolutely nothing, and letting the Americans carry off all the honours for kite work, and our Continental neighbours all those relating to balloons.

We thought that an engraving of the compact little apparatus might tempt some Englishman to take up the subject of continuous records at high altitudes. Of course we cannot here go into full details, they are given in the work we are noticing; but it will be seen that pressure, humidity and temperature are simultaneously recorded on a single sheet of paper; and when we add that the total weight (the instrument being made of aluminium) is only 36 ounces, it will be seen that the lifting of the apparatus is no difficulty.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JUNE, 1897.

STATIONS. <i>(Those in italics are South of the Equator.)</i>	Absolute.				Average.				Absolute.		Total Rain.		Aver.	
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.		Cloud.
	Temp.	Date.	Temp.	Date.										
England, London	87·8	24	43·3	10	71·7	53·0	52·7	74	132·6	37·2	1·87	11	6·9	
Malta.....	92·8	28	57·7	2	80·5	63·8	60·5	70	155·5	52·3	·00	0	2·4	
<i>Mauritius</i>	80·9	1	59·8	25	76·7	61·6	61·6	73	126·2	50·4	2·51	13	5·8	
Calcutta.....	97·1	10	73·5	2	90·5	79·0	77·6	81	161·0	72·7	10·98	12	7·0	
Bombay.....	93·7	5	74·8	11	89·5	80·1	78·2	79	147·3	72·6	14·40	21	7·4	
Ceylon, Colombo	91·2	9	73·8	20	86·4	77·7	76·1	87	142·5	72·0	10·14	25	7·8	
<i>Melbourne</i>	67·7	18	31·5	13	59·2	43·4	43·9	76	117·1	20·9	1·64	7	3·2	
<i>Adelaide</i>	69·0	8	39·1	12	60·2	47·8	44·9	72	124·0	28·1	1·59	11	6·5	
<i>Sydney</i>	68·0	10	44·8	30	61·3	50·3	50·8	87	108·8	34·8	8·06	16	5·4	
<i>Wellington</i>	60·0	8, 25	36·0	19	55·7	43·9	41·3	73	101·0	28·0	2·43	14	4·3	
<i>Auckland</i>	64·0	13	40·0	21	58·7	47·3	44·0	72	120·0	34·0	3·70	17	6·1	
Jamaica, Kingston.....	92·2	24	71·8	25	89·1	74·5	70·7	67	...	...	·58	5	5·3
Trinidad	90·0	a	69·0	6, 9	87·7	71·5	73·6	83	165·0	68·0	11·19	19	...	
Grenada.....	85·8	1	71·0	4, 5	82·7	74·6	71·4	81	148·2	...	8·15	23	3·3	
Toronto	84·0	24	38·8	2	71·2	51·0	51·2	68	100·0	32·2	2·92	10	5·7	
New Brunswick, Fredericton	83·7	24	36·5	3, 8	67·1	45·6	47·4	60	...	...	3·18	14	5·9
Manitoba, Winnipeg ...	90·8	14	28·0	5	72·1	46·4	...	...	...	...	2·31	13	6·0
British Columbia, Esquimalt.....	72·2	21	41·2	10	65·2	50·5	48·2	72	...	...	·86	9	7·4

a—Several.

REMARKS.

MALTA.—Adopted mean temp. 71°·0, or 0°·6 below the average. Mean hourly velocity of wind 8·3 miles. Average sea temp. 71°·0. L on 6th, 7th and 8th.

J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·0, of dew point 1°·0, and rainfall ·49 in., above their respective averages. Mean hourly velocity of wind 12·0 miles, or 0·6 above average; extremes, 26·1 on 6th, and 2·0 on 28th; prevailing direction E.S.E.

T. F. CLAXTON.

CEYLON, COLOMBO.—Thunderstorms occurred on 8 days. Lightning was seen on the 22nd, 23rd and 27th.

H. O. BARNARD.

Adelaide.—Mean temp. 0°·5 above the average of 40 years. Rainfall 1·22 in. below the average.

C. TODD, F.R.S.

Sydney.—Rainfall 2·36 in. above, temperature 1°·4 above, and humidity 9 above, their respective averages. Soft, warm rains fell all over the Colony so abundantly that the drought conditions were completely broken up, and the weather was very mild.

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

Wellington.—Generally a showery month, but no heavy falls except 1·21 in. on 5th; some pleasant days at the beginning and end of the month. Prevailing wind from N.W., strong on 6 days; frequent fogs. Temperature 0°·8 above, and rainfall 2·67 in. below, their respective averages. Slight earthquake on 9th.

R. B. GORE.

Auckland.—An unusually fine June, the rainfall being more than an inch under the average of 30 years. Mean temp. slightly under the average.

T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Rainfall about one-eighth of the average.

J. F. BRENNAN.

TRINIDAD.—Rainfall 3·15 in. above the average of 30 years.

J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,
NOVEMBER, 1897.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	1·01	XI.	Rhayader, Nantgwillt ...	5·76
II.	Dorking, Abinger Hall .	1·18	„	Lake Vyrnwy	6·51
„	Birchington, Thor	1·39	„	Corwen, Rhug	3·76
„	Hailsham	1·45	„	Criccieth, Talarvor	5·31
„	Ryde, Thornbrough	1·70	„	I. of Man, Douglas	5·99
„	Emsworth, Redlands ...	1·45	XII.	Stoneykirk, Ardwell Ho.	3·60
„	Alton, Ashdell	1·39	„	New Galloway, Glenlee	5·66
III.	Oxford, Magdalen Col..	1·09	„	Mouiaive, Maxwellton Ho.	3·84
„	Banbury, Bloxham	·97	„	Lilliesleaf, Riddell	2·08
„	Northampton, Sedgebrook	1·06	XIII.	N. Esk Res. [Penicuick]	3·75
„	Duddington [Stamford].	1·18	XIV.	Glasgow, Queen's Park..	3·37
„	Alconbury	·89	XV.	Inverary, Newtown	5·63
„	Wisbech, Bank House...	1·69	„	Oban, The Corran	4·55
IV.	Southend	·94	„	Islay, Gruinart School ...	2·43
„	Harlow, Sheering.....	1·16	XVI.	Dollar	3·87
„	Colchester, Lexden	·93	„	Balquhiddier, Stronvar...	5·82
„	Rendlesham Hall	1·05	„	Ballinluig	2·65
„	Rushall Vicarage	1·32	„	Dalnaspidal H. R. S.	4·72
„	Swaffham	1·56	XVII.	Keith H. R. S.	2·58
V.	Salisbury, Alderbury ...	·80	„	Forres H. R. S. ...	1·43
„	Bishop's Cannings	1·10	XVIII.	Fearn, Lower Pitkerrie..	1·10
„	Blandford, Whatcombe .	·91	„	N. Uist, Loch Maddy ...	3·97
„	Ashburton, Holne Vic...	4·38	„	Invergarry	3·60
„	Okehampton, Oaklands.	3·01	„	Aviemore H. R. S.	2·25
„	Hartland Abbey	3·03	„	Loch Ness, Drumadrochit	2·87
„	Lymouth, Glenthorne.	3·80	XIX.	Invershin	3·11
„	Probus, Lamellyn	3·48	„	Scourie .....	...
„	Wellington, The Avenue	1·52	„	Watten H. R. S.	1·77
„	Wincanton	1·21	XX.	Dunmanway, Coolkelure	9·65
VI.	Clifton, Pembroke Road	2·06	„	Cork, Wellesley Terrace	4·86
„	Ross, The Graig	1·87	„	Killarney, Woodlawn ...	6·25
„	Wem, Clive Vicarage ...	1·96	„	Caher, Duneske	5·38
„	Cheadle, The Heath Ho.	2·99	„	Ballingarry, Hazelfort...	5·31
„	Worcester, Diglis Lock	1·61	„	Limerick, Kilcornan ...	4·72
„	Coventry, Priory Row ..	1·50	„	Broadford, Hurdlestown	5·60
VII.	Grantham, Stainby	·97	„	Miltown Malbay	6·53
„	Horncastle, Bucknall ...	1·98	XXI.	Gorey, Courtown House	4·71
„	Worksop, Hodsck Priory	2·02	„	Athlone, Twyford	4·42
VIII.	Neston, Hinderton	2·78	„	Mullingar, Belvedere ...	5·21
„	Southport, Hesketh Park	4·74	„	Longford, Currygrane...	4·14
„	Broughton-in-Furness ...	8·43	XXII.	Woodlawn	4·58
IX.	Ripon, Mickley.....	1·54	„	Crossmolina, Enniscoe ..	3·94
„	Melmerby, Baldersby ...	1·53	„	Collooney, Markree Obs.	3·72
„	Scarborough, Observat'y	2·48	„	Ballinamore, Lawderdale	4·28
„	Middleton, Mickleton ...	2·11	XXIII.	Warrenpoint.....	4·49
X.	Haltwhistle, Unthank...	2·67	„	Seaforde.....	3·52
„	Bamburgh	2·26	„	Belfast, Springfield	3·22
„	Keswick, The Bank	7·00	„	Bushmills, Dundarave..	2·35
XI.	Llanfrechfa Grange	4·44	„	Stewartstown	2·64
„	Llandoverly	4·46	„	Killybegs	4·67
„	Castle Malgwyn	4·64	„	Lough Swilly, Carrablagh	2·74
„	Builth, Abergweysyn Vic.	7·43			

NOVEMBER, 1897.

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) ...	1.05	- 1.61	.31	27	14	59.1	18	28.0	26	2	7
II.	Tenterden	1.07	- 2.32	.28	27	17	60.0	14 ^b	25.0	26	2	8
III.	Strathfieldsaye .....	...	...	...	...	...	...	...	...	...	...	...
IV.	Hitchin	1.13	- 1.55	.31	28	12	58.0	14 ^a	27.0	25	8	...
V.	Winslow (Addington)	1.25	- 1.68	.26	28	14	59.0	14	27.0	19	7	9
VI.	Bury St. Edmunds (Westley)	1.09	- 1.46	.24	27	10	58.0	13	29.0	26	...	...
VII.	Norwich (Brundall)	1.54	...	.41	28	16	60.2	14	29.6	26	4	16
VIII.	Weymouth(LangtonHerring) .....	...	...	...	...	...	...	...	...	...	...	...
IX.	Torquay (Cary Green)	1.25	...	.24	14	12	60.3	18	34.0	30	0	1
X.	Polapit Tamar [Launceston]..	2.70	- 1.64	.47	28	12	62.8	1	25.8	6	9	12
XI.	Stroud (Upfield)	1.72	- 1.61	.57	27	16	58.0	13 ^c	31.0	29	1	...
XII.	ChurchStretton(Woolstaston)	2.02	- 1.50	.37	28	14	57.0	9, 11	30.0	16	2	7
XIII.	Tenbury (Orleton) .....	...	...	...	...	...	...	...	...	...	...	...
XIV.	Leicester (Rotherby Hall) ...	1.32	...	.24	14	20	...	...	...	...	...	0 14
XV.	Boston	1.58	- .62	.35	28	12	58.0	20	30.0	11	5	...
XVI.	Hesley Hall [Tickhill].....	1.94	- .08	.68	30	16	58.0	12 ^d	29.0	23	5	...
XVII.	Manchester(PlymouthGrove)	4.20	+ 1.20	1.36	30	14	61.0	1	32.0	...	4	8
XVIII.	Wetherby (Ribston Hall) ...	1.06	- 1.01	.40	14	11	...	...	...	...	...	...
XIX.	Skipton (Arncliffe)	5.78	- .97	.95	28	17	...	...	...	...	...	...
XX.	Hull (Pearson Park)	2.58	+ .57	.69	30	14	58.0	13 ^e	28.0	16	6	8
XXI.	Newcastle (Town Moor)	1.67	- .73	.38	14	14	...	...	...	...	...	...
XXII.	Borrowdale (Seathwaite).....	20.85	+ 6.06	8.03	12	15	...	...	...	...	...	...
XXIII.	Cardiff (Ely)	3.28	- 1.63	.81	12	13	...	...	...	...	...	...
XXIV.	Haverfordwest	5.06	- .80	1.14	12	18	60.0	1	31.0	19 ^f	2	11
XXV.	Aberystwith (Gogerddan) ...	5.58	+ .47	1.27	26	14	61.0	1	...	...	...	...
XXVI.	Llandudno	4.66	+ 1.57	2.43	30	11	63.0	1, 9	35.0	15	0	...
XXVII.	Cargen [Dumfries]	4.50	- .06	1.26	12	14	59.4	1	26.0	15 ^g	5	...
XXVIII.	Edinburgh (Blacket Place)...	1.97	...	.41	12	16	57.3	12 ^d	27.3	16	2	5
XXIX.	Colmonell	4.34	...	.78	12	12	60.0	2	24.0	3	...	...
XXX.	Lochgilhead (Kilmory).....	4.36	- 2.93	.69	27	17	...	...	26.0	14	3	...
XXXI.	Mull (Quinish)	4.05	- 2.94	.79	11	19	...	...	...	...	...	...
XXXII.	Loch Leven Sluices	2.90	- 1.06	.90	13	11	...	...	...	...	...	...
XXXIII.	Dundee (Eastern Necropolis)	1.85	- .85	.45	12	16	57.9	12	24.1	16	2	...
XXXIV.	Braemar	2.23	- 2.35	.54	23	13	55.0	12	11.6	16	8	15
XXXV.	Aberdeen (Cranford)	1.95	...	.60	14	19	60.0	19	20.0	15	6	...
XXXVI.	Cawdor (Budgate)	2.44	- .41	.63	13	15	...	...	...	...	...	...
XXXVII.	Strathconan [Beaully]	4.15	- 2.41	.80	22	14	...	...	...	...	...	...
XXXVIII.	Glencarron Lodge.....	9.25	...	1.47	13	20	57.0	8	19.8	16	6	...
XXXIX.	Dunrobin	2.01	- .82	.60	28	14	56.0	19 ^e	28.0	16	6	...
XL.	S. Ronaldsay (Roeberry).....	4.35	+ .93	.81	13	22	54.0	12	30.0	15	5	...
XLI.	Darrynane Abbey.....	7.25	...	1.97	16	16	...	...	...	...	...	...
XLII.	Waterford (Brook Lodge) ...	6.81	+ 3.14	1.25	24	15	60.0	8	31.0	16	1	...
XLIII.	O'Briensbridge (Ross)	7.63	...	1.34	30	14	...	...	...	...	...	...
XLIV.	Carlow (Browne's Hill)	4.59	+ 1.53	.70	13 ^a	16	...	...	...	...	...	...
XLV.	Dublin (FitzWilliam Square)	3.42	+ .59	.94	13	14	60.9	12	34.0	15	0	3
XLVI.	Ballinasloe	4.33	+ .42	.69	24	18	58.0	9, 10	27.0	26	2	...
XLVII.	Clifden (Kylemore)	6.92	...	1.71	11	16	...	...	...	...	...	...
XLVIII.	Waringstown	3.47	+ .37	.58	26	17	59.0	1	29.0	14	3	10
XLIX.	Londonderry (Creggan Res.)	2.88	- 1.64	.66	28	18	...	...	...	...	...	...
L.	Omagh (Edenfel) .....	...	...	...	...	...	...	...	...	...	...	...

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

a—and 17. b—and 18. c—and 14. d—and 13. e—and 20. f—and 23. g—and 16.

METEOROLOGICAL NOTES ON NOVEMBER, 1897.

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

ENGLAND.

TENTERDEN.—Another very dry month, the total R being the least in November during 35 years, except '58 in. in 1871, '79 in. in 1879, and 1'03 in. in 1867. Partial drought for 45 days ended on 13th. Flowers, such as calceolarias, heliotrope, marigolds, &c., blooming fully till cut by frost of 26th. Two days with temp. above 60°. Duration of sunshine 69 hours. Fearful W. and N.W. gale on 28th and 29th. Fog all day on 9th and 23rd.

ADDINGTON.—Very little R until the end of the month. Fogs rather frequent, and sometimes dense, as on the 22nd and 23rd. High winds on the 28th, 29th, and 30th. On the 28th much lightning at night. On the 30th a very heavy B and H storm at 6 p.m., lasting about five minutes.

BURY ST. EDMUNDS, WESTLEY.—Mild and dry, with no frost till the 27th, tender plants remaining in bloom till that date. Very severe gale at night on 29th and on 30th; much damage to stacks, &c.

NORWICH, BRUNDALI.—Total R 1'25 in. below average. A very mild month. Mean temp. 45°·2. The gale on 28th and 29th was exceedingly severe from N.W., lasting nearly 24 hours, although not so destructive as that of March, 1895, when all the damage was wrought in about three hours. Much damage was done on the coast by the extraordinary high tide blown up by the gale, which is said to be the highest tide on the Norfolk coast within living memory. Generally dry, with high bar., bright days at times, but generally much cloud, and considerable fog at times.

TORQUAY, CARY GREEN.—Rainfall 2'79 in. below the average. Total rain of the eleven months, 29'12 in., being 1'90 in. below the average. Mean temp. 49°·4, or 2°·3 above average. Duration of sunshine 33 hours 55 minutes, being 30 hours 10 minutes below average; 15 sunless days.

POLAPIT TAMAR.—Generally a dry month, but the last four days were wet, stormy, and cold. Fog on seven days; half a gale from S.S.W. on 13th, and from N.W. on 28th, with H and T at 11 p.m. Stormy, with heavy H on 30th.

WOOLSTASTON.—Another warm, dry month, the nights especially warm. Severe gale on 28th, with L, and a little S, the remainder of the month was very stormy. Mean temp. 44°·8.

ROTHERBY HALL.—On the whole November was a dry month, with '74 in. less R than the average. The force of the wind varied from calm to a full half gale. The weather was very changeable, some days being bright, but more than half their number were dull. Fog on 10 days, sometimes dense.

HULL, PEARSON PARK.—Fog on 8 days, dense on 9th and 11th. TS with H, and stormy at night on 28th. H on 29th.

SEATHWAITE.—On 8 days the R exceeded an inch, while on the 12th 8'03 in. fell, causing a flood.

WALES.

HAVERFORDWEST.—Fine weather prevailed during the first six days, with some hoar frost, and partially clear sky; foggy, misty, damp weather succeeded, and continued to the 11th, when a moderate to fresh gale sprang up, culminating in a heavy rainfall, 1'92 in. falling in 24 hours, on 12th and 13th. Weather of a foggy, misty character prevailed throughout the remainder of the month, with an occasional frost at night, and from the 26th to the end it was very stormy and unsettled, with much rain. A vessel was wrecked in Fishguard Bay. Abundance of grass resulting from the unusual mildness.

ABERYSTWITH, GOGERDDAN.—Very stormy in the last week of the month.

LLANDUDNO.—A remarkably fine month for November, the amount of sunshine recorded being 72·8 hours. Stormy, with L and H at night on 28th, and wet and stormy on 30th, when 2·43 in. of R fell, mostly between noon and 2 p.m.

SCOTLAND.

CARGEN [DUMFRIES].—Dry weather continued until the 7th, and during 20 days, 18th October to 6th November, no R fell. Mean temp. 3°·0 above the average, exceeded only in 1876, 1881, and 1894, during 38 years. On only two days, 15th and 16th, did the temp. fall below 32°, while on the night of the 20th the min. was 50°. Upwards of half the total R fell during the four days 11th to 14th. The total for the eleven months of the year is only ·25 in. less than the average. A feature of the month was the remarkable absence of sunshine, the number of hours registered being only 31, against the average of 79. Easterly winds, mostly light, prevailed on 16 days, somewhat unusual in November. The mild open weather was exceptionally favourable for farm stock, pastures looking fresh and green. L in evening of 28th.

EDINBURGH, BLACKET PLACE.—Mean temp. 45°·6, the only warmer Novembers since 1764 being 1818, 1881, and 1894, with mean temps. of 46°·7, 46°·3, and 46°·0, respectively. The mean of the minima was 41°·8, the highest since 1857, when the average was 41°·9. Barometric pressure ·295 in. above average, a value exceeded since 1770 in the Novembers of 1805, 1857, 1867, 1879, and 1896. Dense fog on 11th. Strong N.E. wind, with H and S on 14th. Strong gale, with sleet and S on 28th.

COLMONELL.—Rain ·91 in. below, and mean temp. 4°·9 above, the average for 21 years.

BRAEMAR.—A month more like summer than autumn.

ABERDEEN, CRANFORD.—The month was very warm, the min. temp. on several nights being above 45°, and on the 12th 50°. Little sunshine. A heavy gale from N.N.W. on 28th and 29th.

S. RONALDSAY, ROEBERRY.—The first half of the month was very good, the latter cold and wet. Mean temp. 44°·3, or 1°·3 above the average of 7 years.

IRELAND.

DARRYNANE ABBEY.—Excepting the last week, a very mild month, some days quite summer-like. Although the total R is high, 7·25 in., yet the number of rainy days is not large; 5·56 in. of R fell in 8 days between 9th and 17th, leaving 1·69 in. for the rest of the month. N.W. gale and H on 30th.

WATERFORD, BROOK LODGE.—The weather was so mild that the following plants were in bloom in the garden up to the end of the month—nasturtiums, gentia, clematis, primroses, poppies, heliotrope, and roses. Gale from S.E. on 7th, and from W. on 30th. L on 29th.

O'BRIENSBRIDGE, ROSS.—The first week was beautiful, and there were some very fine days in the middle of the month, which closed with fierce rain storms, T and L.

DUBLIN, FITZWILLIAM SQUARE.—A dull, mild, foggy month on the whole, mean temp. 48°·6, or 3°·9 above the average. High winds were noted on 11 days, but attained the force of a gale only on the 28th. Fogs on 11 days. Lunar halos on the 8th and 29th. H, sleet and S fell in the gale on the 28th, when also L was seen.

KYLEMORE HOUSE.—Gale and R on 26th. Stormy, with W. wind on 27th, and the severest gale of the season on the 28th.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXXIV.] JANUARY, 1898. [PRICE FOURPENCE,
or 5s. per ann. post free.

Joseph Warren Zambra.

1822-1897.

JUST at the close of the year we have to announce, with regret, the death of Mr. Zambra, the last of the trio to whom—especially in the period 1850-1870—we are chiefly indebted for the excellent instruments now used at meteorological stations. Mr., or to give him his proper title, Cavaliere Negretti, passed away first, and now in 1897 we have lost both Mr. Casella and Mr. Zambra. Happily—though perhaps no one ever surpassed Negretti as a glass blower—they have all imparted much of their knowledge to their successors, and all have left sons to, we hope, worthily follow in their fathers' footsteps.

GALE ON NOVEMBER 28TH, 1897.

UNDER this title we gave last month some remarks contrasting the proportion of damage due to wind force and wave action, and stated that "The mischief was due to tidal action rather than to that of wind." We then little thought what excellent data upon the subject were being collected, but on the very day that the *Met. Mag.* was published an excellent account of the flooding appeared in the *Engineer* of December 17th, 1897, signed by Mr. Wheeler, C.E. of Boston, probably the most competent authority in the world.

Now, thanks to Mr. Wheeler's kindness, we are able to offer to our readers what may, perhaps, be regarded as a second edition of the report, with such additions as Mr. Wheeler received after that in the *Engineer* had been printed.

In our own little note we made one incorrect statement, and we are glad that it has been detected, because it shows how sharply our words are watched, and it keeps us up to the mark. We said that the mischief was due "to the intensity of the storm occurring at nearly the time of high water spring tide." Happily the spring

tides had passed four or five days, or the damage would have been, as Mr. Wheeler says, "even more serious." We fell into the error through knowing that as an actual fact the level reached was much above that of "high water spring tide," but the cause was wind, rather than tide.

THE NOVEMBER GALE AND THE TIDES.

By W. H. WHEELER, M. Inst. C.E.

The subject of the effect of the wind and atmospheric pressure on the tides was brought before the British Association at the Ipswich meeting in 1895, in a paper read by me, and in the following year at Liverpool, a report on the same subject was presented by a committee which had been appointed to investigate the matter. With the aid of information kindly furnished to me in reply to my inquiries from the harbour masters of several ports round the coast, I am able to supplement the information already given, by the following account of the effect on the tides of the gale of November last.

The severe gale of the 28th and 29th of November, which caused such serious damage all along the south-east coast of this country, had the effect of raising the tide to an abnormal height, the tide of the following day being considerably depressed. The wind appears to have had the greatest effect in increasing the height of the tide along the part of the coast extending from the Humber to the east end of the English Channel. The wind on the previous days had been blowing strongly from the south-west, a condition favourable to increasing the height in the Channel; it then flew round to the north-west, a quarter which always raises the tide in the North Sea. The combined influence of the winds from these two opposite quarters would therefore tend to concentrate the full effect of the tide along the south-eastern coast, and the records of the damage done to the cliffs and in flooding, owing to the water breaking through or flowing over the banks, and doing other damage, show that this was the case. Fortunately, the gale occurred five days after the full moon, or the effect would have been even more serious.

On Saturday, the 27th, round the south and east coasts the wind was blowing all day strongly from the south-west, the force varying, according to the different reports received, from 5 to 7 of the Beaufort scale; the barometer varying from 29·92 in. at Spurn Point, to 30·13 in. at the North Foreland. On Sunday the barometer had fallen to 29·49 at Spurn and 29·76 at the North Foreland, continuing to fall to 29·10 towards Monday; the wind blowing from the north-west with force of 10, veering to south-west on Tuesday, with force of 3 to 6. New moon was on the 24th, so that the spring tides were falling off. Under these conditions the effect of the gale in raising and depressing the tide was as follows:—

At Sunderland the increase from the computed normal height was 2ft. 10in., and at Tynemouth 2ft. 4in.

At Spurn the water washed over the lifeboat cottage and inn, and carried away a great part of a large chalk and timber groin constructed for the protection of the point.

At Grimsby the morning tide of the 29th rose 5ft. 11in. above the calculated height, the next day's tide being 1ft. 9in. less, the actual difference in height between the two tides being 8ft. 9in. At Hull the tide was 5ft. 3in. above the normal height.

At Cleethorpes, at the mouth of the Humber, at high water the tide swept the Promenade from end to end, and carried away the whole of the sea defences which have recently been constructed for the protection of the town and land.

At Mablethorpe, and lower down the Lincolnshire coast to Skegness, the tide did considerable damage to the sand dunes, in some places running over the banks and flooding the land and gardens behind, and doing an immense amount of damage to bathing machines, boats, and the promenades.

In the Wash the morning tide rose 5ft. 3in. above the calculated height at Boston Dock, the difference between this tide and that of the following day being 8ft. 8in. At Lynn the increase was 7ft., the difference between the two tides being 11ft. 11in., the effect of the wind from the north-west being more felt here than on the other side of the Wash, a large amount of damage was done in the flooding of houses and granaries, in some cases the water rising 4ft. above the floors. A portion of the permanent way of the Hunstanton Railway was washed away owing to the tide flowing over the banks near Heacham, and traffic was stopped.

At Holme, Thornam, Burnham, Cley, and Blakeney, the sea banks which enclose the Marsh land were overflowed and broken, and were injured to an extent requiring several thousand pounds to reinstate them. The lands were flooded, and the houses of the inhabitants submerged; at the village of Salthouse the lower rooms of 90 houses having been submerged.

At Wells also the water found its way into the houses and shops.

At Sheringham, Cromer, and Mundesley great damage was done to the cliffs; and at Palling the high tide carried away several feet of the sand hills.

Between Winterton and Happisburgh the sand hills were clean cut down from five to twelve yards.

Owing to the height of the tide the salt water was driven for an unusual distance up the rivers which run through the Broads, killing great numbers of fresh water fish.

At Horsey Gap, several breaches were made in the sea bank, through which the tide poured and inundated the land at the back.

All along the coast from the Wash to the Thames the tide was abnormally raised, the increase at Yarmouth being 8ft., or 2ft. more than the full rise of a spring tide, the difference between this and the tide of the following day being 9ft. 3in. The quays, marine drive, and the beach garden at Yarmouth were all flooded.

At Lowestoft some of the principal streets of the town were flooded, the masonry of the esplanade was broken down, and the embankment of the railway so damaged at Oulton that traffic had to be suspended.

At Harwich the water broke over the sea bank, carrying a laden barge through a breach into the street. Nearly 300 cottages were flooded to a depth of 6ft.

At Aldeburgh a large breach was made in the sea wall, the land and houses were inundated, and the permanent way of the railway was undermined.

At Ipswich the increase on the tide of the day was 6ft. 6in. An immense amount of damage was done all along this part of the coast by the breaking down of the cliffs.

At the mouth of the Thames the damage done by the high tide and gale was greater than on any other part of the coast.

The banks of Canvey Island suffered considerably, a large area of the enclosed land being flooded. The tide flowed over the bank from Leigh to Pitsea Island and also that at Purfleet, inundating the land behind, and also the houses in the village of Leigh.

Tilbury Marshes and the whole of the lower part of Grays were inundated to a depth of several feet, and the Tilbury Railway was under water in several places.

At Gravesend, the tide rose to 3ft. 4in. above Trinity high-water mark, or within 5in. of the great tide of 1881, the highest on record, the difference in height between this and the tide of the next day being 7ft. 5in. At the Victoria and Albert Dock it was 4ft. 5in. above the expected height, the following tide being 1ft. 11in. less than expected, the actual difference in height between the two tides being 7ft. 4in.

In London the water was nearly level with the top of the parapet of the Embankment and the footway was flooded. The Custom House Pier and several of the low-lying streets, both on the east and west sides of the river, were flooded, in some cases knee deep. Many basement floors were completely submerged and the cellars filled with water. Even up the river as high as Richmond the tide flowed over the towing path and the Twickenham Embankment.

At Blackfriars Bridge the tide rose to 4ft. 9in. above Trinity high water mark, and at Hammersmith to 4ft. 6in.

At Woolwich, where the Arsenal wharves are 4ft. above high water of spring tides, the water flowed over them, and it was only by the help of a great number of troops who were called out to assist, that a large amount of ammunition and stores placed ready for shipment was saved from destruction. The greater part of the Arsenal was flooded, and the fires in the boilers belonging to the electric light plant extinguished.

At Chatham considerable damage was done by floods, and at Rochester the gas works were inundated to a depth of 8ft. Between Sheerness and Queenborough the land was flooded, the water flowing over the railway into Blue Town, flooding the streets and filling the lower floors of the houses, from which the inhabitants had to be removed by boats. The tide broke over the dockyard wall and flooded all the lower portions of the yards and the basement of the Royal Naval Barracks to a depth of 8ft.

At Sheerness the water was 2ft. deep in the streets, and a large area of land in the neighbourhood inundated, the seawall near Scrapsgate having given way. The sewage outfall at West Minster was flooded and the pumping operations stopped; the railway line was also flooded. At Whitstable the tide overflowed the banks two hours before high water and swept across the Salts, carrying with it fences and storehouses, and breaking into the dwelling-houses. Some of the houses were under water to a depth of 8ft., and the High Street was from 3 to 4ft. under water. At Sittingbourne also great damage was done to the river wall, the water flowing a distance of two miles inland; great numbers of sheep and cattle were drowned.

The lower parts of Margate and of Herne Bay were inundated, and the houses filled with water.

At Broadstairs the old pier was submerged and considerably damaged.

The river Stour overflowed its banks and flooded the main streets of Sandwich; the marsh land for nearly two miles inland was inundated, including

the golf links, and vehicular traffic along the main road between Sandwich and Ramsgate had to be suspended.

At Deal the water rose above shore level and flooded the streets and houses, considerable damage being done to the sea wall at the north end of the town.

At Dover the afternoon tide of the 29th rose 6ft. 1in. above its proper height, there being a difference of 8ft. between this tide and that of the next day.

At Newhaven the increased range of the tide was about 2ft. 4in., and at Portsmouth only 1ft. 8in. on the afternoon of the 29th.

The above is only a partial record of the immense extent of the damage done, the most serious amount of flooding perhaps that has been recorded, but it is sufficient to show the extent to which the tide may be influenced by gales of wind.—*Engineer*, December 17th, 1897.

FROMONDUS.

IN our number for August we gave a list of the editions of Fromondus's six books on Meteorology, known, or reported to us; three others have been mentioned since, either in these pages or in those of *Ciel et Terre*. It seems to us that it may be well to sum up the facts as far as at present ascertained.

It appears that Prof. Monchamp's quotation of an edition dated 1655 was a mistake for 1656—so that is disposed of.

M. Lancaster, relying upon the *Biographie Nationale*, published by the *Académie des Sciences de Belgique*, quoted* one of 1634, and in *Ciel et Terre* (1897, p. 431) he quoted one of 1631, but in *Ciel et Terre*, on page 503 both Prof. Monchamp and M. Lancaster appear to admit that neither of these editions ever existed.

The hypothetical edition of 1670, which we called F, is disposed of by the printer's signatures (see *Met. Mag.*, 1897, pp. 118 119).

We are not aware what librarians have adopted as the definition of an edition; we think that the prefixing of a new title page, with a fresh publisher's name, or a fresh date, distinguishes one issue from another, but Prof. Monchamp seems to think not, and he (*Ciel et Terre*, 1897, p. 503) treats editions B and D as two issues of one edition. In this he is mistaken. We have both, and not merely do the titles differ, but also the decorated initial letters and the ornamental headlines. Although at first sight it might be held that the body of the work was identical, for the two run word for word, line for line, and page for page; close examination will show that the whole work has been set up afresh, as stated on the title page. In proof of this many differences can be detected, we quote four instances.

	Edition	B 1639.	D 1656.
Page 135, line 4, last word		Nam.	Nâ.
„ 153, line 11 from bottom		extrinsecum.	eXtrinsecum.
„ 175, „ 14 „ „		avertisse.	evertisse.
„ 449, „ 3 „ „		oculum.	oculû.

* *Met. Mag.*, 1897, p. 118.

The final result is, that our list on p. 118 has, up to the present time, received no augmentations, and the only correction is that F disappears, and E can be called a 4to, although no one looking at it would do so.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, December 15th, at the Institution of Civil Engineers, Mr. E. Mawley, F.R.H.S., President, in the chair.

The following candidates were balloted for and duly elected :— Leonard Addenbrooke ; James Diggle, A.M.I.C.E., F.G.S. ; Ernest Romney Matthews, C.E. ; T. T. S. Metcalfe, J.P. ; William Ormerod, J.P.

Mr. R. C. Mossman, F.R.S.E., read a paper on the daily values of non-instrumental meteorological phenomena in London, from 1763 to 1896. The paper summarised records of snow, hail, gales, thunderstorms, fogs, &c., for each day in the last 134 years, thus exhibiting the daily march of the various phenomena throughout the year. Thunderstorms, it was shown, were at their maximum from the beginning of June to the middle of August, the greatest number being recorded in the week ending July 20th. A rapid decline set in at the beginning of August, and very few cases were recorded between October and March. Lightning, without thunder, was essentially a nocturnal phenomenon ; and increased rapidly after the summer solstice. During January fogs were considerably above the average, but they diminished rapidly after the middle of February, falling to a minimum at the beginning of July. A marked increase took place during September, when the autumnal fall of temperature set in. A great many fogs were recorded about the middle of October, but the maximum extended from November 5th to 24th. This applied also to the density of fogs, as during the above period no less than 27 per cent. of all the fogs recorded were designated "thick," or "dense." At the end of November fogs diminished both in number and in density, only 15 per cent. being recorded as "dense" in the fortnight ending December 8th. Snow was at its maximum at the beginning of January, but the values at the beginning of March were also high. There was a curious increase in snowstorms about the middle of April, and an equally marked decrease at the beginning of December. The increase in April took place at the time of "the borrowing days," (new style) while the diminution in December was associated with the occurrence of a mild stormy period, which recurred from year to year at the beginning of that month, with few exceptions. Storms were most frequent at the end of January, and at their minimum in August. With regard to the occurrence of equinoctial gales it was shown that storms diminished rapidly before, during and after, the vernal

equinox. During the second half of September a rapid increase took place, which rather supported, than otherwise, the popular opinion regarding gales at the autumnal equinox. On closer inspection it was seen that this period might be said to mark the termination of the tranquil summer conditions rather than the commencement of very stormy weather, which characterised the four months November to February.

Mr. W. Marriott read a paper on "the Rainfall of Seathwaite, Cumberland." This place has long been noted for its heavy rainfall, being, in fact, one of the wettest spots in the British Isles,—the average yearly amount is 137 inches. The spring months of April, May and June, are the driest, as they not only have the least rainfall, but also the least number of rainy days. August has the greatest number of rainy days. The heavy nature of the rainfall may be gathered from the fact that 21 per cent. of the falls are above 1 in., 2 per cent. being above 3 in. The greatest fall in one day was 8·03 in., on November 12th, 1897. The author has investigated the atmospheric conditions under which the heavy rainfalls occurred, and he finds that they are due to the direction and force of the wind. When the wind is blowing strongly from the south-east, or south-west, it will be concentrated in the valleys on the windward of Scafell, and rush up them with considerable force, the air current consequently being projected to a considerable altitude beyond Scafell. Owing to the reduction of temperature with elevation, the air parts with a great deal of its moisture, which falls as rain. With such a process going on continuously for a whole day, the heavy rainfall at Seathwaite is fully accounted for.

REVIEW.

Klima-Tabeller for Norge, of H. MOHN. II. Lufttryk. III. Luftens Fugtighed. Christiania. 1896 and 1897. Two parts, large 8vo, 80 pp. and 12 pp.

WE had the pleasure of noticing the first part of Prof. Mohn's excellent summaries of Norwegian meteorology, on p. 43 of our last volume; that dealt with temperature, the two parts now before us deal respectively with pressure, and with humidity.

As there are doubtless other parts to follow, we take this opportunity of expressing the hope that, before completing this valuable monograph, Dr. Mohn will give a map of the stations,—we are aware that he gives full particulars as to the lat. and long. of each, but it would be much more handy to have in the book itself a sketch map showing their distribution.

II. Lufttryk (Pressure). This is, like all Dr. Mohn's work, a thoroughly practical, well arranged, and nearly complete treatise,—we say nearly complete because some diagrams would add to its value. The first section gives full details as to the barometers used

at the central station, and a history of all the comparisons made between them and the standards at Kew, Greenwich, Paris, and other places. Then follows a life history of the barometers at 46 other stations. After this we have a specimen of the process adopted for completing short period records, a list of the stations with lat., long., altitude, beginning, ending and duration of the record, and particulars as to the normal stations, whence (if the record does not cover the whole of the 25 years, 1866-90) the values have been completed. Table II. gives for each station the mean pressure for each month, and for the year, on the average of 25 years. But we cannot go through all these excellent tables, in which apparently nothing has been forgotten. We must pick out one or two facts and pass on. Apparently the greatest and the least mean annual pressure at sea level are—

Greatest.....	^{in.} 29·928	at Tonset, in Lat. 62° 17' N., Lon. 10° 45' E.
Least.....	29·768	at Gjesvær, ,, 76° 6' N., ,, 25° 22' E.

The individual extremes reduced to sea level are given by Dr. Mohn as—

Highest..	^{in.} 31·174	on Feb. 6th, 1895, at Vardø, Lat. 70° 22' N., Lon. 31° 8' E.
Lowest..	27·760	on Jan. 27th, 1884, at Bergen, ,, 60° 23' N., ,, 5° 21' E.

III. Luftens Fugtighed (Humidity). This subject is treated very similarly to the Pressure, we need, therefore, say only a few words as to the results. As regards vapour tension, the maximum at all stations is in July or August, and most generally in July; the minimum is at all stations in January, February, or March, and most generally in February. The relative humidity is at its maximum at nearly every station in one of the four months August to November, the minima are spread over the spring months February to June.

Some marvellously low values are reported as the extremes of relative humidity; an entry of 3 at Vardø has a ? but there is 8 at Christiania, and 10 is reported from Domaas, Lærdalsøren, Brønø, and Bodø, and 11 or 12 at many stations. After that who will say that Norway is always damp?

INCLINED AIR CURRENTS.

To the Editor of the Meteorological Magazine.

SIR,—It may interest you, and through you some of the readers of the *Meteorological Magazine*, to know that it is easy to observe the vertical component of the motion of the wind by means of a simply constructed wind vane, and that quite a new field of interesting investigation is thus opened up.

The vane I have constructed is of $\frac{5}{8}$ inch brass rod. At one end two saw cuts have been made, each at a right angle to the other, in the direction of its length, and in them are fixed two circular sheets

of brass, 6 inches diameter, intersecting at a right angle; the vane is altogether about 2 ft. long. It is pivoted at its balancing point in a metal support, which is fixed in a short length of brass tube, and rests on a metal point, fitting easily into this tube, so as to allow it, with the vane, to revolve in the horizontal plane freely, and the pivot allows it to oscillate, within limits, fixed by springs, of about 35° up or down from the horizontal. Placed at a height of about 50 ft. above the ground, it indicates the direction of the wind truly, both horizontally and vertically.

My observations hitherto made seem to indicate that strong winds sometimes blow at inclinations as great as at least, 30° above or below the horizontal, and that whether these comparatively steady inclinations are themselves parts of atmospheric waves or not—more rapid waves are very general. These observations, if verified, seem to be important to architects, engineers, and those who are endeavouring to work out the problem of a flying machine. One can notice how a bird, with its beautiful living organism adapted to its environment, can utilise these air waves in its soaring flight; but I fear that they will sorely disturb the equilibrium of any machine launched in the free air.

One observation, in the calm centre of a great cyclone of moderate intensity, seemed to indicate a steady, moderate, upward motion of the atmosphere there, replenished presumably from all sides below. This evidently is a very different thing from the violent upward motion in the centre of a small whirlwind. Generally there appears to be an upward motion in the centre of a V depression, and vice versa. The mechanism of land and sea breezes, with their upward and downward motions is well shown.

I am sure that a very wide field of investigation in connection with variations in barometric readings, influenced by upward or downward movements of the atmosphere, is open to any observers who provide themselves with simple instruments of this sort, and place them in open situations, at, I suppose, not less than 30 ft. above the surface of the ground.

I send you this short sketch of my early enquiries in this direction in the hope that if publicity be given to the subject, many meteorologists may be led to give their attention to it, and that combined observations, with good instruments, may largely increase our knowledge.

I am, sir, faithfully yours,

H. SCHAW,
Major-General, R. E., C. B.

Aurora Terrace, Wellington, New Zealand.

27th October, 1897.

[General Schaw's letter has come so far, and is in many respects so interesting, that we gladly insert it, and think it not improbable that some of our correspondents may take up the subject. The

General's instrument is evidently very inexpensive, but it produces no record. The first instrument, not merely to show, but to record, the inclination of the wind, was brought out by Dalberg, in 1780; those by Benzenberg, Cacciatore, Hennessy, and Dechevrens, are described by Professor Laughton in his "Historical sketch of anemometry." (*Quar. Jour. R. Met. Soc.*, VIII., (1882) pp. 174-175). We have an impression that an indicator of inclination was attached to the Atmospheric Recorder constructed by Mr. G. Dollond, for Mr. H. Lawson, and erected at Nottingham, but in neither of the descriptive pamphlets prepared by Mr. Dollond is there any reference to the subject. The last and most elaborate effort in this direction was made by Mr. L. M. Casella, and is described and illustrated in the *Quar. Jour. R. Met. Soc.*, XII., (1886) pp. 246-253.

The great cost of most of the recording patterns is an obstacle to their introduction, and most of them must be placed on piers or buildings which necessarily produce deflections in the very currents, the inclination of which they are intended to measure. We are therefore disposed to think that systematic observation of General Schaw's pattern, mounted on a very tall pole, would give more trustworthy results than any of the recorders.—ED.]

KITE FLYING IN SCOTLAND.

To the Editor of the Meteorological Magazine.

SIR,—With reference to the notice in the current issue of *Met. Mag.*, *re* Scientific Kite Flying, it may be of interest to state that several experiments with kites of the Blue Hill pattern have been made here during the past two months. No instruments have as yet been sent up, but we hope to have the ingenious apparatus of M. Richard at work soon. The trials have been carried out under the direction of Mr. John Anderson (late of Owensboro, Kentucky), and have, on the whole, been successful. An improved hand winch is at present under construction, which, with the substitution of piano wire for cord, will, we hope, yield satisfactory results.

I am, Yours very truly,

R. C. MOSSMAN.

10, Blacket Place, Edinburgh, Jan. 4th, 1898.

WARM WINTER NIGHTS.

To the Editor of the Meteorological Magazine.

SIR,—I think that the high minimum temperature of the night of December 17th, 1897, should not pass without notice. On the morning of the 18th I recorded 53°·2 in my Stevenson screen, and

52°·7 in the old screen, as the lowest temperature of the preceding 24 hours; both are verified thermometers. I had only one other minimum equalling 50°·0 in the nineteen Decembers from 1878 to 1896 inclusive, viz.: 50°·8 on December 4th, 1889. In the "Greenwich Met. Obs.," Part III., Temperature 1841-1890," there is no minimum in December exceeding 52°·0; this, therefore, seems to have been most exceptional.

While on the subject of high minima, permit me to point out what appears to be an error on p. 116, Vol. 28 of the *Met. Mag.* I find in the above Greenwich records that 60°·0 was the minimum on August 8th, 1846, and not 68°·0. The highest recorded at Greenwich during 50 years was 66°·1, on July 26th, 1872; that of August 18th, 1893, is therefore unprecedented since 1841. Again, minima above 60° can hardly be described as *very* rare; at Greenwich they average about four per annum, and in the *Met. Mag.* for September, 1897, p. 123, you state that at Camden Square you have two every August on the average.

Minima above 64° are very rare. Howard records eight in 25 years, the highest being 70° on July 27th, 1814. Mr. Cowe's *Register* records 26 in 46 years. Greenwich only four in 50 years.

Yours very truly,

CHARLES L. BROOK.

Harewood Lodge, Meltham, Dec. 20th, 1897.

[Mr. Brook is right and we were wrong in Vol. 28, but we can plead extenuating circumstances. It is printed (wrongly) in the Greenwich Observations for 1846 as 68°·0, but at that time observations were being taken every two hours, and from them it is obvious that 68°·0 is wrong, and 60°·0 right. We agree with Mr. Brook as to the use of the words "rare," and "very rare," and only think it necessary to add that a consideration of the position of the Rev. J. Cowe's thermometer (see the photo and plan in the volume) will explain the number of high minima recorded by him—the surrounding walls would radiate heat at night and prevent proper cooling.—ED.].

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JULY, 1897.

STATIONS.	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
<i>(Those in italics are South of the Equator.)</i>	°		°		°	°	°	0-100	°	°	inches		
England, London	83·6	24	44·0	8	75·8	55·3	52·9	68	130·1	36·1	·64	8	4·0
Malta.....	97·0	15	66·3	31	88·2	71·5	67·0	69	159·7	58·4	·09	2	2·0
<i>Mauritius</i>	78·5	23	59·8	13	75·9	64·9	59·6	61	121·5	50·4	1·50	10	5·2
Calcutta.....	97·7	3	74·6	14	88·5	78·7	77·8	84	156·3	74·2	13·45	18	7·7
Bombay.....	89·7	2	73·9	17	84·9	77·7	77·3	87	143·6	73·9	30·19	28	8·7
Ceylon, Colombo	88·2	...	73·0	4	86·5	78·1	73·7	80	139·0	71·0	5·24	22	6·4
Melbourne.....	66·1	30	34·6	29	57·0	44·5	44·0	78	115·2	26·0	2·45	14	7·2
Adelaide	67·7	17	38·9	28	60·0	46·5	45·8	79	124·2	29·2	1·81	16	6·0
Sydney	66·9	31	41·4	18	60·3	47·6	45·2	82	110·2	29·9	6·58	7	4·2
Wellington	62·0	26	31·0	20	54·8	43·3	39·5	71	105·0	21·0	3·31	20	4·5
Auckland	61·0	14	40·0	3	57·7	46·8	43·1	71	120·0	38·0	5·23	25	6·2
Jamaica, Kingston.....	92·4	23 ^a	70·8	23	89·1	73·5	70·9	71	...	...	1·74	10	6·2
Trinidad	92·0	26 ^b	67·0	15	87·6	70·6	73·8	83	167·0	66·0	13·88	23	...
Grenada.....	86·0	21	70·2	30	83·2	74·6	71·2	75	152·0	...	7·51	22	2·8
Toronto	93·3	5	53·0	15	81·4	63·5	64·1	74	109·4	50·2	5·24	13	4·4
New Brunswick, Fredericton	92·7	8	45·5	4	78·7	55·8	61·4	67	...	...	3·42	12	5·4
Manitoba, Winnipeg ...	88·5	17	47·0	12	79·0	56·8	...	...	...	...	5·38	14	5·8
British Columbia, Esquimalt.....	77·7	12	45·1	25	68·2	50·5	51·7	82	...	...	·97	8	4·8

a—and 30. b—and 27.

REMARKS.

MALTA.—Adopted mean temp. 78°·4, or 0°·9 above the average. Mean hourly velocity of wind 8·6 miles. Average sea temp. 80°·0. TS on 5th, L on 6th.

J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·0 above, of dew point 0°·2 above, and rainfall ·76 in. below, their respective averages. Mean hourly velocity of wind 12·1 miles, or 0·3 above average; extremes, 29·1 on 22nd, and 2·0 on 24th; prevailing direction E.S.E.

T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 81°·6, or 1°·1 above, of dew point 0°·3 above, and rainfall ·84 in. above, their respective averages. Mean hourly velocity of wind 10·3 miles; prevailing direction S.W.

H. O. BARNARD.

Adelaide.—Mean temp. 1°·7 above the average of 40 years. Rainfall ·84 in. below average. In the northern agricultural districts the rainfall was generally above the average.

C. TODD, F.R.S.

Sydney.—Rainfall 2·34 in. above, humidity 5·5 above, and temperature 1°·6 above, their respective averages. Heavy general rains fell in continuance of those in June, and a high flood occurred on the Darling.

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

Wellington.—From 12th to 22nd generally showery, and also at the end of the of the month; the remainder fine. Variable winds, generally moderate. L on 8th, 15th, and 16th, and T and L on 19th. H on 8th, 17th, and 18th. Temp. 1°·4 above, and rainfall 3·03 in. below, the average. Slight earthquake on 8th.

R. B. GORE.

Auckland.—A showery and stormy month, rain being registered on 25 days, and the total nearly ·50 in. above the average. Mean temp. and barometric pressure both slightly above the average.

T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Frequent thunderstorms.

J. F. BRENNAN.

TRINIDAD.—Rainfall 4·43 in. above the average of 30 years.

J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,
DECEMBER, 1897.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	2·91	XI.	Rhayader, Nantgwillt ...	11·05
II.	Dorking, Abinger Hall .	4·25	„	Lake Vyrnwy	8·94
„	Birchington, Thor	2·63	„	Corwen, Rhug	5·22
„	Hailsham	3·51	„	Criccieth, Talarvor	4·50
„	Ryde, Thornbrough	3·31	„	I. of Man, Douglas	5·36
„	Emsworth, Redlands ...	3·09	XII.	Stoneykirk, Ardwell Ho.	4·48
„	Alton, Ashdell	5·60	„	New Galloway, Glenlee	11·81
III.	Oxford, Magdalen Col..	2·28	„	Moniaive, Maxwelton Ho.	10·04
„	Banbury, Bloxham	3·55	„	Lilliesleaf, Riddell	4·62
„	Northampton, Sedgebrook	2·39	XIII.	N. Esk Res. [Penicuick]	5·00
„	Duddington [Stamford].	2·06	XIV.	Glasgow, Queen's Park..	5·56
„	Alconbury	1·46	XV.	Inverary, Newtown	9·44
„	Wisbech, Bank House...	1·45	„	Oban, The Corran	6·90
IV.	Southend	1·94	„	Islay, Gruinart School ...	4·16
„	Harlow, Sheering.....	2·70	XVI.	Dollar.....	5·87
„	Colchester, Lexden	1·77	„	Balquhider, Stronvar..	10·94
„	Rendlesham Hall	1·53	„	Ballinluig	(4·00)
„	Rushall Vicarage	2·00	„	Dalnaspidal H. R. S.....	9·07
„	Swaffham	1·86	XVII.	Keith H. R. S.....	3·96
V.	Salisbury, Alderbury ...	5·64	„	Forres H. R. S.	2·28
„	Bishop's Cannings	3·95	XVIII.	Fearn, Lower Pitkerrie..	2·07
„	Blandford, Whatcombe .	5·95	„	N. Uist, Loch Maddy ...	7·11
„	Ashburton, Holne Vic... 14·46		„	Invergarry.....	12·26
„	Okehampton, Oaklands.	9·29	„	Aviemore H. R. S.	5·41
„	Hartland Abbey	5·35	„	Loch Ness, Drumnadrochit	5·77
„	Lynmouth, Glenthorne.	8·73	XIX.	Invershin	3·64
„	Probus, Lamellyn	6·77	„	Scourie .....	...
„	Wellington, The Avenue	6·02	„	Watten H. R. S.....	2·17
„	Wincanton.....	6·08	XX.	Dunmanway, Coolkelure	10·65
VI.	Clifton, Pembroke Road	4·31	„	Cork, Wellesley Terrace	4·25
„	Ross, The Graig	3·60	„	Killarney, Woodlawn ...	11·85
„	Wem, Clive Vicarage ...	2·23	„	Caher, Duneske	4·42
„	Cheadle, The Heath Ho.	3·75	„	Ballingarry, Hazelfort...	3·54
„	Worcester, Diglis Lock	2·57	„	Limerick, Kilcornan ...	3·87
„	Coventry, Priory Row ...	2·80	„	Broadford, Hurdlestown	3·68
VII.	Grantham, Stainby	2·30	„	Miltown Malbay	7·83
„	Horncastle, Bucknall ...	2·01	XXI.	Gorey, Courtown House	4·22
„	Worksop, Hodsock Priory	2·02	„	Athlone, Twyford	4·48
VIII.	Neston, Hinderton	2·18	„	Mullingar, Belvedere ...	3·84
„	Southport, Hesketh Park	2·98	„	Longford, Currygrane...	5·37
„	Broughton-in-Furness ...	8·09	XXII.	Woodlawn	5·65
IX.	Ripon, Mickley.....	3·47	„	Crossmolina, Enniscoe ..	7·78
„	Melmerby, Baldersby ...	2·81	„	Collooney, Markree Obs.	4·65
„	Scarborough, Observat'y	1·52	„	Ballinamore, Lawderdale	...
„	Middleton, Mickleton ...	2·92	XXIII.	Warrenpoint.....	4·36
X.	Haltwhistle, Unthank...	4·16	„	Seaforde.....	4·78
„	Bamburgh	2·25	„	Belfast, Springfield	5·38
„	Keswick, The Bank	11·35	„	Bushmills, Dundarave..	4·64
XI.	Llanfrechfa Grange	7·28	„	Stewartstown	4·79
„	Llandoverly	7·48	„	Killybegs	7·07
„	Castle Malgwyn	8·39	„	Lough Swilly, Carrablagh	5·61
„	Builth, Abergwesyn Vic.	14·70			

DECEMBER, 1897.

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		Deg.		Max.		Min.		In shade.	On grass.
				Dpth	Date			Deg.	Date	Deg.	Date		
I.	London (Camden Square) ...	2·20	+ ·13	·64	7	17	55·9	16	23·7	26	10	17	
II.	Tenterden	3·28	+ ·65	·70	7	22	54·0	16 ^b	21·5	26	10	16	
III.	Strathfieldsaye	2·32	+ ·29	·48	7	19	56·0	16	22·0	22	12	...	
IV.	Winslow (Addington)	3·07	+ ·62	·57	29	18	58·0	16	20·0	24	14	16	
V.	Bury St. Edmunds (Westley)	1·71	- ·53	·43	7	12	54·0	17	27·0	4	...	...
VI.	Norwich (Brundall)	1·82	...	·33	7	17	54·2	17	21·2	23	9	20	
VII.	Weymouth (Langton Herring)	7·16	...	2·14	29	18	56·6	16	32·0	3	1	4	
VIII.	Torquay (Cary Green) ...	6·27	+ 2·04	·99	29	22	57·1	16	27·6	3	4	11	
IX.	Polapit Tamar [Launceston].	4·02	+ 1·57	·72	29	18	57·0	16	26·0	22	14	...	
X.	Stroud (Upfield)	3·63	+ ·58	·58	7	21	55·0	16	26·5	23	11	18	
XI.	Churchstretton (Woolstaston)	2·65	...	·76	4	21	...	...	...	...	...	...
XII.	Leicester (Rotherby Hall) ...	1·23	- ·62	·32	13	12	54·0	16	22·0	23	14	...	
XIII.	Boston	1·98	- ·00	·34	7	18	58·0	16	19·0	24	14	...	
XIV.	Hesley Hall [Tickhill]	3·72	+ ·28	·92	7	17	56·0	16	25·0	22	12	14	
XV.	Manchester (Plymouth Grove)	1·02	- 1·42	·31	7	12	...	...	...	...	...	...
XVI.	Wetherby (Ribston Hall) ...	11·00	+ 4·19	1·56	7	23	...	...	...	...	...	...
XVII.	Skipton (Arncliffe)	2·04	- ·23	·65	13	13	57·0	16 ^b	24·0	22 ^f	12	15	
XVIII.	Hull (Pearson Park)	2·38	+ ·08	·80	7	18	...	...	...	...	...	...
XIX.	Newcastle (Town Moor)	20·57	+ 5·76	2·50	29	23	...	...	...	...	...	...
XX.	Borrowdale (Seathwaite)	6·92	+ 2·37	1·53	7	18	...	...	...	...	...	...
XXI.	Cardiff (Ely)	7·41	+ 2·42	·76	5	21	56·0	17	26·2	3	5	18	
XXII.	Aberfordwest	3·69	- 1·19	·65	7	17	56·0	17	...	...	...	...
XXIII.	Aberystwith (Gogerddan) ...	3·77	+ ·81	·80	7	18	60·0	27	30·0	22	2	...	
XXIV.	Llandudno	11·24	+ 7·22	1·80	26	20	56·0	17	20·0	23	12	...	
XXV.	Cargen [Dumfries]	2·45	...	·39	28 ^a	15	54·0	27	24·9	23	10	18	
XXVI.	Edinburgh (Blacket Place)	6·97	...	·75	26	20	54·0	27	25·0	2	...	...
XXVII.	Colmonell	6·35	- 1·22	·81	6	21	...	...	...	...	...	...
XXVIII.	Lochgilphead (Kilmory)	6·00	+ 2·69	·90	9	15	...	...	...	...	...	...
XXIX.	Mull (Quinish)	3·35	+ 1·27	·50	5	19	52·6	17	21·9	23	12	...	
XXX.	Dundee (Eastern Necropolis)	4·99	+ 2·52	·81	8	17	50·0	27	16·0	23	18	29	
XXXI.	Braemar	3·68	...	·90	10	23	51·0	26	20·0	22 ^f	18	...	
XXXII.	Aberdeen (Cranford)	3·04	+ ·58	·50	8	23	...	...	...	...	...	...
XXXIII.	Cawdor (Budgate)	8·91	+ 3·14	1·50	27	13	...	...	...	...	...	...
XXXIV.	Strathconan [Beaully]	9·65	...	1·25	8	22	53·6	26	21·2	22	13	...	
XXXV.	Glencarron Lodge	2·78	- ·59	·81	8	13	51·0	27	23·8	23	10	...	
XXXVI.	Dunrobin	4·40	+ ·74	·60	11	17	49·0	17 ^c	32·0	2	1	...	
XXXVII.	S. Ronaldsay (Roeberry)	6·25	...	·63	12	22	...	...	...	...	...	...
XXXVIII.	Darrynane Abbey	5·48	+ 1·84	·82	12	21	56·0	26	29·0	3	2	...	
XXXIX.	Waterford (Brook Lodge) ...	5·27	...	·54	25	19	...	...	...	...	...	...
XL.	O'Briensbridge (Ross)	3·47	+ ·35	·53	7	23	...	...	...	...	...	...
XLI.	Carlow (Browne's Hill)	1·84	- ·32	·26	5	18	57·8	27	32·9	3	0	12	
XLII.	Dublin (Fitz William Square)	4·59	+ 1·17	·90	26	21	50·0	16	28·0	31	5	...	
XLIII.	Ballinasloe	11·91	...	1·58	29	24	...	...	...	...	...	...
XLIV.	Clifden (Kylemore)	4·57	+ 1·53	1·07	26	17	55·0	16 ^d	28·0	2 ^g	8	19	
XLV.	Waringstown	4·62	+ ·41	·62	26	21	...	...	...	...	...	...
XLVI.	Londonderry (Creggan Res.)	4·65	+ ·97	·93	26	20	52·0	7 ^e	29·0	22	10	16	
XLVII.	Omagh (Edenfel)												

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

a—and 29. b—and 17. c—and 26. d—and 26, 27. e—and 16, 25. f—and 23.

g—and 22.

METEOROLOGICAL NOTES ON DECEMBER, 1897.

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

ENGLAND.

TENTERDEN.—A wet month at last, but not enough R to fill up ponds and springs. The second week very wet, and the last five days showery. Much wind at times. Hard frost from 22nd to 26th. Duration of sunshine 67 hours. Dense fog nearly all day on 18th. Gales from S.W. on 7th, N.W. on 11th, and S on 29th and 30th. On 1st, 6 hrs. 40 min. of sunshine, and on 25th, 6 hours.

ADDINGTON.—Max. temp. rather high at times; from the 13th to the 17th it averaged 54°, and from the 24th to the end, 50°. Sharp frost on the 4th, and again from 23rd to 26th. On the 18th thick fog all day. Wind high on several days. Floods on the 15th and 30th.

BURY ST. EDMUNDS, WESTLEY.—A mild and windy month, with no snow.

NORWICH, BRUNDALL.—A mild and stormy month, with some sharp rime frosts at Christmas. At the close of the month violets, chrysanthemums and Christmas roses were in full bloom in the garden, with winter aconites and snowdrops coming through the soil, and nearly ready to bloom. H, sleet, and a few flakes of S on 2nd. Gales on 7th, 29th, and 30th.

TORQUAY, CARY GREEN.—Rainfall 3·69 in. above the average. Mean temp. 46°·0, or 3°·1 above the average. Duration of sunshine 79 hrs. 10 min., being 27 hrs. 5 min. above average; 10 sunless days.

POLAPIT TAMAR.—Very wet and stormy, and unseasonably warm. H on 1st, 8th, 9th, and 28th. L and T at 4.30 p.m. on 14th. Gales from S. on 7th and 10th, W.S.W. on 8th and 13th, S.S.W. on 16th, 26th, and 29th.

STROUD, UPFIELD.—S.W. gales on 7th, 13th, 16th, 28th and 29th. L and T on 14th.

WOOLSTASTON.—Stormy weather prevailed in the early part of the month, with heavy gales on 7th and 8th, and again on 26th and 29th. There was a good deal of sharp frost, but the middle of the month was mild and genial. Mean temp. 39°·4.

ROTHERBY HALL.—Rainfall ·65 in. above the average, and the month was dull and damp, with much wind. On the 4th more than half an inch of S fell. On the 23rd the temp. on grass fell to 12°.

HULL, PEARSON PARK.—H on 2nd. Fog on 5th, 12th, 13th, 14th, 18th, 19th, 22nd, 23rd, and 24th. Stormy on 28th, 29th and 30th.

WALES.

HAVERFORDWEST.—December was wet and stormy up to the 16th, with temp. above the mean, and vegetation in a luxuriant condition; a mild frost then set in, with much mist and fog, and grass temp. rather low (18°·6 on 23rd), this weather lasted until the 25th. Another stormy wet period followed, which lasted to the end of the month. The wettest December since 1891, when 7·87 in. fell.

ABERYSTWITH, GOGERDDAN.—Strong gales from 27th to 30th.

LLANDUDNO.—T and L on 30th. Lunar halo on 12th. Rainbows seen on six days, that on 27th lasting for four hours.

SCOTLAND.

CARGEN [DUMFRIES].—A month of wet, unsettled weather, the rainfall (11·24 in.) being the heaviest in any month since observations commenced in 1860, the nearest approach to it being 10·72 in. in October, 1874; 6·50 in. fell in the last six days, quite the heaviest fall ever experienced here. The fall of 1·80 in. on 26th has been exceeded on only 5 days during 38 years. The mean temp. is 1° above the average for December, and on only 11 days did the minimum fall below 32°. On 26th it blew hard from S.E., and easterly winds prevailed on 14 days. T and L occurred on 4 days, and a severe TS, during which the L was very vivid, on the evening of the 30th; slight S fell on 8th. Sunshine was conspicuous by its absence, and during 18 days the sun was never seen.

EDINBURGH, BLACKET PLACE.—S on 1st and 8th. Dense fog on 18th, 22nd, 23rd, and 24th.

COLMONELL.—Rain 1·90 in. above, and mean temp. 4°·1 above, the average of 21 years.

MULL, QUINISH.—With the exception of a week of fine weather, with some frost from 18th to 24th, the month was mild, wet and stormy. A gale of unusual violence blew from S.S.W. on the 30th.

BRAEMAR.—A wet, but open month.

ABERDEEN, CRANFORD.—Very mild and warm, the mean temp. on some nights being between 40° and 45°.

S. RONALDSAY, ROEBERRY.—Not a bad month upon the whole, although the rainfall is ·93 in. above the average of 30 years. Mean temp. 40°·7, or 1° above the average.

IRELAND.

DARRYNANE ABBEY.—A wet, but mild month; the middle part very wild and stormy. N.W. gale with H showers on 8th. Strong S.W. gale, and very heavy sea on 15th.

WATERFORD, BROOK LODGE.—H and sleet on 8th. H on 13th, 27th, and 30th. The Comeragh mountains well covered with S on 9th. Mean temp. 44°·8.

O'BRIENSBRIDGE, ROSS.—A very dreary and wet month, excepting one week from 16th to 24th. Frequent and severe gales, mostly from S.E.

DUBLIN, FITZWILLIAM SQUARE.—A changeable open month, with frequent, but not heavy rain, and almost entire absence of frost. Mean temp. 44°·9, or 3°·6 above the average. A lunar halo was seen on the 9th. High winds were noted on 15 days, and attained the force of a gale on 7 occasions. Foggy on 7 days. S and sleet on the 8th; H on the 14th. Aurora borealis on the 11th. L on the evening of the 14th.

KYLEMORE HOUSE.—Gales on 3rd, 8th, 13th, 26th, 27th, and 29th. Weather very wild on 14th, 15th, and 28th.

OMAGH, EDENFEL.—Another mild month, with considerable rainfall, but no snow or frost of any severity. Christmas day was especially soft and springlike with a mean temp. of 46°·5

Duplicate Meteorological Books.

It is a long time since I could make even a partial clearance of duplicates, and, therefore, this list is longer than usual. No money should ever be sent with the order, as probably several books may be gone; but a note of the cost and carriage will be enclosed in the parcel, and the amount must be sent by return, as no accounts can be kept.

G. J. SYMONS.

62, CAMDEN SQUARE, N.W.

ABBE, C. Preparatory Studies for Deductive Methods in Storm and Weather predictions	1890	8vo.	2/-
ABBE, C. Agricultural Science.—On the Production of Rain.	1892	8vo.	1/-
ARISTOTLE. Aristotelis operum omnium Græcè et Latine, 2 vols. (with John Ray's autograph)	1606-7	8vo.	7/6
ARISTOTLE. Aristotelis Meteorologica et de Mundo	1832	16mo.	1/-
BAILY, F. Description of a new Barometer in the apartments of the Royal Society	1837	4to.	1/-
BAKER, E. E. Extraordinary Snows, 1674	1887	4to.	2/6
BARBER, Rev. S. Cloud Outlines	1878	8vo.	-/6
BOYLE, Hon. R. New Experiments and Observations touching Cold, &c.	1683	4to.	2/6
Brit. Assoc. Committee. Report on Observations of Luminous Meteors. (1862)	1863	8vo.	1/-
BUCHAN, A. Handy Book of Meteorology. Rare 2nd edit.	1868	8vo.	7/6
CANTONI, Prof. G. La Temperatura Propria dell Aria e lo Psicrometro Ventilatore	1879	sm. 4to.	1/-
CANTONI, Prof. G. Su gli Evaporimetri	1879	sm. 4to.	-/6
CAPPELLETTI, E. M., S.J. Dictamen sobre la Improbabilidad del Temblor, &c.	1887	8vo.	-/6
COOK, J. Meteorology in Mysore, 1895	1896	4to.	1/-
CRULS, L. Méthode Graphique pour la Détermination des heures approchées des éclipses du soleil et des occultations	1894	8vo.	1/-
DAVIS, G. G. Anales de la Oficina Meteorológica Argentina, vol. ix.	1893	4to.	2/6
DAVIS, G. G. Anales de la Oficina Meteorológica Argentina, vol. x.	1896	4to.	2/6
DE ALMEIDA, F. A., Jun. De motibus aeris Dissertatio ...	1876	8vo.	-/6
DE GL'ANGELI, S. Della Gravita dell Aria e fluidi, &c. (rare early engravings of Barometers)	1671	sm. 4to.	2/6
DENZA, F. I Freddi. Jan., 1893	1893	4to.	-/6
DENZA, F. Fotografie della Stella Nova Aurigæ	—	4to.	-/6
DERHAM, W., F.R.S. Hooke's Philosophical Experiments and Observations, with autograph of author	1726	8vo.	2/6
EATON, H. S. Dorset Annual Rainfall, 1848-92	1895	8vo.	1/-
ESPY, J. P. Espy's 2nd and 3rd Reports on Meteorology (many Maps and Diagrams)	—	oblong 4to.	5/-
FORSSMAN, L. A. Des Relations de l'Aurore Boréale et des Perturbations Magnétiques avec les Phénomènes Météorologiques	1872	4to.	1/-
FOURNET, J. Note sur un effet de Coloration des Nuages...	—	8vo.	-/6

GALTON, F., F.R.S. Meteorographica; or, Methods of Mapping the Weather. Illustrated by upwards of 600 Printed and Lithographed Diagrams for Dec., 1861. Scarce..	1863	4to.	7/6
GASTER, F. Report on Experiments with Thermometer Stands in 1869, at Strathfield Turgiss... ..	—	4to.	2/-
GEISENHEIMER, Dr. Erdmagnetismus und Nordlicht ...	1874	8vo.	-/6
GILBERT, G. K. A new method of Measuring Heights by means of the Barometer	1882	4to.	4/-
GODFRIDUS. The Knowledge of Things Unknown. (See <i>Met. Mag.</i> , August, 1896, p. 105)	1707	16mo.	7/6
GRÜTZMACHER. Jahrbuch der Meteorologischen Beobachtungen der Wetterwarte der Magdeburgischen Zeitung, 1892	1893	4to.	1/-
HELLMANN, Dr. G. Grösste Niederschlagsmengen in Deutschland mit besonderer Berücksichtigung Norddeutschlands	1884	4to.	1/-
HERGSELL, Dr. H. Ergebnisse der Meteorologischen Beobachtungen im Reichsland Elsass-lothringen im Jahre 1890, 92, 93	1895	4to.	1/6
HINRICHS, Dr. Iowa Weather Service. Set of Reports, 1-3 Biennial, 1880-3 and 1878-83 (except 4th quarter of 1881)	1879-84	8vo.	2/6
HOSIE, A., M.A. Droughts in China, A.D. 620 to 1643 ...	—	8vo.	2/6
HOWARD, L., F.R.S. Papers on Meteorology, relating especially to the variations of the Barometer. Pt. I.	1854	4to.	2/-
HUNT, H. A. Essay on Southerly Bursters	1894	8vo.	1/-
KAEMTZ, L. F. A Complete Course of Meteorology, with additions by C. V. Walker. (Perfect copy with all the plates)	1845	8vo.	4/6
KLAUPRECHT, Dr. J. L. Die Lehre vom Klima Carlruhe..	1840	8vo.	1/-
KLOSSOVSKY, A. (Meteorological Register for S. Russia. Vol. II. Report for 1891)	1892	4to.	1/-
KLOSSOVSKY, A. Distribution annuelle des orages à la surface du globe terrestre	1894	4to.	-/6
LAMARCK, J. B. Annuaire Météorologique pour l'an 1807...	1808	8vo.	2/-
LAURENCIN, P. La Pluie et le beau temps. Météorologie usuelle	1874	16mo.	1/-
LE VERRIER. Atlas des Mouvements Généraux de l'Atmosphère, 1865, Jan.-Mar.	1869	folio	2/6
LITROW, J. J. Über Höhenmessungen durch das Barometer	1823	8vo.	1/-
MERLE. Merle's MS., 1337-1344. Facsimile photographic reproduction with translation; introduction by G. J. Symons, F.R.S.	1891	folio	20/-
Mersey Docks & Harbour Board. Report of the Astronomer to the Marine Committee, 1875-8	1879	8vo.	-/6
Met. Council. Report of International Met. Conference at Munich	1893	8vo.	-/6
MILLS, J., F.R.S. An Essay on the Weather, with Remarks on the Shepherd of Banbury's Rules. 2nd edit. ...	1773	la. 16mo.	2/-
PICKERING, E. C. Investigations of the New England Meteorological Society, 1890. Vol. xxxi., part I. ...	1892	4to.	1/-
PRINCE, C. L. Observations on the Great Drought of 1893	1893	fol.	-/6
RENNY, H. L. On the Constants of the Barometric Formulæ which make correct allowance for the Hygrometric State of the Atmosphere, with autograph ...	1859	4to.	1/-
RICHARD, M. L'ABBÉ. Histoire Naturelle de l'Air et des Météores, vols. 1-6. (A perfect set consists of 10 vols., but the last 4 are rarely found)... ..	1770	8vo.	4/-

[Continued on p. iii.]

Duplicates for Sale.—(Continued from p. ii.)

ROOKE, H. Meteorological Register, 1785-1805, at Mansfield Woodhouse, Notts. (Excessively scarce set. Only one other perfect one known)	1795-1806	8vo.	21/-
ROSSER, W. H. The Law of Storms, considered practically	1876	8vo.	2/6
ROTCH, A. L. Results of Meteorological Observations made at the Blue Hill Met. Observatory, Massachusetts, U.S.A. 1886	1887	4to.	1/-
SCHMID, Dr. E. E. Lehrbuch der Meteorologie (no atlas)...	1860	8vo.	7/6
SCHWALBE. Ueber das Nordlicht	1871	4to.	2/-
SCOTT, R. H. Birth, Life and Death of a Storm	—	8vo.	-/6
SHERMAN, O. T. Meteorological and Physical Observations on the East Coast of British America	1883	4to.	1/6
Signal Office, U.S.A. The practical use of Meteorological Reports	1871	8vo.	1/-
SMEATON, J. Experimental Enquiry concerning the Natural Powers of Wind and Water to turn Mills	1794	8vo.	2/-
STRECCHI, G. L. Delle Meteore. Poema Filosofico	1726 sm.	4to.	2/6
SYMONS, G. J. Spring Drought of 1893, with Maps	1893	8vo.	1/-
TODD, Sir C. Rainfall in Southern Australia and the Northern Territory, 1890-3	1892-5	folio	2/-
VERNON, G. V. On the irregular Barometric Oscillations at Geneva, and on the Great St. Bernard, and their relations to Mean Temperature and the fall of Rain..	1861	8vo.	1/-
VERNON, G. V. Examination whether when November has a mean temp. above the average, it is usually followed by excessive cold between December and March following	1865	8vo.	1/-
VERNON, G. V. Inquiry whether excess or deficiency of Temperature during part of the year is compensated during the remainder	—	8vo.	1/-
WEBSTER, W. H. B. The Recurring Monthly Periods and Periodic System of Atmospheric Actions	1857	8vo.	2/6
WILLIAMS, C. T. The Climate of the South of France	1869	8vo.	1/6
ZENGER, Prof. K. W. Die Meteorologie der Sonne und die Wetter-Prognose des Jahres, 1886	1887	8vo.	1/-

ANONYMOUS.

Meteorography ; or, the Perpetual Weather Almanac. Many queer coloured plates	1841	16mo.	1/6
Report of Cardiff Naturalists' Society, 1868-9	1870	8vo.	1/6
Report of Proceedings of Met. Council at Leipzig	1873	8vo.	-/6
Instructions de la Commission Spéciale des Paratonnerres...	1875	4to.	-/6
Report of Met. Committee of Royal Society for 1875	1876	8vo.	-/6
Modern Meteorology. Six Lectures	1879	8vo.	4/-
Departement de la Seine — Travaux de Paratonnerres Cahiers des Charges	1879	4to.	-/6
Meteorological Observations made at the U.S. Naval Observatory, 1878	1882	4to.	-/6
Meteorologische Beobachtungen an 15 Stationen der Schweiz, Jan. to Dec., 1888	1888	4to.	1/-
Humidade do Ar em Lisboa	1888	folio	-/6
Resumen de las Observaciones Meteorologicas Puebla, 1889	1890	1ge.8vo.	-/6
Pubblicazione della Specola Vaticana. Fascicolo I... ..	1891	4to.	1/-
New England Weather Service in 1892	1893	4to.	-/6
Report of Trinidad Botanic Gardens for 1892	1893	fol.	-/6
Observaciones Meteorológicas del Colegio Catolico en Puebla, 1893	1894	folio	1/-
Journal of the Sanitary Institute, April, 1895—Jan., 1896.	1895-6	8vo.	2/6

ENGINEERING.

Second, Third and Fourth Reports of the Commissioners appointed in 1878, to inquire into the best means of preventing pollution of Rivers	1870	folio	10/-
Metropolitan Sewage Discharge, 2nd and final Report of Commissioners	1884	4to.	-/6
AUSTIN, H., C.E. General plan of parts of Westminster and Chelsea showing Drainage	1848		2/-
AUSTIN, H., C.E. Plan of the Drainage of part of the City of Westminster. February	1848		2/-
BURNELL, G. R., C.E. Water Supply of the City of Paris... ..	1866		1/-
CLARK, E., C.E. Engineering philosophy. Durability of Materials	1869		1/-
FÉRÉ, Octave. Les Inondations de 1856. (Illustrated)	—		1/6
HOMERSHAM, S. C., C.E. Supply of Pure Spring Water (Watford Water Company) to the Metropolis	1850		2/6
P. C. De l'influence des Irrigations dans le midi de la France ...	1841		1/6
POWELL, Evan. Surveyors' Institution—Transactions, 1881-2. Vol. XIV., parts XI. and XII. Papers on River Conservancy and Flood Prevention... ..	—		1/-
RANGER, W., C.E. A Report to Board of Health on an enquiry into Sewage, Drainage, and Supply of Water and Sanitary condition of Town of Aylesbury	1849		1/-
RAULIN, M. Victor. Notice sur la Disposition des Terrains Tertiaires des Plaines de l'Allier et de la Loire	—		1/-
REY, M. Le Puits Artésien de Grenelle	1845		1/-
ROBERTS, E. Thames Tides	1882		—
SIMON, J., F.R.S. Water Supply to the Metropolis: part of a report to the City Commissioners of Sewers	1851		1/6
Note sur les Débordements des Fleuves et des Rivières	1847		1/-
Map or plan of Metropolitan Sewers, Westminster district, May ...	1848		1/6
Skeleton Map showing the districts occupied by the Metropolitan Gas Companies	—		1/-