

SYMONS'S

MONTHLY

METEOROLOGICAL

MAGAZINE.

---

VOLUME THE SECOND.

~~~~~

1867.

~~~~~

LONDON :

EDWARD STANFORD, CHARING CROSS, S.W.,

AND ALL BOOKSELLERS.



# INDEX.

	PAGE		PAGE
Abstracts of Meteorological Works, 43, 66,	88	Introductory .....	1
Action of Lightning .....	105	Is the Royal Charter Gale Periodic ?	138
Anemometers..... 51, 63, 87, 111,	123	Linton Park, Wind at .....	33
Aneroid Behaviour of .....	99	Low Temperatures.....	18
„ Derivation of.....4, 21,	38	Luminosity of Phosphorus .....	100
A Silver Thaw .....	20	Luminous Meteors.....	114
Atmospheric Electricity, Observations of .....	105	Lunar Rainbow .....	107
British Association Meeting .....	99, 114	Magnetic Disturbances .....	99
Buchan's "Handy Book of Meteorology" .....	55	Mauritius Meteorology .....	115
Cannes, Weather at .....	5	Measurement of Snow..... 27,	59
Capper's "Tracts" .....	43	Meteorological Observations at Sea... 100	57
Castleton Moor, Rain at .....	25	„ „ on Humidity .....	70
Clouston's "Explanations of Weather Prognostics" .....	90	„ „ Tables for 1866 .....	56
Cyclone in Bengal.....	135	Meteorology of the Months, 8, 23, 36, 49, 61, 73, 85, 97, 109, 121, 133, 145	115
Derivation of Aneroid.....4, 21,	38	Meteors of August .....	115
Dryness of Air on June 27th .....	68	„ November.....122,	129
Earthquake in Westmoreland .....	21	New Telegraphic Thermometer .....	117
Eclipse on March 6th, 1867.....	29	Notes and Sundries .....	82
Editor's Gossip, Corrections, &c. 26,	46	"Observations Pluviométrique," V. Raulin ..	71
Entry of Minimum Temperatures, 47,	57	Periodic (?) Hail Balls.....20,	30
Evaporation from Rain Gauges .....	115	Phosphorus, Luminosity of .....	100
Evaporators .....	74	Previous Heavy Rains .....	81
Excessive Rain, July 26th .....	75	"Proceedings of the Manchester Literary & Philosophical Society" ..	140
Forbes on effects of Frosts .....	94	Positions of Gauges ..	6
Frost of January, 1867 .....	3,	Radiation Temperatures .....	31
„ 1813-14.....	18	Rainbow, Lunar.....	107
Frosts, effects of.....	94	Rainfall, 1866, Supplementary Returns ..	26
Gale on February 6th .....	18	„ at Arbroath.....	114
Gauges, Positions of .....	6	„ at Cardiff.....	58
Greenwich Meteorological Observations .....	181	„ at Castleton Moor .....	25
Hailstorm in India .....	53	„ Committee Report .....	100
Heavy Rain at Worthing, June 3rd... 69	134	„ Excessive, July 26th.....75,	81
Height above Sea Level .....	39,	„ „ in United States ..	95
Humidity of the Air of Scarborough ..	57	„ Monthly ... 7, 22, 35, 48, 60, 72, 84, 90, 108, 120, 132, 144	115
Hurricanes of the Indian Ocean .....	116	Rain Gauges, Evaporation from .....	115

	PAGE		PAGE
Rains, previous Heavy .....	81	"Sunshine and Showers" ... ..	33
Report of Rainfall Committee .....	100	Temperature in Sun and Shade... 98,	105
"Report of the Sanitary Committee of the Town of Nottingham" .....	140	Temperature, Low .....	18
Reviews ..... 33, 55, 71, 90, 131,	140	,, Min., Entry of ..... 47,	57
Royal Charter Gale, is it Periodic?... ..	138	,, Radiation .....	31
Saussure's "Essais sur l'Hygromé- trie" .....	66, 88	"The Life Boat" .....	140
Severe Hailstorm in India .....	53	Three Strange Stories .....	130
Shower of Hazel Nuts .....	59	Tortola Cyclone.....	125
Silver Thaw.....	1, 20	Vapour in the Atmosphere .....	117
Snow, Measurement of.....	27, 59	Weather at Cannes .....	5
Steinmetz's "Everybody's Weather Guide".....	95	Wind at Linton Park .....	33
Storm at Steyning.....	70	Worthing, Rain at.....	69
,, Warnings, Importance of .....	101	Yellow Haze and S.E. Wind ... 107,	118
Supplementary Rain Returns, 1866...	26		

## ENGRAVINGS AND DIAGRAMS.

	PAGE
Hail Balls .....	30
Lind's Anemometer .....	52
Robinson's Cup Anemometer .....	64
Saussure's Hygrometer .....	67
Map of Rainfall of July 26th .....	<i>to face</i> 75
Diagram of Commencement, &c., of Rain of July 26th .....	77
Casella's Embossing Anemometer .....	<i>to face</i> 87
Osler's Pressure Anemometer .....	<i>to face</i> 111
Cator's Lever Anemometer .....	<i>to face</i> 123
Depression of Barometer in Tortola Cyclone.....	128
Diagrams of Solar Radiation .....	143





# SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

XIII.

FEBRUARY, 1867.

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

## INTRODUCTORY.

IN the forefront of our first number we asked that it should not be taken as a specimen of succeeding numbers. We have the same reason for urging the same plea on the present occasion. We there also expressed the hope that we should be judged not by our promises but by our deeds, and we renew the request. We proposed, it is true, to give some articles which, after all, we did not give, and why not? Because matters of current interest crowded them out, in spite of occasional enlargements. Last month we announced our intention to give some rather elaborate details of low winter temperatures, yet this number appears without them. Why? Because we have received so large a collection of returns, of the most heterogeneous nature, that it has been impossible to prepare them as they deserve; they, therefore, must stand over till next month. Besides, the silver thaw of January 22nd claims special and early notice, and the Aneroid question requires settling at once.

### A SILVER THAW.

THIS phenomenon is so rare in England—we only remember one previous instance (in 1855?)—that we make no apology for briefly describing it. On the 22nd of January, at 7.10 p.m., the ground being then frozen, and the temperature of the air below freezing point, some rather sleety hail began to fall on the pavement; it crackled under foot, and flattened out into diminutive lozenges; about 8 p.m. it turned to rain, although the temperature of the air was still several degrees below freezing point, and the ground was about 24°. The necessary result was the coating of everything with a layer of ice. At 9 p.m. the temperature at 4 ft. above the ground was 26°·2, and it was still raining, and the rain still freezing on pavement, walls, gravel walks, umbrellas, in fact on everything. We never recollect being (meteorologically) more mortified than we were at the failure of all our efforts to reach the thermometers 20 ft. above the ground; but climbing an iced pole was a feat beyond us, and we know not what was the temperature at that small elevation. It was especially vexing, because the opportunity once lost we shall probably have many years to wait for another. Of course the streets were in a frightful state. Cabmen refused fares of even £1 per mile, and the number of accidents

was unprecedented. We do not know the limits of this phenomenon, but have heard of it from Surrey, Berks, Kent, Middlesex, Nottingham, and even Glasgow. Throughout this large tract of country there was for some hours (till 3 a.m. in London) no safe mode of traversing the roads or pavements but the very novel one of skating.

### THE FROST OF JANUARY, 1867.

*To the Editor of the Meteorological Magazine.*

DEAR SIR,—In a recent letter to the "*Times*," you ask for notes on the frost of last week. Though not a scientific observer, I can give you some particulars which may be of interest, especially as the nucleus of the tract of cold air seems to have been in this neighbourhood.

There had been no indications (except, perhaps, the migration of birds) of any approaching cold, up to the 30th of December; on that day the weather was fine, with fresh W. wind, which shifted to N.W. in the evening, but as yet no frost. December 31st, sharp white frost;  $25^{\circ}$  at 9 a.m.; maximum of the day  $32^{\circ}$ . Driving to Hounslow, I observed large flocks of field-fares, but the red-wings which had been swarming westerly on Saturday, were not to be seen. Also the golden plovers (which had appeared in unusual numbers during the previous fortnight) had betaken themselves elsewhere. What little wind there was, came from the N., and the rime lay in patches, and both ground and air had a peculiar sulky appearance. Towards evening the sky cleared partially, the wind backed to W. and S.W., and at 11 p.m. of new year's eve, the thermometer stood at  $24^{\circ}$ , and barometer was low and steady.

January 1st, 1867,  $24^{\circ}$  at 9 a.m.; sharp frost all day; a sprinkle of snow on the ground; very little rime, and the frost turned to black, with brisk N.W. wind; clear in evening,  $23^{\circ}$  at 10 p.m.; a peculiar haze in the north, but clear sky at 11 p.m.

January 2nd, very deep snow, 8 inches on the average at 7 a.m., and coming down in clouds with a gusty N.E. wind. Temperature rising from  $24^{\circ}$  to  $30^{\circ}$ ; snow ceased at noon, and was then a foot deep on the average, and drifted in places to 4 feet; all this had fallen in ten hours, having commenced at 2 a.m. Sky cleared, the sun came out, and the snow, as dry and as light as dust, rose in petty whirls, and flitted as if along the edge of a knife; the effect in the bright sunshine was very strange and beautiful. The temperature fell rapidly, and at 11 p.m., seven thermometers, on N. aspect, 6 feet from the ground, told very different tales, but all agreed that it was cold. They marked from  $5^{\circ}$  to  $14^{\circ}$ ,  $12^{\circ}$  being probably the truth. My self-registering double column instrument works from  $6^{\circ}$  to  $8^{\circ}$  too low, and has another slight defect; the minimum needle follows the column, and therefore registers nothing.

January 3rd, minimum unknown, from the cause last mentioned, but a 3 feet 6 inches registerer (kept at my garden) marked  $+4$  as the result of the night; the scale being iron, this mark would probably be too low; probably  $+8^{\circ}$  was about the mark. I often wonder at the reliance of newspaper correspondents upon any unproven self-registerer; my impression is that scarcely any can be trusted in either extreme of temperature, though they work true enough for some part of the scale. In the forenoon a thick white haze arose, and the maximum was  $28^{\circ}$ ; light E. wind, barometer slightly rising. Hazy at night;  $20^{\circ}$  at 11 p.m.

January 4th,  $12^{\circ}$  at 9 a.m.; minimum about  $10^{\circ}$ ; sky grows brighter, and of a lovely violet colour; thermometer stationary all the forenoon at  $12^{\circ}$ ; white haze round the horizon; trees and bushes clad with the deepest rime I ever saw, as if all the earth were "twelfth caked"; a scene of wonderful beauty. I walked to Kingston to see the Thames, and found it frozen here and there for a few yards from the bank, full of thin floating ice, and covered with a white rolling steam. The frost was so intense that the feet of my dogs became lumps of ice, which I was obliged from time to time to cut out with a pruning-knife. The maximum of the day was  $18^{\circ}$  in the shade, and  $25^{\circ}$  in the sun; the evening was very remarkable. If the sky would only continue clear, there was every prospect of the hardest frost

ever registered. The temperature fell steadily up to 8 p.m., when a blanket of haze came over the sky, and fog upon the earth, and the radiation was checked. That was the acme of the frost; from that hour (although the intense cold could not quickly be shaken off) an increasing change began. At this remarkable moment my seven thermometers scored from  $-2$  to  $+4$ ; Negretti and Zambra's would have gone lower, but the needle stuck in the turn of the tube, and the spirit could no further go; the true minimum was, I believe, from zero to  $+2$ . On the famous Christmas Eve, 1860,  $+12^{\circ}$  was the mark at 10 p.m., by some of the same instruments, at a distance of a mile hence.

The mercury was on the rise at 10, 11, and 12 p.m., and in the morning stood at  $12^{\circ}$ ; then the signs of change grew more and more decided. The sun shone very faintly under a white corona, and muddy tails of cloud came out, and the sky was tiled with heavy blots. The maximum was  $32^{\circ}$ , with a S.E. breeze creeping up, and the night was dark and dirty. At 11 p.m. a storm of thick snow, with a temperature of  $30^{\circ}$ , and a blustering S.E. gale; at 1 a.m. of the 6th the snow turned to sleet and rain, and it was all up with the frost.

I fear I have wearied you already, and will only add two observations. First, I have not given range of barometer, being under a disability. Mine strikes work at 29.50, probably because the bag is too small for the quicksilver; this is not as it ought to be. Secondly, I would state that the snow of January 2nd, was peculiarly light, and wanting in specific density. Six inches of the famous snow of January 11th, 1866, would, I think, outweigh a foot of our recent visitor. I forget what the proper formula is, but from 13 inches I only procured 1.15 of water.

In conclusion allow me to ask how any man who goes to bed can even approximate to the measure of fall on such a night as that of the 5th. The snow turned to rain, and of course was half gone or more in the morning, while the rain could not get into the receiver, the funnel being choked with snow? An answer in your next will oblige.—Your's faithfully,

Teddington, Jan. 9th, 1867.

R. D. BLACKMORE.

[It is not so easy to answer as to ask this question. Clearly the capacity of the funnel was too small—as rain gauge funnels often are. On the other hand, if the capacity is great, small showers are unable to do more than wet the large surface, and thus *they* do not get registered.—Ed.]

*To the Editor of the Meteorological Magazine.*

SIR,—Your tables of extreme cold at different places will, I am sure, have been read with the greatest interest by all. A table such as you propose, showing the lowest temperature registered at 4 feet in each year, at a number of different stations, will of course be interesting; but do you not think it might help on science more, if the conditions under which the extreme occurred were also given? Some necessary conditions it would be unnecessary to specify—*e.g.*, that the air was calm and the sky clear from clouds, and there must of course have been, and be, a very cold and undiluted “polar current” of air over the place. But there are other conditions which may, or may not, be necessary, and doubtless others again which are not yet discovered. That snow, by arresting the conduction of heat from the earth, and by spreading over all surfaces a good uniform surface for radiation, is very favourable to the production of great cold, is evident: and I have seen it laid down as a rule, that the cold will always be greatest where most snow has fallen.

Perhaps, however, 4 or 5 inches may do as well as a yard for this purpose. Then I fancy that light snow recently fallen is better both as a non-conductor and as a radiator, than compact and hard snow. All the instances of great cold that I have noticed—not very many, though—have occurred very soon after a thick fall of light snow.

Then, again, it is generally agreed that plains and valleys are the most likely for great cold, but there may be exceptions. I hope, if no destructive tourists have got at the instrument, to be able to tell you the lowest temperature this winter on the top of Scawfell, 3200 feet above the sea. But this is by the way. Again, what influence have the soil, and the humidity and pressure of the air on the production of cold? I would suggest, therefore, that the following particulars should be noticed by those who send you these reports:—

1. The state of barometer the day before, and that day.
2. The humidity on both days.
3. Whether any visible vapour or mist in the morning?
4. The direction and force of the wind the day before.
5. Whether any snow on the ground; and if so, the nature and depth of it, and the date of its falling.
6. The nature of the soil.
7. The configuration of the ground, and its elevation above the sea.

I may add a remarkable fact, that on Christmas Day, 1860, I observed a remarkable solar halo, and this year on January 1st, I observed parhelia at noon. Has the state of air which produced them, anything to do with the intense cold of both those days?—I am, Sir, your obedient Servant,

F. W. STOW, F.M.S.

## THE FROST—DERIVATION OF "ANEROID."

*To the Editor of the Meteorological Magazine.*

DEAR SIR,—The article upon cold winters in your Magazine for this month is extremely interesting; but you seem to me to have done small justice to the claims of the long frost of January and February, 1855, lasting from the 15th of the former month to the 24th of the latter, and producing far more ice in the Thames than any other winter since 1838. The winter of 60-61 was not to be compared to it for continuous severity, although upon one particular day the cold was certainly more intense. In 1855 some gentlemen skated down the Thames, from Oxford to Barnes Bridge. In 60-61, the river was not closed even at Kingston. Again in 1855, the floating ice was so thickly packed, even as far as London Bridge, that the arches of all the other bridges were quite closed at low water, and it was stated in the papers that an active man with a pole had crossed above Blackfriars Bridge. Whether this was true I cannot say; but I know that some of the ships in the Pool were frozen in, and on the 19th of February, I walked on the ice off Billingsgate, and saw skittles played upon it. The ice in the Regent's Park was ten inches thick.

You state the probable minimum of that year as 11°. At 7 a.m. of February 18th, in Camden Town, (where I then lived), I saw the thermometer at 11°, no doubt it had been lower, but I had no self-registering then. Newspaper correspondents sent readings (I know) below zero; of course their thermometers may have been wrong, but they can scarcely have all been wrong to the extent of the error which you attribute (no doubt *justly*) to the Chiswick readings.

Excuse my random jottings. One of your correspondents asks for the etymon of the word "aneroïd." I believe the derivation generally assigned ( $\alpha$  and  $\nu\eta\rho\acute{o}s$ ) is wrong. In the first place, the form of the word would in that case be aneric; for the addition of the termination  $\epsilon\iota\delta\eta s$  (as indicating similitude) is not only uncalled for, but absurd, where the composite word is a privative. In the next place,  $\nu\eta\rho\acute{o}s$  or  $\nu\alpha\rho\acute{o}s$ , is not a substantive but an adjective, and a very rare one. Had the object of the word coiner been to indicate absence of *moisture* (about the last thing which would occur to him as contradistinctive to quicksilver), he would doubtless have taken some form of  $\psi\gamma\rho\acute{o}s$  for his basis.

Next, to suggest a more probable etymon: is not the true word  $\alpha\nu\epsilon\rho\omega\iota\delta\eta s$  or  $\alpha\nu\delta\rho\omega\iota\delta\eta s$ ? "aneroïd" or "androïd" (both forms exist) signifies an automaton, (see "Ogilvie's Comprehensive Dictionary"), something which, by internal springs, works as might a man. And the broader sense of the word automaton, is of anything self-acting, as if it contained its own motive power.

If I am right in this, "aneroïd barometer" means simply a barometer of an automatic character.

Yet Ogilvie, on the heels of the right track, runs into error, and makes two distinct words, aneroïd and aneroïd, both of the same pronunciation, (in laying down which he is wrong, for aneroïd=androïd *must* have the penultima short), and yet in no way connected!—With many apologies, I am, Sir, yours truly,

Teddington, Jan. 19, 1867.

R. D. BLACKMORE.

*To the Editor of the Meteorological Magazine.*

SIR,—The derivation you quote of the word aneroid from *a* without, *νηρος* moist, and *ειδος* form, has astonished me a little. What on earth has a barometer to do with moisture in its principle of action, as signified by its name? The *Encyclopædia Britannica* with its *ἀνεροειδής* *I enquire*, is equally absurd.

If you consult any of the French encyclopædias or scientific dictionaries (De Boulay's for instance), you will find that the inventor of the aneroid compounded the word precisely in accordance with the nature of the instrument, thus:—*a* no, *ἀνρ* air, *ειδος* form or shape, that is "in the shape of no air, or a vacuum," the *ν* or *η* being put in, as usual in such Greek compounds, for the sake of euphony, as in the word *ἀνεπαρτος* *unamiable*, from *a* non, and *ἐπαύω* amo. I need not state that the principle of the instrument is a cavity exhausted of air to the utmost, although, practically, not to a greater extent than that represented by about half-an-inch height of the mercurial column, under the action of the air-pump.

In Chambers's Cyclopædia, the derivation from *νηρός* (translated "wet") is said to be "anomalous"; but the writer goes on to say that the aneroid is a barometer in which the pressure is measured without the use of a liquid, as in ordinary instruments. Now by "ordinary instruments" must be meant the mercurial,—and, assuredly, mercury is no liquid, but only a fluid. Oddly enough, the second meaning of *νηρός* in the old lexicon of Schrevelius (which we tugged at in our young days) is *cavus* "hollow," which would make a much better derivation for aneroid, if we make the *a* intensive instead of privative, as occasionally done by the Greeks—*i.e.*, "very hollow."—Your obedient servant,

A. STEINMETZ.

*To the Editor of the Meteorological Magazine.*

DEAR SIR,—In reply to Mr. Taylor's query in your last, I beg to say, that the word *aneroid* appears to me one of a very base coinage; that the question about its etymology is hopeless. They only who invented it, can say what they meant by it. The word *νηρός*, *humid*, is mere lexicon Greek, though it seems still to be represented in the modern term *γέρο*, *water*. The only practicable derivation for *aneroid* would be from *ἀνέρος*, the old genitive of *ἀνρ*, but that of course would not do here.

T. F. BARHAM.

## THE WEATHER AT CANNES.

*To the Editor of the Times.*

SIR,—I have passed some months here, not for my health, but solely for the purpose of cheating the English winter, and after the accounts I have had of the weather not only in England, but in almost every part of France, I cannot resist troubling you with a short statement, which I shall confine to the month of January, merely premising that during October, November, and December we had a bright sun, a cloudless sky, and an ultramarine sea, with only three rainy days.

The first five days of January were windy, with at times a severe mistral. On the 6th, heavy rain all day; the 7th cloudy, with a cold wind; the 8th and 9th fair, but rather cold. From the 9th to the 13th fine and very warm. On the 13th and 14th very heavy rain, nearly two inches having fallen in 40 hours. The 15th and 16th fine; on the night of the 16th the thermometer in a north aspect marked 32°. The 17th, bright sun, but at night the thermometer registered 29°—that is, 3° of frost; and this was the coldest night we have had. From the 18th to the 24th very fine, with a bright sun, and the greatest cold 39°. 24th to 25th, heavy rain; in six hours on the 25th one inch and a half of rain fell! From the 26th to the 31st most beautiful. In February, to the 7th, uninterruptedly fine.

Compare the above with the rain, cold, snow, frost, and thaw you have had in England, and even in France, where at Lyons there was 26° of frost, and at Marseilles and Pau nearly as much.

With the exception of the 16th and 17th, the night thermometer here has registered from 39° to 48°. It has only twice been as low as 39°.—I am, Sir, your most obedient servant,

Cannes, Feb. 7th.

AN ENGLISH WINTERER AT CANNES.

POSITIONS OF GAUGES,  
WHENCE MONTHLY RETURNS ARE PUBLISHED.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs,]	RAIN GAUGE.			Latitude.	Longitude.
		Diameter.	Above Ground.	Above Sea Level.		
		in.	ft. in.	feet.		
I.	Camden Town .....	8	0 6	100	51°33'N	0° 8'W
II.	Staplehurst (Linton Park) .....	8	0 6	296	51 13 N	0 31 E
"	Selborne (The Wakes) .....	"	4 0	500 ?	51 6 N	0 56 W
III.	Hitchen .....	9	2 0	240	51 57 N	0 17 W
"	Banbury .....	6	7 0	345	52 4 N	1 20 W
"	Wisbech .....	8	0 6	10	52 40 N	0 10 E
IV.	Bury St. Edmunds (Culford) ...	5	1 2	...	52 17 N	0 42 E
V.	Calne .....	5	0 11	250	51 27 N	1 59 W
"	Plymouth (Goodamoor).....	5	0 2	580	50 25 N	4 0 W
"	Barnstaple .....	8	0 6	31	51 4 N	4 4 W
"	Taunton (Fulland's School) .....	5	1 4	...	51 1 N	3 6 W
VI.	Shrewsbury (Highfield).....	5	5 6	200	52 42 N	2 46 W
"	Tenbury (Orleton).....	5	0 9	200	52 18 N	2 27 W
VII.	Leicester (Wigston) .....	8	0 6	220	52 35 N	1 6 W
"	.....	...	...	...	...	...
"	Derby .....	5	5 0	180	52 55 N	1 28 W
VIII.	Manchester .....	8	2 7	106	53 28 N	2 17 W
IX.	York .....	5	0 6	50	53 58 N	1 5 W
"	Skipton (Arncliffe) .....	8	3 0	750	54 9 N	2 6 W
X.	North Shields .....	8	1 0	124	55 0 N	1 26 W
"	Borrowdale (Seathwaite) .....	5	1 0	422	54 30 N	3 12 W
XI.	Abercarn .....	...	1 3	450	51 39 N	3 6 W
"	Haverfordwest .....	5	2 0	60	51 48 N	4 55 W
"	Rhayader (Cefnfaes) .....	5	2 0	880	52 18 N	3 32 W
"	Llanberis (R. Victoria Hotel) ...	5	1 0	370	53 6 N	4 7 W
XII.	Dumfries .....	5	0 5	70	55 5 N	3 36 W
"	Hawick (Silverbut Hall) .....	...	4 0	512	55 26 N	2 46 W
XIV.	Ayr (Auchendrane House) .....	...	2 3	94	55 27 N	4 37 W
XV.	Otter House .....	...	0 6	130	56 1 N	5 20 W
XVI.	Leven (Nookton) .....	5	0 6	80	56 47 N	5 7 W
"	Stirling (Deanston) .....	6	0 0	130	56 12 N	3 0 W
"	Logierait .....	5	1 0	250	56 11 N	4 4 W
XVII.	Ballater .....	5	0 10	656	56 38 N	3 41 W
"	Aberdeen .....	5	4 8	115	57 4 N	3 5 W
XVIII.	Inverness (Culloden).....	...	3 0	104	57 9 N	2 6 W
"	Fort William .....	5	0 8	20	57 30 N	4 7 W
"	Portree .....	3	0 4	60	57 24 N	6 13 W
"	Loch Broom .....	5	0 8	48	57 47 N	5 5 W
XIX.	Helmsdale .....	5	1 0	34	58 7 N	3 38 W
"	Sandwick .....	11	2 0	78	59 3 N	3 17 W
XX.	Cork .....	10	6 0	65	51 54 N	8 30 W
"	Waterford .....	...	4 0	60	52 16 N	7 6 W
"	Killaloe .....	10	5 0	128	52 48 N	8 26 W
XXI.	Portarlinton .....	5	1 2	236	53 10 N	7 10 W
"	Monkstown .....	10	0 6	100	53 17 N	6 8 W
XXII.	Galway .....	10	6 0	25	53 17 N	9 3 W
"	Bunninadden (Doo Castle) .....	5	1 0	...	54 3 N	8 38 W
XXIII.	Bawnboy (Owendoon) .....	5	1 3	218 ?	54 6 N	7 44 W
"	Waringstown .....	8	0 4	191	54 26 N	6 18 W
"	Strabane (Leckpatrick).....	8	0 5	260	54 53 N	7 26 W

JANUARY, 1867.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which .01 or more fell.	TEMPERATURE.				No. of nights below 32°.
		Total Fall.	Difference from average 1860-5	Greatest Fall in 24 hours.		Max.		Min.				
				Dpth	Date.			Deg.	Date.			
										Deg.	Date.	
I.	Camden Town .....	inches 2·81	inches. +·85	in. ·51	30	16	56	27	6·7	4	19	
II.	Staplehurst (Linton Park) ..	3·05	+·99	·57	2	18	57	28	10	5	21	
III.	Selborne (The Wakes) .....	4·11	+·84	·63	5	17	50	27	—2	3	20	
IV.	Hitchen .....	3·01	+·87	·62	30	19	53	27	9	§3	18	
V.	Banbury .....	3·03	+·94	·53	30	17	53·7	27	12	4	19	
VI.	Wisbech .....	3·03	...	·87	30	18	56	+27	12·3	4	20	
VII.	Bury St. Edmunds (Culford) ..	2·73	+·86	·87	30	12	56	27	0	1	19	
VIII.	Calne .....	3·34	...	1·12	6	11	55	24	1·5	5	19	
IX.	Plymouth (Goodamoor) .....	7·74	+1·72	1·46	6	19	52	26	8	2	16	
X.	Barnstaple .....	5·89	+2·37	·92	26	17	...	...	...	...	...	
XI.	Taunton (Fulland's School) ..	4·85	...	·90	6	16	...	...	9	5	17	
XII.	Shrewsbury (Highfield) .....	2·33	+·61	·38	11	13	...	...	6	5	...	
XIII.	Tenbury (Orleton) .....	3·83	+1·30	·60	7	19	56·5	27	1·6	4	19	
XIV.	Leicester (Wigston) .....	3·24	+1·26	·73	8	9	55	+24	9	3	...	
XV.	West Retford .....	...	...	...	...	...	...	...	...	...	...	
XVI.	Derby .....	2·91	+1·12	·37	5	16	55	27	13	¶4	20	
XVII.	Manchester .....	3·27	+·76	·50	7	15	56	27	9	15	21	
XVIII.	York .....	2·23	+·64	·97	24	11	52	27	10	5	19	
XIX.	Skipton (Arncliffe) .....	7·35	+1·71	1·00	7	18	46	27	8	4	20	
XX.	North Shields .....	3·61	+1·49	·57	10	18	52	28	14	2	17	
XXI.	Borrowdale (Seathwaite) .....	15·66	—·70	3·28	7	17	...	...	...	...	...	
XXII.	Abercarn .....	7·95	...	1·79	6	12	53	7	20	3	16	
XXIII.	Haverfordwest .....	7·11	+2·06	1·33	23	13	...	...	8	15	8	
XXIV.	Rhayader (Cefnfaes) .....	4·96	+·44	1·29	6	12	55	...	7	3	14	
XXV.	Llanberis (R. Victoria Hotel) ..	11·46	...	2·07	7	17	...	...	...	...	...	
XXVI.	Dumfries .....	3·11	—1·49	·97	23	12	55	27	14·5	4	19	
XXVII.	Hawick (Silverbut Hall) .....	2·94	...	·44	8	25	...	...	...	...	22	
XXVIII.	Ayr (Auchendrane House) ...	4·55	+·03	·88	26	15	57	29	7	15	21	
XXIX.	Otter House .....	5·03	—1·67	1·28	27	13	50	29	21	12	21	
XXX.	Leven (Nookton) .....	4·11	...	·40	26	23	...	...	...	...	...	
XXXI.	Stirling (Deanston) .....	4·01	—1·71	·65	26	18	48·8	25	10	15	25	
XXXII.	Logierait .....	4·02	...	·65	29	12	...	...	...	...	...	
XXXIII.	Ballater .....	5·88	...	1·10	8	27	47·5	28	—5	5	23	
XXXIV.	Aberdeen .....	6·21	...	·65	12	27	47·3	26	10·2	5	18	
XXXV.	Inverness (Culloden) .....	5·07	...	1·36	18	...	47	31	14·6	5	17	
XXXVI.	Fort William .....	5·84	...	1·23	26	14	51·2	28	7·2	15	21	
XXXVII.	Portree .....	7·82	—5·27	1·55	23	16	51·5	27	12	5	20	
XXXVIII.	Loch Broom .....	4·27	...	1·25	8	16	...	...	...	...	...	
XXXIX.	Helmsdale .....	4·62	...	·63	24	26	...	...	...	...	...	
XL.	Sandwick .....	4·06	+·77	·78	7	27	...	...	...	...	...	
XLI.	Cork .....	5·12	...	1·95	5	13	...	...	...	...	...	
XLII.	Waterford .....	3·55	—1·31	1·10	6	17	52	7	16	4	18	
XLIII.	Killaloe .....	3·82	—1·04	·50	*8	14	54	27	14	18	17	
XLIV.	Portarlington .....	2·32	—1·69	·29	7	21	51	28	8	18	19	
XLV.	Monkstown .....	3·90	+·51	1·70	5	21	57	27	12	4	17	
XLVI.	Galway .....	4·77	...	·75	6	17	53	31	15	3	17	
XLVII.	Bunninadden (Doo Castle) ...	09·9	...	...	...	...	...	...	...	...	...	
XLVIII.	Bawnboy (Owendoon) .....	5·58	...	·97	5	15	...	...	...	...	...	
XLIX.	Waringstown .....	4·50	...	·81	5	18	54	27	2	2	20	
L.	Strabane (Leckpatrick) .....	5·56	...	·84	13	24	53	27	4	4	20	

\* And 22nd. † And 28th. ‡ And 27th. § And 4th. || And 15th. ¶ And 14th & 15th.  
 + Shows that the fall was above the average ; — that it was below it.

## METEOROLOGICAL NOTES ON THE MONTH.

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.

## ENGLAND.

CAMDEN ROAD.—Frosty at intervals throughout the month.

LINTON PARK.—The intense frosts of the 3rd, 4th, and 5th, were followed by a few mild days, commencing with the 7th; another severe frost followed on the 14th, being only 2° higher than on the coldest day in the former period; the last week very mild. The frost appears to have been very capricious in its action, as a difference of 10° lower than mine was registered at a place a very short distance from hence. High wind on 8th, doing much damage and of course a very low bar. accompanying it. The snow drifted on 2nd and 16th, rendering the roads impassable in places. A high flood followed the breaking up of the first fall of snow, which, however, was not so high as a similar one in January, 1866.

SELBORNE.—First snow this winter on 1st. Ther.—2° on 3rd (at Chawton House —5°), lower than it has been for 6 years; the evergreens very much injured, especially the laurustinas, ilex-catyolia, darwinia, laurels, and deodar.

BANBURY.—Snow on 1st, 5th, 6th, 12th, and 16th; at 7.30 p.m. on 22nd sleet and frozen R. Fog on 4th, 6th, and 25th.

WISBECH.—Snow on 1st, 3rd, 11th, 12th, 14th, to 19th. The 2nd, 4th, 5th, and 14th the coldest days in the month. Temp. not below freezing after the 23rd. Max. in sun 89°·7 on 27th. On 30th, at 4 a.m., gale pressure 10lbs. per square foot.

CULFORD.—Snow on 2nd, 5th, 10th, 12th, to 17th. The coldest January we have had for many years. Min. (5 ft. above ground against house) 9°, on a stake in open space) 1ft. 6in. + ground) zero, and on the snow close by—7°; the instruments were all tested instruments and have been found always to work well together and indicate alike; pray settle what height they ought to be placed. [Thoroughly protected from the sun and rain, on a post 4 ft. high.]

CALNE.—Hard frost from 1st to 6th, and from 11th to 22nd. Snowdrops and winter aconite in bloom on 25th, and hepatica on 31st.

GOODAMOOD.—Gale from S.W. on 8th. A very thick fog came on just before the thaw on the 22nd.

TAUNTON.—Four inches of snow on the 2nd. Severe frost on 5th and 15th. Rapid thaw with Southerly wind, on 23rd.

ORLETON.—Severe frost set in on the 1st and continued till the 5th. Ther. on 4th 1°·6 in shade and—1°·7 (below zero) 5 in. above grass. Snow on the night of the 5th, followed by rapid thaw, much R, and great floods; on the 7th, much R with T and L. Bar. on 8th, uncorrected, 28·38 at 9 a.m. Frost set in again on the 11th and continued with severity till the 22nd. Great wind and cloudy sky on 20th and 21st. On the night of 22nd snow, changing to sleet and rain, fell and froze upon the snow; at 9 a.m. thaw commenced with frequent showers. Warm stormy weather to the end of the month; very warm on the 27th and 28th; the temperature of the month in extremes, but upon the whole about 1°·4 below the average. L at night, on 26th.

MANCHESTER.—Heavy snow on 12th.

ARNcliffe.—Snow fell on the 1st and remained on the ground, with severe weather, till the 23rd.

SEATHWAITE.—Very severe frost from 10th to 23rd; Bassenthwaite and Derwentwater Lakes frozen from end to end affording splendid skating. R on Styx 21·82; Taylor's Gill, a new station, 18·10.

## WALES.

ABERCARN.—Snow on 1st, 2nd, 5th, and 14th, with R on 22nd. Bar. was 28·4 on 7th, the lowest since February 11th, 1866. A very severe month; several sudden changes of temp. being very trying to the weak and the aged; mortality above the average.

HAVERFORDWEST.—First five days severe. Month commenced with snow and frost, which terminated in a fearful gale, on the 5th, of violence such as few can



remember ; a few days of wet and storm ushered in a second much more severe frost with heavy snow, averaging from 7 to 8 inches on the level ; I have no record of so severe a frost as the present, except the frosty period included between the 10th and 20th of February, 1855, when the mercury sunk to 8° ; this second frost broke up on the 22nd, accompanied by a severe gale from the S.E. and immense quantities of rain ; the month very wet and mild towards the end.

CEFNFAES.—Snow fell on the night of the 1st, 10 in. deep on the level. Ther. on 3rd under shelter, but exposed to the east, stood at 7°. Shrubs and all ever-greens except rhododendrons very much injured, common laurels more especially so. Many instances of persons suffering from exposure, hands and feet being frost-bitten.

## SCOTLAND.

DUMFRIES.—The first five days frosty ; snow on the 6th, and thence to the 9th wet ; 10th to 22nd frosty ; from 23rd to the end of the month wet. Temp. 14°·5 on morning of 4th. Bar. on morning of 8th, only 28·39 in. Beautiful sunrise on morning of 26th. Snowdrops in flower on 29th.

SILVERBUT HALL, HAWICK.—The severest snowstorm experienced here for many years ; the frost has been the keenest felt here since 1860 ; roses, deodars, and aurocarias have suffered terribly, and many favorite pine trees are injured beyond recovery. T and L on night of 29th.

AUCHENDRANE.—11th snow fell between 11 and 12, and was measured at 9 a.m. on 12th 4 in. deep ; this was the great snowfall of the month, and extended over a large district ; here it was not severe, but the snow continued on the ground till the thaw of the 23rd.

OTTER HOUSE.—The month began with a severe frost, which lasted several days. On the 13th a snowstorm with intense frost ; the ground covered with snow to the depth of 2 in. till the 22nd when a thaw set in ; afterwards every day but one was wet. The month was remarkable for snow, frost, and towards the end R.

DEANSTON HOUSE.—As the first fall of snow had melted, the want of it was severely felt by garden vegetables during the second frost, but there is not yet any appearance of damage to plants or trees.

LOGIERAIT.—Very severe frost from 31st of December to 6th January, on which day a heavy fall of snow ; from that date till the 27th, with one brief interval of uncertain thaw, very intense frost and repeated falls of snow, forming the most severe storm we have experienced for many years ; a very rapid thaw and heavy falls of R since the 27th have considerably swollen the Tay.

BALLATER.—Remarkably stormy month with occasional intense frosts. 5° below zero on the 5th ; depth of snow from 2 to 3 feet. Railway communication with lower districts suspended for a time from the accumulation of snow in the cuttings. Thaw commenced on the 23rd, and by the end of the month most of the snow on the lowlands was gone. Vivid flashes of L in N. from 7 to 9 p.m. on 29th ; aurora at midnight of 30th. With reference to Mr. Bewley's communication in last month's magazine : the meteor he mentions, and the peculiar forms it assumed was noted here, although not minutely, the time being occupied in an attempt to count the shooting stars ; it remained for 10 minutes or more, and could readily be picked up again, although the eye had for some time been directed away from it.

ABERDEEN.—A month of terrible weather ; there has been no such storm here since 1838 ; ground round Aberdeen white with snow on 24 days. Temp. of month 4°·2 below the mean of the month for 10 years, and lower than the mean of any January for that period. On the morning of the 22nd about 27 or 30 in. of snow was lying all round town, but it disappeared very rapidly. In the country there were many places where the snow had drifted to the depth of 15 or 20 feet. L on 29th in evening.

FORT WILLIAM.—The first 3 weeks were for the most part, clear and frosty, with a little R now and then, and a good deal of snow ; on the 11th and 13th the fall of snow, however, was not as heavy as in most other parts of the kingdom, and postal communication with the S. was never delayed for an hour ; thaw set in on the 23rd. A gale from S. on 29th, with a good deal of L and some T.

PORTREE.—This has been a very severe month for all sorts of stock that were exposed to the late severe storm, which has not been equalled for 30 or 40 years.

The first snow fell as the old year went out and the new one came in, and continued till the evening of the 5th, when thaw set in, and we had it mild till 4 a.m. of 10th, when it again fell and continued, more or less, till the 20th, when there was 2 feet of snow all over; thaw set in on 23rd, and since then the weather has been wet and squally. T and L at noon 28th.

LOCHBROOM.—The frost which commenced at the end of December continued with almost unabated intensity till the 23rd, when a mild and much required thaw set in and continued till the end. Seldom has the county been more thoroughly locked from stock by frost and snow, the latter being, most unusually, as deep on the sea islands as on the elevated mainland, showing the want of drift and the severity of the frost both at the time of snowing and during its continuance; a month equally severe has not been experienced here for the last 20 years, though it appears to have been far worse in other localities.

HELMSDALE.—From the 9th to the 21st Helmsdale was visited by the severest snow storm experienced in this district for very many years.

SANDWICK.—The coldest January for 40 years. On the morning of the 6th we had again the snow-rollers, which were seen forming in front of the house at 9 a.m.; there were about 100 of them on the lawn at the lee end and in the shrubbery, the wind being apparently too strong for them in the open fields, the largest was 2 feet long and 20 in. in diameter, which is far from the size we have formerly seen; the circumstances attending their formation this time were just the same as I formerly mentioned, viz., 1st a fall of snow flakes on the top of a previous fall which yields a smooth surface for it to be rolled on; 2nd a temp. about 32°, which gives adhesion to the snow without thawing it; 3rd, a strong breeze of wind.

## I R E L A N D.

KILLALOE.—Not much snow here, but what there was continued to lie between 2 and 3 in. deep; all snow disappeared before the 21st.

MONKSTOWN.—On 5th the heaviest fall of R I ever measured, 1.70. The month commenced with sharp frost and snow; the weather throughout was unusually severe; except from the 6th to the 10th, and from the 24th to the end; the night of the 5th will long be remembered as the most severe here for many years; it was blowing wildly from the S.E. up to 2 p.m., after that it increased to a perfect hurricane accompanied by blinding showers of sleet which partly thawed, covering the ground to a considerable depth. After the thaw commencing on the 6th, the frost returned on the 11th, and a good deal of snow fell up to the 19th, when it was 10 or 12 in. deep; on the morning of the 23rd a rapid thaw commenced. *Latest Intelligence*.—The mild weather continued to the evening of the 6th February, and on the morning of the 7th the mountains were again coated with snow.

WARINGSTOWN.—The frost which set in on the 1st has been here the most intense in the memory of anyone now alive, and the injury to evergreens, &c., greater than on any previous occasion; it was followed by a rapid thaw, the temp. of the 6th being unusually high; the frost, however, set in again, accompanied as before with snow, and though not quite so intense as the first, was more severe than any of late years, as well as more lasting. The min. was 5° lower than in 1859-60.

LECKPATRICK.—On 2nd grass min. was covered with 6 in. snow, and read 30°, while exposed one registered 12°, so that the cover of 6 in. snow = a protection of 18°. On night of 4th-5th a gale from S.E., blowing the snow into drifts; on that night two men lost their lives near this house: one was stopped by storm in driving, took out his horse, wandered from the road, and was found dead in a field, the horse took shelter under a ditch-hedge and survived. On the morning of 5th the garden-gate was so blocked by snow that we had to get over the wall by a ladder to get to the instruments. Thaw set in on 20th with S. E. wind; many shrubs much damaged, some killed. The severest month ever remembered. *Query*—With reference to the above mentioned reading of the thermometers, should all snow be swept away from about the instruments, and should the grass min. be laid on grass, or on the top of the snow? [So far as we are aware no instructions have been issued on this point; our own practice (perhaps improper) is to place the thermometer on the top of the snow.—Ed.]

# SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

XIV.

MARCH, 1867.

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

## THE FROST OF JANUARY, 1867.

Owing to the somewhat excessive length of the tables which we have compiled upon the above subject, our remarks must be rather brief. In the first place, we must thank our numerous correspondents for having enabled us to make the tables so complete, and remind our readers that while we take all practicable measures for the exclusion of all but thoroughly reliable observations, we cannot be responsible for the absolute accuracy of every one.

Before proceeding any further we should state, once for all, that every reading is to be understood as plus unless marked minus. Great and most troublesome confusion has been introduced by some persons speaking of so many degrees of frost, until they themselves hardly know whether  $10^{\circ}$  represents  $10^{\circ}$  below freezing, *i.e.*  $22^{\circ}$ , or  $10^{\circ}$  below zero, *i.e.*  $-10^{\circ}$ ; or  $10^{\circ}$  above zero, *i.e.*  $10^{\circ}$ . If Fahrenheit's scale is bad, let us combine and choose a better one if we can—but if not, then for our own sake, and for mutual advantage, let us eschew *in toto* degrees of frost, and speak of temperatures solely as they stand on the scale.

It is especially necessary that this point be clearly understood, because many of our readers will doubtless be surprised to see temperatures of  $-10^{\circ}\cdot0$ , or even less, recorded at a score of English stations. Strange it may be to find that our temperature is occasionally  $40^{\circ}$  or  $50^{\circ}$  below the freezing point of water, but it is undoubtedly true. (We thus express it for the benefit of those who cannot all at once abandon their false notation.)

Table I. is compiled from returns received in reply to the suggestion on page 104 of our last volume. The principal remarks it needs are explanatory. Under each station is stated in the first column the lowest temperature, in the second the day or days on which it occurred—the months are indicated by the Roman numerals, and the day of the month by ordinary figures. Thus, by way of example, we may explain that at Haverfordwest in 1858 the lowest temperature was  $22\cdot5$  on the 18th of November, and in the same year at Red Hall, Leeds, the lowest temperature was  $19^{\circ}$ , and it occurred twice, on the 1st of March, and again on the 24th of November.

TABLE I.—MINIMUM TEMPERATURES, 1846—1867.

Year.	Haverfordwest.		Kilgobee.		Pen-y-maes, Brecon.		Dumfries.		Red Hall, Leeds.		Wolverhampton St. John's Sq.		Camden Town.		Sheering, Harlow.		Bristol, Frenchay.	
	Deg.	Date.	Deg.	Date.	Deg.	Date.	Deg.	Date.	Deg.	Date.	Deg.	Date.	Deg.	Date.	Deg.	Date.	Deg.	Date.
1846	16.0	XII. 16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	19.0	II. 19	18.0	II. 13	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	14.0	I. 27	20.0	I. 31	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	29.0	I. 2	20.0	XII. 30	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1850	...	...	15.0	I. 17	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1	22.0	XII. 1	25.0	{ XI. 29 XII. 20 }	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	24.0	III. 27	22.0	I. 10	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	17.0	{ II. 19 XII. 28 }	21.0	{ II. 8, 13 XII. 17 }	22.0	XII. 29	...	...	...	...	...	...	...	...	...	...	...	...
4	22.0	XI. 26	21.0	I. 16	22.0	I. 3	14.5	I. 3	...	XII. 22	...	...	...	...	...	...	...	...
5	8.0	II. 10	14.0?	II. 15?	12.0	II. 15	9.0	II. 16	18.0	XII. 22	...	...	...	...	...	...	...	...
6	16.0	XII. 27	18.0	I. 13	15.0	XII. 8	9.0	XII. 28	17.5	XII. 28	13.0	XII. 28	...	...	...	...	...	...
7	20.0	II. 3	22.0	I. 29	30.0	XI. 24	14.0	II. 4	11.5	I. 30	13.0	I. 29	...	...	...	...	...	...
8	22.5	XI. 18	21.0	I. 22	27.0	I. 5	18.0	II. 1	19.0	{ III. 1 XI. 24 }	22.0	I. 5	20.1	XI. 24	...	...	...	...
9	8.0	XIII. 17, 19	14.0	XII. 18	17.0	XII. 18	11.0	XII. 17	15.0	XII. 19	9.0	XII. 19	14.4	XII. 17	1.0	XII. 17	...	...
1860	10.0	XII. 23	13.0	XII. 24	9.0	XII. 24	-1.5	XII. 24	11.0	XII. 25	6.0	XII. 25	6.7	XII. 25	-2.0	XII. 25	...	...
1	9.0	I. 6	23.0	I. 3	13.0	I. 7	6.5	I. 7	12.0	II. 13	17.0	I. 7	14.3	I. 9	6.0	I. 8	6.0	I. 7
2	20.9	II. 9	24.0	XI. 25	29.0	XII. 20	17.0	XI. 25	19.0	I. 19	22.0	I. 19	18.1	I. 19	19.0	I. 19	18.5	XI. 23
3	24.0	I. 16	...	...	30.0	XII. 11	23.5	II. 15	...	...	28.0	XII. 28	24.5	II. 17	24.0	II. 17	...	...
4	10.0	I. 5	20.0	XII. 26	22.0	XII. 5	17.0	I. 6	14.0	I. 8	15.0	I. 7	15.1	I. 6	20.0	II. 9, 20, 24	19.5	XII. 18
5	14.0	I. 24	18.0	I. 28	12.5	XII. 29	9.5	II. 15	...	...	18.0	I. 29	15.4	II. 15	14.0	I. 29	10.0	I. 29
6	18.5	II. 28	23.0	II. 18	26.0	III. 1	19.0	III. 5	...	...	24.0	III. 2	22.5	III. 1	17.0	I. 13	19.7	III. 1
1867	8.0	I. 15	14.0	I. 18	6.0	I. 15	14.5	I. 4	...	...	16.0	I. 15	6.7	I. 4	7.0	I. 4	9.0	I. 4

This table is not so complete as we could wish, but seems just sufficient to indicate that if it were thrice as large some interesting results as to the progress of cold tracts of air might be deduced.

Table II. contains the whole of the returns hitherto received (about 170), arranged according to the counties in which the observations were made. It would, in some respects, have been desirable to arrange them according to the intensity of the frost, but the opportunity of discussing the observations would have been thereby impeded. Moreover, a glance at either Table II., III., or IV. will show that it was, as previously stated, most severe in the Home Counties. Low temperatures will be noticed in other parts, but *they* mostly occurred about 14th, 10 days after the first frost. A column gives (where known) the elevation of the station above the sea, the effect of which is, we believe, popularly considered just the reverse of the truth. Take, for instance, the returns from Kent: the two highest stations, Goudhurst and Wrotham, had a min. of  $21^{\circ}$ ; the stations of medium height, say 250 ft., had a mean of  $5^{\circ}0$ ; and those under 100 ft. a mean of  $-5^{\circ}0$ . In Westmoreland, at 300 ft., the min. was  $5^{\circ}5$ , and at 1,550 ft., it was  $14^{\circ}0$ .

Table III. compares the intensity of the frosts of 1860 and 1867 at stations where observations were made in both years, and Table IV. effects the same object, by showing the very large number of excessively low temperatures recorded in 1860.

TABLE II.—*General Table of Low Temperatures in January, 1867.*

STATION.	Above Sea.	Degree.	Date.	REMARKS.
MIDDLESEX. — Pinner Hill .....	410	$8^{\circ}0$	4th	$12^{\circ}0$ on 3rd and 12th.
Staines .....	52	$-7^{\circ}0$	4th	$-4^{\circ}0$ on 2nd.
Winchmore Hill.....	...	$-4^{\circ}0$	4th	$1^{\circ}0$ on 5th. $3^{\circ}0$ on 3rd.
Hackney (Town Hall) .....	40	$6^{\circ}8$		
„ (London Fields).....	30	$5^{\circ}0$		
Hammersmith Royal Vineyard .....	...			
Nursery .....	...	$-3^{\circ}0$		
Hornsey .....	...	$-3^{\circ}0$	4th	
Camden Town.....	100	$6^{\circ}7$	4th	
SURREY. — Walton-on-Thames } (Oaklands) .....	...	$0^{\circ}0$	5th	
East Sheen .....	...	$-3^{\circ}0$	4th	(Ther. only 1 ft. above snow.)
Cobham Lodge .....	100	$-3^{\circ}0$	5th	
„ (Pyports) .....	...	$-6^{\circ}8$	5th	$-4^{\circ}9$ 3rd.
Epsom .....	135	$-12^{\circ}0$	4th	$3^{\circ}0$ on 2nd; $10^{\circ}0$ on 3rd.
Bagshot Park .....	230	$3^{\circ}0$		
„ grass .....	...	$-2^{\circ}0$		
Wimbledon .....	170	$5^{\circ}0$	3rd	$8^{\circ}0$ on 4th.
KENT—Greenwich Observatory..	160	$6^{\circ}6$		
East Peckham.....	76	$-10^{\circ}0$	5th	$-6^{\circ}0$ 4th; zero 3rd.
Bromley Common .....	250	$-3^{\circ}0$	4th	$2^{\circ}0$ 5th.

STATION.	Above Sea.	Degree.	Date.	REMARKS.
KENT ( <i>con.</i> )—Beckenham .....	157	0·0	5th	4·0 4th.
Maidstone .....	60	0·0	5th	
Goudhurst .....	375	20·5	3rd	21·5 on 4th
Cranbrook (Hartley) ..	...	10·0	4th	12°·0 on 3rd and 5th.
Wrotham (Fairseat) .....	650	21·0	4th	
Tunbridge .....	71	— 5·0	4th	2°·0 on 3rd ; 4°·0 on 5th.
Linton Park .....	296	10·0	5th	
SUSSEX—Uckfield .....	149	4·0	4th	
„ <i>grass</i> .....	...	— 2·6	4th	
„ (Framfield) .....	200 ?	6·5	4th	
Hastings (Ore) ..	380	13·0	3rd	14°·0 on 14th.
Chichester (Chilgrove) .....	284	12·0	4th	14°·0 on 14th.
HAMPSHIRE—Isle of Wight (Ryde) ..	15	21·0	14th	23°·0 on 4th.
„ (St. Lawrence) ..	200	17·0	13th	21°·0 on 3rd.
„ (Newport) ...	...	14·8	14th	
Southampton (Woolston) .....	...	7·0	4th	
„ (Shirley Warren) ..	110	4·0	4th	
„ „ „ <i>grass</i> ..	106	2·0	4th	
„ (Ord. Sur. Office) ..	75	4·2	4th	9°·1 on 14th.
Selborne .....	500 ?	— 2·0	3rd	
„ (Chawton House) ...	...	— 5·0		
Strathfield Turgiss, <i>grass</i> .....	269	— 3·0	3rd	
BERKSHIRE—Maidenhead .....	...	— 3·0		
„ (Cookham) ..	...	0·0	4th	1°·0 on 3rd ; 1°·5 on 5th.
„ (Ray Lodge) ..	...	— 3·0	5th	— 2°·0 on 4th.
Wantage .....	185	3·0	5th	6°·0 on 4th.
Wallingford .....	...	— 5·0		
Long Wittenham .....	170	6·0	4th	
Old Windsor, (Woodside).....	...	4·0	5th	
HERTS—Berkhampstead .....	370	0·5	5th	{ 2°·2 on 4th ; 4°·5 on 3rd ; 1855, 11., 18, 0°·8.
Harpenden ...	...	— 6·0	5th	
Kensworth .....	902	10·0	4th	
Berkhampstead, Hawridge ...	600	— 8·0	13th ?	
Ware (Braughing) .....	...	— 6·5	3rd	— 3°·0 on 4th.
Hitchin .....	240	9·0	3 & 4	
BUCKS—Datchet (Riding Court) ..	...	— 8·0	5th	
OXFORD—Dorchester .....	...	— 2·0	4th	
Banbury .....	345	12·0	4th	
NORTHAMPTON—Ashby St. Ledger ..	...	14·5	4th	
CAMBRIDGE—Wisbech .....	14	12·3	4th	
ESSEX—Dunmow (High Roding) ..	250 ?	11·0	4th	
Saffron Walden .....	...	5·0	4th	
„ „ (Audley End) ..	...	5·4	4th	7·1 on 2nd ; 9°·4 on 5th.
Harlow (Sheering).....	100 ?	7·0	4th	
SUFFOLK—Bury St. Edmunds } (Culford)..... }	...	4·0	1st	
„ <i>grass</i> .....	...	— 7·0	1st	
NORFOLK—Lynn (Hillington)...	...	3·0	4th	
Norwich (Cossey) .....	...	4·5	5th	
WILTS—Calne .....	255	1·5	5th	
DORSET—Bridport.....	85	11·0	...	
Upwey.....	70	15·3	3rd	
„ <i>grass</i> .....	...	12·2	3rd	
DEVON—Bideford (Pillhead) ...	25	8·0	15th	
Sidmouth (Belgrave) ...	26	16·6	14th	19°·7 on 3rd, 21°·6 on 4th.
„ Town .....	...	20·2	14th	

STATION.	Above Sea.	Degree.	Date.	REMARKS.
DEVON ( <i>con.</i> )—Exeter .....	140	9.0	4th	
Torquay (Sandhurst).....	..	15.0	13th	
„ (Woodfield).....	150	22.0	12th	
Goodamoor .....	580	8.0	2nd	
CORNWALL—Launceston (Tre- bartham Hall) .....	...	5.0	4th	
„ (Altarnum) .....	570	4.0	15th	
„ „ <i>grass</i> .....	325	2.0	15th	
Bodmin .....	325	11.0	17th	lowest in 17 years, 1855 II, 12°.
Truro .....	56	8.0	15th	1855 I. 19 10°; 1859 I. 23 9°0.
SOMERSET—Street .....	...	3.5	...	
Taunton (Fulland's School) ...	...	9.0	5 & 15	
„ (College School) .....	...	10.0	...	
Bath .....	54	8.5	4th	14° on 15th.
GLOUCESTER—Cheltenham .....	...	5.0	4th	
Boyce Court .....	...	7.0	4 & 5	
Bristol (Frenchay) .....	...	9.0	4th	
„ „ <i>grass</i> .....	...	— 4.5	4th	
Witcombe Court .....	225	— 3.0	5th	
Clifton .....	192	14.1	...	
HEREF'D—Leominster W. Lodge	229	3.0	4th	4°0 on 5th
Ross .....	200	9.0	4th	10°0 on 5th.
SALOP—Bridgnorth .....	...	1.0	5th	4°0 on 4th.
Weston-under-Lyzziard .....	...	8.5	4th	
Shrewsbury .....	200	6.0	5th	
STAFFORD—Sugnall Hall .....	...	— 5.0	4th	
Wolverhampton, St. John's Sq.	513	16.0	15th	18°2 on 3rd ; 18°3 on 4th.
WORCESTER—Tenbury (Orleton)	200	1.6	4th	1865, I., 29, zero.
„ „ <i>grass</i> .....	...	— 1.7	4th	1865, I., 29, —2.0.
Bromsgrove .....	273	2.3	4th	
Evesham (Lansdowne) .....	...	10.0	4th	
WARWICK—Leamington .....	195	12.5	4th	13°4 on 5th.
Birmingham .....	340	12.7	...	
LEICESTER—Wigston .....	220	9.0	3rd	
Leicester .....	230	11.0	...	
LINCOLN—Brigg (Appleby) .....	60	4.9	2nd	8°6 on 4th, 5°0 on 5th.
„ „ <i>grass</i> .....	...	2.8	2nd	5.2 on 4th ; 3.5 on 5th.
NOTTS—Nuthall .....	...	5.0	...	
Highfield House .....	166	9.0	14th	
„ „ <i>grass</i> .....	...	2.7	14th	
DERBY—Derby .....	180	13.0	4, 14, 15	
LANCASHIRE—Liverpool .....	22	16.3	...	
Manchester (Eccles) .....	145	9.0	...	
„ (Old Trafford) ..	106	8.7	15th	
Stonyhurst .....	381	10.0	...	
YORK—Beadlam Grange .....	192	10.0	15th	
Skipton (Woodlands) .....	430	3.6	3rd	
„ (Arnccliffe).....	76	8.0	4th	
Middlesboro' .....	21	10.0	3rd	
Ripon .....	...	1.0	1st	
„ .....	116	2.0	2nd	
„ „ <i>grass</i> .....	...	— 9.5	2nd	
Sheffield .....	337	15.5	...	
Wakefield .....	115	5.0	...	
Malton .....	73	6.0	...	
York .....	50	10.0	5th	
Hull .....	14	8.0	1st	10°0 on 4th.

STATIONS.	Above Sea	Degree.	Date.	REMARKS.
NORTHUMBERLAND—N. Shields	124	14·0	2nd	
Newcastle .....	150	12·0		
Chathill .....	...	24·0	4th	
WESTMORELAND — Kirkby }	267	5·5	3rd	
Lonsdale (Casterton)..... }				
Ullswater (Greenside) .....	1550	14·0	14th	

## MONMOUTH, WALES, AND THE ISLANDS.

MONMOUTH—Abercarn .....	450	20·0	3rd	
Chepstow (Winwood Green) ..	200	17·0	5th	
PEMBROKE—Haverfordwest ...	85	8·0	15th	
GLAMORGAN—Cardiff (Routh)...	...	14·0	4th	15°·0 on 14th.
BRECON—Pen-y-maes .....	400	12·0	4th	
RADNOR—Rhayader .....	880	7·0	3rd	
DENBIGH—Llandudno .....	99	20·7	5th	
CARNARVON—Port Madoc .....	20	12·0	3rd	
CHANNEL ISLES—				
Guernsey (Grange Road) .....	150	20·0	14th	} lowest for 20 years.
„ „ „ grass. ..	..	15·0	14th	

## SCOTLAND.

DUMFRIES—Dumfries .....	70	14·5	4th	
Carlesgill .....	370	— 0·3	4th	
ROXBRO—Galashiels (Wooplaw)	890	5·0	1st	
EDINBURGH—March Hall ...	270	16·0		
Leith .....	50	24·0		
LANARK—Lanark .....	505	5·0		
Glasgow (Cessnock Park).....	30	5·0	14th	
„ (Observatory) .....	200	13·0		
AYR—Auchendrane .....	94	7·0	15th	
RENFREW—Greenock .....	50	22·0		
Paisley .....	88	12·0		
ARGYLL—Otter House .....	130	21·0	12th	
Mull (Bunessan) .....	30	24·0	4th	
PERTH—Deanston .....	130	10·0	15th	
FORFAR—Dundee (Westfield) ...	...	21·0	5th	
„ (Cemetery) ..	...	19·0		
ABERDEEN—Ballater .....	656	— 5·0	5th	
Aberdeen .....	115	10·2	5th	
INVERNESS—Culloden .....	104	14·6	5th	
Fort William .....	20	7·2	15th	
Portree .....	60	12·0	5th	

## IRELAND.

WATERF'D—Waterf'd (Newtown)	60	16·0	4th	
CLARE—Killaloe .....	123	14·0	18th	
KILKENNY—Stoneyford (Inisnag)	196	11·0	18th	
QUEEN'S Co.—Portarlinton ...	236	8·0	18th	
DUBLIN—Monkstown .....	104	12·0	4th	
Dublin.....	35	14·0	4th	
GALWAY—Galway.. ..	25	15·0	3rd	
WEST MEATH—Mullingar .....	...	11·0	3rd	12·0 on 4th.
„ grass. ....	...	— 4·0	4th	1°·0 on 3rd.
DOWN—Waringstown .....	190	2·0	2nd	
ANTRIM—Ballymoney .....	...	1·0	4th	
TYRONE—Leckpatrick .....	260	4·0	4th	



TABLE III.—Returns from the same Stations in the two (or three) frosts.

STATIONS.	Lowest temperature in the Years.			STATIONS.	Lowest temperature in the Years.		
	1838	1860	1867		1838	1860	1867
Hammersmith .....	0·0	— 2·0	— 3·0	Bath .....	...	8·5	8·5
Hackney .....	...	5·6	6·8	Clifton .....	...	7·1	14·1
Camden Town .....	...	6·7	6·7	Boyce Court .....	...	— 5·0	7·0
Walton-on-Thames .....	...	11·0	0·0	Witcombe Court .....	...	2·0	— 3·0
" " " " " "	—14·0	...	...	Orleton .....	...	3·0	1·6
Cobham Lodge .....	...	6·0	3·0	Bromsgrove .....	...	0·3	2·3
Greenwich Observ. .....	— 4·0	8·0	6·6	Birmingham .....	...	— 1·0	12·7
Maidstone .....	...	10·0	0·0	Appleby (Lincoln) .....	...	—11·0	4·9
Uckfield .....	...	6·6	4·0	Nottingham .....	...	— 6·0	9·0
Selborne .....	...	— 1·5	— 2·0	Derby .....	...	2·0	13·0
Maidenhead .....	...	5·0	— 3·0	Eccles .....	...	— 3·0	9·0
Wallingford .....	— 5·0	0·0	5·0	Old Trafford .....	...	— 3·0	8·7
Berkhempstead .....	...	4·0	0·5	Wakefield .....	...	— 4·5	5·0
Ware .....	...	— 4·0	— 6·5	York .....	...	— 4·0	10·0
Dunmow .....	...	2·0	4·0	Malton .....	...	— 6·0	6·0
Calne .....	...	2·0	1·5	Chepstow .....	...	11·0	17·0
Upwey .....	...	11·5	15·3	Carlesgill .....	...	—12·0	— 0·3
Exeter .....	...	13·7	9·0	Paisley .....	...	— 5·0	12·0
Bodmin .....	...	14·0	11·0	Aberdeen .....	...	7·0	10·2
Truro .....	...	11·0	8·0	Mean .....	...	2·3	5·4

TABLE IV.—List of Temperatures below —5·0 Fahrenheit.

1838.		1860.		1867.	
Walton-on-Thames .....	—14·0	Chatsworth .....	—12·0	Staines .....	— 7·0
Claremont .....	—12·0	Willersley .....	— 6·0	Epsom .....	—12·0
Beckenham .....	—13·5	Tarporley .....	— 8·0	Cobham (Pyports) .....	— 6·8
Newbury .....	— 6·0	Sale .....	— 9·8	East Peckham .....	—10·0
Moulsford .....	— 6·4	Thelwall .....	— 6·0	Berkhempstead (Hawridge) ... ?	— 8·0
Ball's Park, Hertford .....	—10·0	Thorpe Perrow .....	—12·0	Ware .....	— 6·5
Tyttenhanger .....	— 6·0	Bedale .....	—11·0	Datchet .....	— 8·0
St. Neot's .....	—12·5	Doncaster .....	— 8·0		
Saffron Walden .....	—12·0	Malton .....	— 6·0		
Fakenham .....	—10·0	Milne Graden .....	— 5·6		
Long Stratton .....	—10·0	Smeaton .....	— 6·0		
Cheadle .....	—15·0	Thirlestane .....	— 8·7		
Rolleston .....	—10·0	Braemar .....	—11·0		
Tamworth .....	— 7·0	Castle Newe .....	—12·0		
Lichfield .....	— 6·0				
Appleby (Lincoln) .....	—11·0				
Carlton .....	—12·0				
Highfield House .....	— 6·0				
Beeston .....	— 8·3				
Beesthorpe .....	— 6·0				
Worksop .....	— 6·0				

NOTE.—In Number XII., page 104, the temp. at Stratford, in 1816, should have been —5·0, instead of 5·0, and on page 102, Stonyhurst should have been 6·7.

## NOTES MADE DURING THE LONG FROST OF 1813-14.

*To the Editor of the Meteorological Magazine.*

SIR,—The frost commenced the 26th December, 1813; the thermometer (placed against a house in Cirencester and taken at half-past 8 a.m.) fluctuated between  $12^{\circ}$  and  $22^{\circ}$  for the first three weeks; during this period there were two falls of snow of about 2 inches deep. The sky was clear and there was little wind, always from the N. or E. At the beginning of the fourth week there was a great disturbance in the atmosphere, high winds, and a fall of 15 inches of snow with deep drifts, stopping the traffic of the roads; hard frosts followed, the thermometer falling to  $10^{\circ}$  on the 25th January; the wind then shifted to the S. and day thaws succeeded by frosty nights followed. The wind then went to the N. with clear frosty weather.

On the 3rd February two dense concentric circles appeared round the moon, and on the 5th we had snow, and then a rapid thaw, leaving only drifts of snow. The frost then resumed and continued with keen winds to the end of February; a slight tendency to thaw in the beginning of March was followed by a week of steady, clear, frosty weather until the 12th, about which time crystals of snow fell, then a week of cold, easterly winds with severe frosts until the 20th March, when a S. wind brought mild weather and rain.—Yours,

Further Barton, Cirencester.

THOMAS C. BROWN.

## GALE ON FEBRUARY 6TH.

SIR,—We had a severe hurricane here on Wednesday morning, February 6th, from the S.W. The wind blew strongly from the early morning, and at 3.16 a.m. attained such force as to knock down the semaphores at the railway station, at the same time doing other severe damage; extreme force 21 lbs.; the wind then calmed down a little, but at 10.45 a.m. it again blew with fearful violence, tearing down a large elm, 45 feet high, on my glebe, and blowing down two barns not very far distant from us. One erected two years ago, a large barn, brick and timber built and 25 feet high, was literally annihilated, the roof blown entirely off, and portions hurled nearly 60 feet away, to the no small astonishment of a laborer who was threshing inside the barn, and who, although much cut with the shower of slates, was providentially saved; extreme force 26.04lb. We have not had such wind since the date of the wreck of the "Royal Charter."

I am, very truly yours,

Turgis Rectory, Strathfield Saye, Winchfield. CHARLES H. GRIFFITH.  
February 9th, 1867.

## LOW TEMPERATURES.

*To the Editor of the Meteorological Magazine.*

MY DEAR SIR,—I send you a list of the lowest temperatures in each year from the end of 1855 to 1862 at Red Hall, near Leeds, and a single one in 1864 at High Harrowgate, a very similar situation. Up to December, 1860, the thermometers were placed in our back yard, on the north side of a wall, which caused the range to be less, and I afterwards found that when placed on a stand on a large lawn they read not unfrequently  $3^{\circ}$ , and sometimes  $5^{\circ}$ , lower on a still night. Yet the yard itself was open enough, being some 50 yards across. I have given a sort of sketch of the weather that just preceded the minimum, to show you what I meant by the letter I wrote a short time ago. If you think the investigation not unnecessary, a few similar extracts from registers might enable you to make some generalisations which would be afterwards verified and confirmed, or rejected. One cannot see much from one register, but a dozen might throw a little light on some points which can hardly be said to be yet settled. At Red Hall it never fell below  $18^{\circ}$  without a good covering of snow, although some of the "S. E. frosts," (as I call them, being a distinct genus which never indulge in snow till they go away,) have been marked by the lowest day maxima and the clearest possible sky. If you thought it worth while to get some such registers as I have suggested, I should have no objection to give any assistance that might be in my power towards classifying them, &c.—Believe me to remain, yours truly,

60, Hall Gate, Doncaster, Feb. 4th, 1867.

FENWICK W. STOW.

*Lowest Temperature registered at Red Hall, near Leeds (4 ft. from ground), in each year from December, 1855, to 1862. Soil clay; ground generally level; elevation 450 ft.*

Year.	Day.	Min. at 4 ft.	Max. previous day	Rise or fall of day 9 a.m. to 1 p.m.	On previous day.			Dry and wet bulbs at 9 a.m.	Cloud 0-10.	Direction of Wind.	Strength of Wind.	SNOW.			REMARKS.
					0	Direction of Wind.	Strength of Wind.					Depth on ground, inches, about	Date of falling.	Character.	
1855	Dec. 22	18°	24°	in.		0	S. E.	V. stng. breeze	0	...	Nov 26 & 30 & Dec 2	...	{ Wind blew strongly from S. E. throughout the frost. Minimum occurred again at noon.		
1856	Dec. 4	18°*	26°	+0°14		0	N.	Light.	6 at least.	...	25 & 26	Firm.	{ The min. occurred on a "very stormy night."		
"	Dec. 28	17°5*	25°	+0°20		0	N. W.	Sharp breeze	6	...	27 & 28	Light.			
1857	Jan. 30	11°5*	26°	-0°06		2	N.		4	...	same night	?			
1858	Mar. 8	19°	37°	+0°01	{ 29·5	3 or 4	N. W.	Gale.	7	...	1	20	{ A "S. E. frost." Frost began with S. E. wind.		
"	Nov. 24	19°0*	35°	-0°19	{ 29·5	0?	W & NW		1	...	5	15 & 18			
1859	Dec. 19	15°0*	24°	+0°02	{ 28·0	10	S.	Light.	5	...	21 & 23	Light.			
1860	Dec. 25	11°0*	22°	-0°30	{ 21·5	0	N. W.	Sharp breeze	5	...	3	12	'Hail'		
1861	Feb. 13	12°	37°	0°00	{ 20·0	5	N. N. W.	Strong.	3	...	0	...	{ A "S. E. frost." Frost began with S. E. wind.		
1862	Jan. 19	19°	30·2	-0°06	{ 16·0	3	S. E.	V. stng. breeze	0	...	...	...			
+1864	Jan. 8	14°	24°	-0°18	{ 14·5	1	N. E.	Light.	v. slight snow.	...	...	...			

*Lowest Temperature at 4 ft. at the Knoll, Ripon; 110 ft. above sea; gravel soil. Situation on first rise from valley of river.*

1865	Jan. 3	14·8	36°	-0°24	{ 32·4	9		S. S. W.	Strong.	2	2	Light.	{ Violent gusts and snow storm day before.
"	Feb. 15	14·6	37·5	-0°30	{ 28·4	4		N. E.		?	13	Sleety.	
1866	Mar. 1	16°	38·5	+0°24	{ 33·0	6		N. E.	Strong.	2 or 3	Feb. 28		
1867	Jan. 2	2°	21·8	-0°17	{ 32·8	2		N.	Light breeze	3	Dec. 31	Light.	
					{ 29·0	2							

\* Readings in calm nights marked \* would have been lower in a more exposed situation.

† This taken at Harrowgate; clay soil; 420 ft.

## THE SILVER THAW.

*To the Editor of the Meteorological Magazine.*

MY DEAR SIR,—I must tell you of a strange occurrence here yesterday evening. As I was sitting in my study about 8 p.m., I heard what seemed like the pattering of rain against the window, which faces the S.E. I felt surprised at this, knowing that the temperature outside had been for several days below freezing point, and often considerably so. On careful observance I found that though there was some hail, yet the fall was principally rain. The thermometer outside was then about 27° or 28°, and I felt fairly puzzled to think how rain could fall under such circumstances. I fancied that the thermometer must have burst, and so not told a true tale; but on putting out a common boxwood one, it soon fell to 29°. On putting my foot on the ground I heard the newly-frozen rain crunch under it. The rain continued till about 10.30, the thermometer still keeping to about 28°, and after I went to bed at 11.30 I heard the rain again falling on the window, which has the same aspect as that of the study. I had previously remarked that as the rain fell on the windows and ran down the glass it froze there. To see hail in summer is a common occurrence, but I certainly never saw or heard of rain falling when the temperature was 4° or 5° below freezing. To-day there is a decided thaw, as was to be expected after the strange freak of nature last night. I measured .12 in. of rain at 9 this morning.—Yours truly,

High Roding Rectory, Dunmow, Essex,

EDWARD MAXWELL.

23rd January, 1866.

DEAR SIR,—Happening to turn to an old journal of mine, I find the following entry:—"1855. Reedings, Newick, Sussex, February 3rd. Rained heavily from 1.30 to 7 a.m. this morning, each drop freezing where it fell, so that every leaf was covered this morning with a thick coating of ice. Thawed much to day." I also find that frost began on the 16th January, and that it went on again after the thaw on the 3rd February, and that there was 6 inches of snow on the 11th of March. I do not seem to have noticed the weather afterwards.—Yours very faithfully,

THOMAS E. CRALLAN.

Framfield Lodge, Hurst Green,

February 23rd, 1867.

SIR,—I note in the February number, your remarks on the silver thaw of January 22nd. In this neighbourhood it began later in the evening, as at half-past 10 p.m. it was snowing a little, but at 6 o'clock the following morning the roads were one mass of ice; the thermometer fell to 19° during the night, at 9 o'clock the following morning it was 31°. The above were registered by Hick's thermometer, on a stand 5 feet above the ground.—I am, Sir, yours respectfully,

Rastrick, March 9th, 1867.

ALFRED CLAY.

## PERIODIC (?) HAIL-BALLS.

*To the Editor of the Meteorological Magazine.*

SIR,—There fell here to-day, March 6th, a shower from the N.W. of soft hail about 3.45 p.m.; it lasted for a very short time, and was followed by a little snow. I was on the look out for this soft hail, as it was mentioned as periodic (?) in your Magazine for March last year. It was not like ordinary hail: your description of it as miniature snowballs seems to be very close; I could observe no crystallization, the shapes appeared very irregular, but chiefly of a rough cubic form; I saw none that appeared larger than swan shot: this I should put down as the average size of the "hail-balls."

The snow that fell after it was not in a thick shower. If the snow in falling through layers of atmosphere became semi-melted, and then partially frozen again, it would, I fancy, present the above appearance of balls. But these balls were composed of more than one snow-flake bound together, and to effect that, I should imagine a dense shower would be requisite.

It is certainly a very curious fact, that this occurrence should so frequently have happened on or about this date, or that of the 8th of March. We have had no snow this month up to to-day. Should any more "soft hail" fall here in the next two or three days, I will acquaint you.—Yours sincerely,

Staff College, Farnboro' Station,

ROWLAND HILL FAWCETT.

March 6th, 1867.

# DERIVATION OF THE WORD "ANEROID."

*To the Editor of the Meteorological Magazine.*

SIR,—Questions of philology are generally troublesome, especially when they concern words concocted in modern times from Greek roots, not always in the most regular way. A modern Greek compound is as puzzling to me as a queer-looking mutton bone, which a dog has just gnawed and buried, is sometimes to an amateur geologist. It is not, therefore, without diffidence that I venture to stand up for the much-derided derivation which you gave.

Whether an aneroid be of an "*inquiring*" disposition or *unamiable*, whether its inside be *very hollow* or *very dry*, or its "shape" be that of a "*vacuum*" and its action that of a *manly automaton*, far be it from me to decide. But without insisting on the inventor's scholarship, I certainly do attach a definite meaning to the name he invented.

It is true that *ῥηψ* is somewhat rare, but *ῥαψ*, which is only another form, was good enough for Sophocles and Æschylus and even the sea-god Nereus did not disclaim the connection; *ῥηψ* then, or *ῥαψ*, comes from *ῥαω* to flow, and means therefore, not *moist*, but *fluid* or *liquid*. The distinction is important, for the inventor doubtless meant to express by the name "aneroid" the fact that *no fluid* (as water or mercury) was used in its construction, as they are in other barometers. In short, he meant that it belonged to a *class* or *species* (*εἶδος*) of instruments, which might be called *ἀνηρὰ*, because destitute of fluid.—Your obedient servant,

F. W. S.

## EARTHQUAKE IN WESTMORELAND.

*To the Editor of the Meteorological Magazine.*

SIR,—On Saturday morning last, February 23rd, about 1 a.m., the shock of an earthquake was felt here; the wind at the time was westerly and boisterous. The local papers report that it was felt at Ambleside, and other places.—Yours,

Greenside Mines, Ullswater, *March 1st.*

J. BARNINGHAM.

A correspondent at Ambleside writes to the *Express* as follows:—

"The inhabitants of the group of valleys extending from the foot of Windermere to the head of Langdale have been looking in vain for some notice in the newspapers of the earthquake which startled them out of their sleep at about a quarter-past one on Saturday morning last; and, rather than let such an event pass altogether without public notice, I now send you an account of as much as is known about it in the neighbourhood from which I write. Friday night was fine—a brilliant starlight night, and perfectly calm. At the time I have mentioned, a sound like a prolonged clap of thunder—only too loud and too long-continued for thunder in this country—seemed to fill the valley of the Rothay, while the houses—even those built into the rock—shook as in a hurricane. A dead stillness followed for a considerable time; and then the wind rose. In the morning it appeared that the inhabitants of Ambleside had undergone the usual alarms occasioned by earthquake. Children's cots had been shaken, and the babies awakened; crockery and window sashes had rattled, aged people and invalids had risen from their beds; one lady believed there had been an explosion within her house; the people at the bobbin-mill in the ghyll had dressed and come down the hill; and so forth. The first conjecture was that the powder-mills at Elterwater had blown up; but it was presently known that the inhabitants there, were as wonder-stricken as ourselves. Everybody at Grassmere got up, and the alarm was very great throughout Langdale, and not less at Windermere. How much further it was felt we hope to hear some day. Persons who have experienced earthquakes in volcanic countries declare that there can be no question of the character of this phenomenon, though nobody seems to have heard of any preceding visitation of the sort in this district."

## FEBRUARY, 1867.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which .01 or more fell.	TEMPERATURE.						No. of nights below 32°.
		Total Fall.	Difference from average 1860-5	Greatest Fall in 24 hours.		Dpth		Date.	Max.		Min.			
				inches	in.				Deg.	Date.	Deg.	Date.		
I.	Camden Town .....	1.44	+ .22	.36	16	11	56.2	15	30	3	1			
II.	Staplehurst (Linton Park) ...	1.53	+ .02	.28	17	17	56	17	29	3	5			
	Selborne (The Wakes) .....	2.54	+ .83	.48	5	13	50	*16	22	28	5			
III.	Hitchen .....	1.45	+ .19	.46	6	10	52	+16	25	28	1			
"	Banbury .....	1.31	— .12	.33	5	15	53.7	20	31	3	3			
"	Wisbech .....	1.09	...	.28	8	10	58.1	20	28.2	...	2			
IV.	Bury St. Edmunds (Culford).	1.82	+ .41	.42	5	10	56	16	22	27	5			
V.	Calne .....	1.95	...	.50	7	13	55	+18	31.8	3	1			
"	Plymouth (Goodamoor) .....	4.86	+1.50	.86	6	17	55	...	25	...	...			
"	Barnstaple .....	3.57	+1.49	.80	27	22	...	...	...	...	...			
"	Taunton (Fulland's School)	1.89	+ .51	.47	6	21	...	...	30	3	1			
VI.	Shrewsbury (Highfield) .....	1.53	+ .39	.48	8	12	...	...	...	...	...			
"	Tenbury (Orleton) .....	2.13	+ .56	.39	5	19	59	20	28.2	28	2			
VII.	Leicester (Wigston) .....	1.28	— .06	.20	8, 11	11	56	12	24	28	4			
"	West Retford .....	...	...	...	...	...	...	...	...	...	...			
"	Derby .....	1.95	+ .47	.53	7	10	59	19	29	27	3			
VIII.	Manchester .....	2.93	+ .98	...	...	12.	...	...	...	...	...			
IX.	York .....	1.17	— .21	.35	10	11	53	\$10	24	28	2			
"	Skipton (Arncliffe) ...	7.56	+3.89	1.28	7	18	48	2	22	28	3			
X.	North Shields .....	.82	— .71	.26	7	12	53	21	26	28	3			
"	Borrowdale (Seathwaite) .....	17.05	+5.67	2.32	4	21	...	...	...	...	...			
XI.	Abercarn .....	4.28	...	.88	7	14	52	16	30	28	1			
"	Haverfordwest .....	5.97	+3.11	1.00	11	18.	55	23	27.5	28	...			
"	Rhayader (Cefnfaes) .....	3.53	+ .55	.85	8	20	55	...	23	...	...			
"	Llanberis (R. Victoria Hotel)	5.45	...	.87	3	16	...	...	...	...	...			
XII.	Dumfries .....	2.10	— .45	.31	7	19	55	21	23.5	27	3			
"	Hawick (Silverbut Hall) ...	1.73	...	.40	3	19	...	...	22	25	11			
XIV.	Ayr (Auchendrane House) ...	3.67	+ .32	.65	3	20	58	1	23	27	3			
XV.	Otter House .....	5.50	+1.58	.70	4, 10	16	51	21	22	27	4			
XVI.	Leven (Nookton) .....	1.62	— .08	.29	7, 10	14	54	21	25	27	4			
"	Stirling (Deanston) .....	4.27	+1.27	.65	4	21	52.4	21	21	27	8			
"	Logierait .....	2.92	...	.58	3	14	...	...	...	...	...			
XVII.	Ballater .....	1.30	...	.21	9	14	55	22	20	28	9			
"	Aberdeen .....	1.44	...	.47	9	17	54.4	21	28.7	**27	3			
XVIII.	Inverness (Culloden) .....	1.81	...	.43	8	10	51.6	22	29.3	28	4			
"	Fort William .....	9.08	...	.90	1	21	54.5	18	25.5	27	6			
"	Portree .....	8.78	—1.45	1.26	10	17	51.8	15	26	27	4			
"	Loch Broom .....	4.74	...	.46	9	21	...	...	...	...	...			
XIX.	Helmsdale .....	3.09	...	.35	25	19	...	...	...	...	...			
"	Sandwick .....	4.03	+1.55	.41	9	21	...	...	...	...	...			
XX.	Cork .....	2.59	...	.43	5	19	...	...	...	...	...			
"	Waterford .....	2.93	+ .90	.47	27	20	...	...	...	...	...			
"	Killaloe .....	5.21	+2.31	1.03	7	18	55	20	29	3	1			
XXI.	Portarlington .....	2.97	+ .94	.49	28	23	...	...	...	...	...			
"	Monkstown .....	2.14	+ .50	.39	25	19	58.4	1	33	6	0			
XXII.	Galway .....	4.98	...	.64	10	23	...	...	...	...	...			
"	Bunninadden (Doo Castle) ...	4.42	...	...	...	...	52	1	29	17	1			
XXIII.	Bawnboy (Owendoon) .....	4.08	...	.70	5	24	...	...	...	...	...			
"	Waringstown .....	2.02	...	.40	5	17	55.5	21	25	26	6			
"	Strabane (Leckpatrick) .....	3.27	...	.61	7	17	53	¶19	27	27	8			

\* And 20th. † And 20th. ‡ And 20th. § And 21st. || And 9th &amp; 13th. ¶ To 22nd. \*\* And 28th.

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

# METEOROLOGICAL NOTES ON THE MONTH.

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.

## ENGLAND.

LINTON PARK.—A very mild month; only five slight frosty mornings; often dull and foggy, with hazy R, no heavy downpour. Bar. fluctuated much in the first week, afterwards it was generally high. Winds mostly S.S.W. and W., but opposite changes from these did not always affect either the bar. or the weather. L faintly seen on the 17th. The continuance of mild weather is pushing on vegetation, and the birds are singing as in early spring.

SELBORNE.—Aurora on 8th and 13th. Fog on 1st, 17th, 18th, and 19th. Boisterous winds from 5th to 8th. Prevailing winds S.W. Thrush first heard on 1st. Little S on 26th.

BANBURY.—High winds on 6th, 7th, and 8th. Bar. at 7.30 a.m. on 6th 28.390 at 32°. Hazel blooming in the middle of the month; whitethorn beginning to bud about the 17th. Fog on 18th, 19th, and 20th.

WISBECH.—Bar. 28.728 in. on 6th; gale 15lbs. on square foot. Lunar halo on 14th. Solar halo on 27th. White frosts on 27th and 28th, the coldest days in the month, which, for February, was unusually mild, the mean temp. being 44°.6. Fog on 18th and 19th.

CULFORD.—Altogether a very favourable month, mean temp. being 44°.2. Windy from 5th to 8th. Bar. very low on 6th.

CALNE.—Violent gale on 5th, with R and L in evening. Gale with L on the evening of 8th, after raining all day. Snow all night of 27th, melting as it fell. Daffodil in bloom on 25th, and leaves showing on quickset hedge.

HIGHFIELD, SHREWSBURY.—Bar. on 6th 28.68 in.

ORLETON.—The month generally damp, cloudy, and warm, with frequent falls of R, but not in large quantities. The mean temp. about 5° above the average. On the 26th the wind changed northward, and the following two days were cold, with a slight fall of S on the 28th. Distant T on 5th after 1 p.m., and frequent L on the night of the 8th, in S.W. The Teme and Severn flooded on the 9th and 10th from heavy R in Wales. Gale on 6th, with very low bar. Fog on 18th and 19th.

WIGSON GRANGE.—The temp. of this month has been unusually high, the mean being 5° higher than the mean of this month for the last 12 years, the mean max. being 50° and the mean min. 37°.

DERBY.—A warm agreeable month, unusually so for February. Vegetation active, but with a N. wind, and bar. at 30.41, a return of frost must be looked for.

ARNCLIFFE.—The early part of the month exceedingly wet. On the 8th the highest flood in the river for many years. The latter part of the month dry and fine.

NORTH SHIELDS.—Aurora on the 8th and 17th. Lunar halo on 13th and 16th. S on 6th. H on 27th. Fog on 9th, 14th, and 15th.

SEATHWAITE.—A month of high temp. and great humidity.

## WALES.

ABERCARN.—The early part of the month was rainy and stormy. After the 11th the temp. became milder, and it was generally calm and fine until the 26th, when it became much colder. TS on night of the 8th. Fog on 17th and 18th.

HAVERFORDWEST.—A generally damp and mild month. No high winds, the prevailing characteristics being fog and mist. No frost till the last night.

CEFNFAES.—The weather during the month has been generally open and damp.

## SCOTLAND.

DUMFRIES.—The first 11 days were wet and stormy, with S on 6th, 7th, and 11th. From 12th to 25th mild and calm, with little R. On 26th frost set in very severe. Near the close of the month whins were in bloom, the honeysuckle in leaf, and buds bursting on hedgerows and fruit trees.

**SILVERBUT HALL, HAWICK.**—February, 1867, will long be remembered for its mildness. Heavy S showers on the 10th, but no frost of any consequence till the 23rd, when the ther. registered 24°, and 22° on the 24th. Gardening and husbandry operations are in a pretty forward state, but the buds of many of the trees are suffering for their incautiousness in expanding so freely at the beginning of the month.

**AUCHENDRANE.**—February has been a month of fine weather for all seasonable out-door work and rural sports.

**OTTER HOUSE.**—A comparatively mild month. Rainy till the 13th, then seven days of dry weather, afterwards light rain to the end of the month. T and L on 2nd, aurora on 9th.

**NOOKTON.**—S showers on the 8th. Gales on 1st and 25th, and frequent high winds during the month. 26th, 27th, and 28th fine, but cold.

**DEANSTON.**—2 in. of S on 6th. S. W. gale on 2nd.

**LOGIERAIT.**—The finest February on record. No S throughout the month. Keen frost on the last three nights. Spring work advancing rapidly.

**BALLATER.**—A fine month throughout, particularly from the 11th to the close. Vegetation was advancing very rapidly, but received a severe check in the last three days, the temp. falling to 29°, 22°, and 20°. The lark and other birds were singing on the 20th. The R fall is 1·07 below the average of the last 5 years, although in 1863 only 0·51 was measured. It also was a remarkably fine month, and gardening operations were commenced on the 18th, the same day as this season. Lunar halo on 21st. L in E. on 2nd.

**ABERDEEN.**—Aurora on 4th, 5th, 8th, 12th, and 13th. L H on 9th and 21st. S on 8 days, but would not amount to 2 in. altogether. Bar. on 6th 28·34 in. but no gale here; the month was remarkable for high mean temp. dryness, great range of bar., and rather light winds from S., S. W., and W., more frequently than usual.

**CULLODEN.**—L on 2nd and 3rd. S or sleet on 10 days; high wind on 10th and 24th; frequent night showers.

**ROSSE PARSONAGE, FORT WILLIAM.**—With the exception of two mild days (the 9th and 15th) February was wet and boisterous up to the 25th; after then it was clear and frosty. No snow except a very little on the 6th. Strong wind from S. W. on 1st, 2nd, 3rd, 9th, and 24th.

**LOCHBROOM.**—This month has certainly commenced with an adder's head, and I may say has ended with a scorpion's tail, for its extremes were as rough, stormy, and disagreeable as can well be conceived, while its centre, from the 13th to the 21st, was as beautiful for the season as could well be imagined. It has one peculiarity—while many of its days were passable, the nights broke out in the most terrific manner, but its last day being very fine, it is to be hoped that the seed-time will be favorable. T S on 10th.

**SANDWICK.**—February has been wetter and milder than the average. L on the 1st, T S on 2nd, T on 22nd and 24th, gales on 2nd and 3rd, blowing 966 miles in 24 hours; from 6th to 7th blowing 50 miles per hour; and one on 24th and 25th, blowing 60 miles per hour. Aurora on three nights.

#### IRELAND.

**MONKSTOWN.**—At noon on the 6th, a severe T S with the exception of one or two days, the temp. was pretty uniform, until the 26th, when it became colder, and the mountains were again covered with snow, some of the higher ones appearing to be thickly coated. Bar. varied considerably during the month; max. 30·466 in. on 23rd, while on the 6th it was only 28·738 in.; a fall of 0·834 took place on the 3rd, but was not (at least here) attended by such severe consequences as might have been anticipated from so rapid a fall.

**DOO CASTLE.**—Very wet month; ground completely saturated, and little progress has been made in farming operations. A fierce storm on the night of the 9th.

**OWENDOWN.**—Wet for the first 11 days, then fine to the 25th.

**WARINGSTOWN.**—The early part of the month wet and unfavorable for labor, but the last fortnight was fine, dry, and seasonable. The spring is more forward than the late severe weather would have led one to expect.

**LECKPATRICK.**—Warmest February since 1863, in which the mean temp. was nearly the same. Vegetation very forward, and prospect of good early seed-time.



# RAINFALL AT CASTLETON MOOR, MANCHESTER.

Lat. 53° 35' 20" N. Long. 2° 10' 31" W. 475 ft. above Mean Sea Level.  
FOR THE YEAR 1866.

Height above ground	1 foot.		5 feet.		10 feet.*		20 feet.	
	5 in.	8 in.	5 in.	8 in.	5 in.	8 in.	5 in.	8 in.
<i>Diameter</i> .....	in.	in.	in.	in.	in.	in.	in.	in.
January.....	5·017	5·154	4·765	4·937	5·032	4·607	4·323	4·452
February .....	4·839	4·847	4·643	4·731	4·820	4·448	4·349	4·400
March .....	2·103	2·064	1·791	1·785	1·770	1·688	1·570	1·615
April .....	1·077	1·047	1·023	·954	1·008	·956	·929	·955
May .....	1·973	1·926	1·875	1·855	1·907	1·824	1·778	1·782
June .....	5·938	5·815	5·702	5·570	5·715	5·579	5·424	5·561
July .....	3·961	3·890	3·919	3·872	3·874	3·839	3·810	3·840
August .....	5·242	5·109	4·949	4·898	4·954	4·865	4·648	4·767
September.....	8·598	8·575	8·193	8·406	8·421	8·076	7·723	7·854
October.....	3·128	3·061	2·892	2·960	2·992	2·903	2·666	2·777
November.....	6·832	6·781	6·384	6·554	6·553	6·395	6·014	5·990
December .....	5·592	5·521	5·240	5·351	5·539	5·103	4·813	4·842
Totals ... ..	54·300	53·790	51·376	51·873	52·585	50·283	48·047	48·835

J. CHADWICK BATES.

We are sure our readers will learn with regret that the non-arrival of the tables epitomized above was caused by serious and fatal illness in Mr. Bates's family. The returns for the last year harmonize perfectly with the results of previous years, as shown in the following abstract from *British Rainfall*, 1866, page 26, the values for 1866 being now added.

*Relative Rainfall at different heights, as deduced from Castleton Observations.*

Gauges 8 inches diameter.				Gauges 5 inches diameter.			
Height.	1864.	1865.	1866.	Height.	1864.	1865.	1866.
1 foot.....	1·00	1·00	1·00	1 foot.....	1·00	1·00	1·00
5 feet.....	·97	·95	·96	5 feet.....	·95	·93	·95
20 feet.....	·90	·90	·91	20 feet.....	·90	·87	·89

These observations also enable us further to examine the relative indications of gauges 5 inches and 8 inches in diameter. Completing the table on page 29 of *British Rainfall*, 1866, we have the following results :—

Year.	1 ft. above ground.		5 ft. above ground.		20 ft. above ground.	
	5 inch.	8 inch.	5 inch.	8 inch.	5 inch	8 inch.
1864.	1·00	1·01	1·00	1·03	1·00	1·01
1865.	1·00	1·00	1·00	1·02	1·00	1·03
1866.	1·00	·99	1·00	1·01	1·00	1·02
Mean..	1·00	1·00	1·00	1·02	1·00	1·02

It is almost needless to point out that the observations during 1866 confirm in almost every respect the inferences and deductions from those of the preceding years, thus proving at once the accuracy of the observations, and the reliability of the deductions.

\* From some cause (at present unknown) this gauge has evidently collected about 5 per cent. too much.

## SUPPLEMENTARY LIST OF RETURNS OF RAINFALL IN 1866.

Division.	COUNTY.	STATION.	OBSERVER.	Rain Gauge.			Depth of Rain 1866.	Days on which 91 or more fell.
				Diameter.	Height above grnd.	Height above sea l.		
II.	Surrey .....	Kingston (Fairfield) .....	Mr. T. Chalk .....	in.	ft.	in.	feet.	inches
				5	0	6	...	23·87
		Cobham Lodge .....	Miss Molesworth ..	5	0	6	100	26·80
	Kent .....	Staplehurst (East Sutton) ..	Mr. T. Skinner ...	8	0	8	...	32·93
	Sussex .....	Lynch [Midhurst] .....	J. Eames, Esq. ...	5	0	6	160	43·85
IV.	Norfolk ...	Yarmouth, Filby .....	Mr. Crisp .....	5	2	4	18	27·69
		East Dereham .....	G. H. Cooper, Esq.	8	3	0	...	30·39
V.	Devon .....	Exeter (Brampford Speke) ..	W. H. Gamlen, Esq.	8	...	...	...	37·22
VI.	Gloucester..	Bristol (Brislington) .....	G. Thomas, Esq. ...	18	5	3	...	38·13
		Stroud .....	J. Bateman, Esq. ...	...	1	0	240	35·43
	Stafford ...	Wolverham't'n (Patshull) ..	Rev. B. S. Malden ..	8	1	6	400	23·94
		Stoke-on-Trent (Stanley) ..	J. S. Forbes, Esq. ...	5	3	1	550	34·10
		" " " (Etruria) ..	" " "	5	4	2	440	36·17
		Leek (Rudyard) .....	" " "	5	12	7	500	37·86
		Knypersley [Congleton] ..	" " "	5	14	0	500	32·01
		Wincle [Macclesfield] .....	" " "	5	5	0	500	39·18
	Worcester..	Worcester (Gas Works) ..	N. Gosling, Esq. ...	10	4	1	...	25·87
VII.	Leicester ..	Thornton Reservoir .....	J. Bevins, Esq. ...	...	2	8	420	27·65
		Loughboro' (Cedar Cot.) ..	J. Gills, Esq. ....	5	0	9	400	32·22
	Lincoln ...	Brigg (Ferriby Sluice) ...	Rev. J. E. Cross ...	...	0	9	20	25·53
	Derby .....	Morley .....	Rev. S. Fox .....	5	3	0	406	33·25
VIII.	Lancashire.	Cartmel (Allithwaite) ...	W. R. Nash, Esq. ...	...	1	0	88	46·95
IX.	Yorkshire..	Outershaw .....	<i>Preston Guardian</i> ..	...	...	...	...	91·73
		Mirfield (Calder Farm) ..	Mr. J. Johnson ...	8	0	5	320	34·07
		Redcar (Upleatham) .....	M. Gray, Esq. ....	3	0	4	330	28·00
XI.	Monmouth.	Abergavenny .....	Dr. McCullough ...	5	1	3	...	38·61

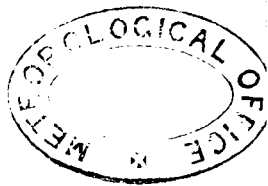
## NOTES ON BRITISH RAINFALL, 1866.

DIAGRAM.—It has been suggested that Bideford is placed too high in the list, where it stands as 56, the depth returned from Buckish. Northam is said to be the true representative of Bideford, and it only returned 41 inches—less than any station on the west of Devon or Cornwall.

On page 85 Clapham is entered as having 177 days with rain ; it should have been 187.

On page 104, for "Festiniog (Blaenyddob)," read "Blaenyddol."

On page 116, for "Howard, N. T., Esq.," read "Howard, W. D., Esq."



# SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

XV.

APRIL, 1867.

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

## THE MEASUREMENT OF SNOW.

THE frequency of snow showers during the past month, has again called into prominence the best method of measuring it. In *British Rainfall*, 1864, page 12, the following rules were given :—

“ In snow, three methods may be adopted ; it is well to try them all. (1) Melt what is caught in the funnel, and measure that as rain. (2.) Select a place where the snow has not drifted, invert the funnel and turning it round, lift and melt what is enclosed. (3) Measure with a rule the average depth of snow, and take a twelfth as the equivalent of water. (Comparative observations of this class will be very acceptable.)”

In the *Rainfall Circular*, for March, 1865, reprinted on page vii. of the Appendix to *British Rainfall*, 1865, Mr. Harrison, of Weybridge Heath, asked for the results of any direct experiments in confirmation, or otherwise, of the third rule given above. All the observations available were, therefore, thrown into a table. With one exceptional case of 35 inches, almost every equivalent was obtained from 25 to 1, down to 5 to 1, the mean result being 14 inches of snow = 1 inch of rain, the conclusion adopted being that less than 12 to 1 should not be taken. Subsequently several communications were received, suggesting that 12 to 1 was too high, but not containing observations in support thereof. Adverting to these and other remarks, the following suggestions were offered :—

“ A second point is, to take the snow fairly *as it falls*, not to fill a vessel with the snow ; obviously by so doing the snow is rendered more dense. The proper plan, I presume, is—previous to snow, lay down a piece of tin or board in an open place ; after the fall, measure its vertical depth in two or three parts of the board ; then invert the funnel of the rain gauge on the board, taking care to hold it horizontal, press it down firmly till it touches the board, brush away the snow from the rest of the board, turn over funnel and board together, and, leaving the funnel covered by the board, place the funnel in its bottle, or other similar receptacle, and in a moderately warm room.”

Some additional observations from different parts of the country in 1865 gave a mean 11·5 inches of snow equals 1 of rain. The following letters also seem to indicate about the same value :—

SIR,—I am fairly snowed up here, with an average of about 12½ in. deep of snow, so have amused myself by comparing the depth of snow with the rainfall. As the results may be interesting, I send them to you, leaving it to you to make any use of them you please. First as to the gauges—

Casella's 5 in., after the snow in it was melted, measured ..... 155 inch.

Glashier's 8 inch ditto..... 32 ..

The average depth of snow round the gauge, I calculate would

make the fall ..... 97 ..

From the above I expect you will get some rather serious discrepancies in the

January rainfall. Next as to the depth of snow compared with the rain. On this five experiments were carefully made, the snow taken from different places—

11½ inches of snow gave	.97 of rain.
12    "            "	1.12    "
7½    "            "	.78    "
7½    "            "	.71    "
10    "            "	1.17    "

These vary for 100 inches of snow from 8.25 to 11.7 of rain. The mean of the five experiments, 9.74 per cent.—I am, dear Sir, yours truly,

Pyports, Cobham, Surrey,

GEO. DINES.

January 2nd, 1867.

P.S. Since writing the above, I have tried 8 other pieces of snow, equal to 68 inches deep. This gave 5.82 inches, or 8.55 inches of water for 100 inches of snow, so that altogether 1 of rain for 11 of snow appears to be about the average.

SIR,—The phenomena of to-day have suggested to me some observations as to the measurement of snow, referred to in your *British Rainfall* 1865.

In the important snowfall we had on 10th January, 1866, I have registered the amount ascertained by actual liquefaction, which I quite see is subject to error, not only from the possibility of the funnel not retaining the whole of the snow, but also from evaporation during liquefaction. Still I cannot feel satisfied with the equivalents suggested, viz. "1 to 12," or "1 to 5.4;" neither can I quite agree with you in your remark that in ascertaining the quantity of rain by measurement of depth of snowfall, "the ratio depends entirely on the density." An illustration of this has occurred to-day; I have on two or three occasions this day measured the depth of snow immediately adjacent to three selected spots. The diminution of depth I hardly think can be accounted for either by evaporation, increased density, or superincumbent pressure, or by these forces combined.

Notwithstanding that the thermometer has continued considerably below freezing point ever since the snow fell, and that the ground was hard when it commenced falling, yet, at the bottom of the snow, the surface of the earth is now soft from the radiation of caloric from a greater depth, and *moist*. Whence does this moisture arise? I infer that it is occasioned from the gradual liquefaction of the *under* surface of the snow, which from being incalculable must necessarily derange estimates formed by measurement of snowfall.—I am, dear Sir, yours truly,

WALTER F. MOATES.

The Pines, Epsom, 2nd January, 1867.

SIR,—In order to ascertain how much water a given quantity of snow yielded, when melted, I made six experiments. I filled a cubic inch measure (made of brass, and which contains one cubic inch of distilled water at 60°) with *newly-fallen snow*, and allowed it to melt at the temperature of the room, 57°. The result of *five* of these trials was, that 1 cub. in of snow =  $\frac{1}{1\frac{1}{2}}$  of water, the sixth trial gave 1 cub. in snow =  $\frac{1}{2}$  of water. The result of five experiments, therefore, corroborates your rule given, page vii. *Rainfall Circular*. In these experiments the snow was taken from a different place for every experiment, and carefully put into the measure.—I am, truly yours,

JAMES PROCTOR.

Barry Village, Forfar, N.B., 26th January, 1867.

The results are therefore—

Table published in 1865.....	14	inches of snow = 1 of rain.
Observations made in 1866 ...	11½	"    "    = 1    "
"                                    1867 ...	11½	"    "    = 1    "
Mean .....	12.33	"    "    = 1    "

These values, however, agree *too well*; for instance, the snow which fell on January 10th and 11th, 1866, was so dense that 4 inches of it gave 1 inch of rain. (*Approximately*, we have no really good determination.) A few such observations would, of course, materially alter the equivalent,

It is hardly the time of year to ask for additional determinations of the relative yield of freshly fallen snow, but we trust observers will remember when winter returns that there is very much to be done in the matter.

### THE ECLIPSE ON MARCH 6TH, 1867.

ALTHOUGH the late eclipse was not in England of great magnitude, it was sufficiently so to be worthy of notice. As a preliminary we may quote the depression of temperature on some former occasions.

Year	Date.	Place.	Shade.	Black Bulb.	Year	Date.	Place.	Shade.	Black Bulb.
1764	April 1 ...	London .....	1°0	...	1860	July 18..	London ...	7°0	30°
1816	Nov. 19 ...	" .....	1°0	...	"	" "	Oundle ...	6°0	...
1820	Sept. 7 ...	" .....	6°0	...	"	" "	Dorset ...	3°0	22
1836	May 15 ...	Cambridge ...	2°5	29°	"	" "	Silloth ....	2°8	10
1842	July 8 ...	Gloucester ...	3°0	...	1863	May 17..	London ...	1°0	7
"	" "	London .....	1°5	...	1867	March 6.	" .....	1°5	13
1858	March 15.	" .....	5°0	...	"	" "	Leicester...	1°0	...
"	" "	Oundle .....	4°0	12	"	" "	Liverpool..	1°0	17

It would be very interesting to examine the many existing records (of which the above are not a hundredth), and by collating them, eliminating as far as possible fluctuations not due to the eclipses, but to ordinary atmospheric changes, and moreover in every instance allowing for diurnal range of temperature, and then classifying the records according to the number of solar digits eclipsed. Thus the existing materials might be made to tell their own tale, and one, if we mistake not, of high interest to all.

Explanatory of the following table, we may mention that the 20 ft. thermometers are in an ordinary stand, elevated on a pole 20 ft. high.

#### *Thermometrical Readings at Camden Town, March 6th, 1867.*

Eclipse began, 8.17 ; middle, 9.32 ; ended, 10.52. Magnitude (Sun, =1.0.), 0.7.

TIME.	4 feet.				20 feet.		4 feet.	20 feet.
	In Shade.		In Sun.		In Shade.		Humi-	Humi-
	Dry Bulb.	Wet Bulb.	Black Glass Bulb	Black Bulb in vacuo.	Dry Bulb.	Wet Bulb.	dity.	dity.
A.M.	in.	in.	in.	in.	in.	in.		
8.0	35.0	32.8	...	...	34.8	32.4	79	77
8.15	35.4	33.4	37.0	39.0	35.4	33.2	81	79
8.30	36.1	34.1	37.8	40.2	35.8	33.5	82	79
8.45	36.8	34.7	38.2	43.5	36.4	34.1	83	80
9.0	36.5	34.5	37.3	40.6	36.3	34.0	83	80
9.15	36.3	34.6	37.0	39.4	36.0	34.0	85	82
9.30	36.2	34.5	37.0	37.7	36.0	34.0	85	82
9.45	36.3	34.6	37.0	38.0	36.0	34.0	85	82
10.0	36.5	34.7	37.1	38.4	36.2	34.2	85	83
10.15	36.8	35.0	37.8	39.5	36.4	34.3	85	82
10.30	37.0	35.2	38.0	40.3	36.5	34.6	85	84
10.45	37.1	35.4	38.0	41.0	36.5	34.7	86	85
11.0	38.6	36.8	40.8	55.4	37.5	35.6	86	84

10.16 began to snow. 11.0 sun and snow.

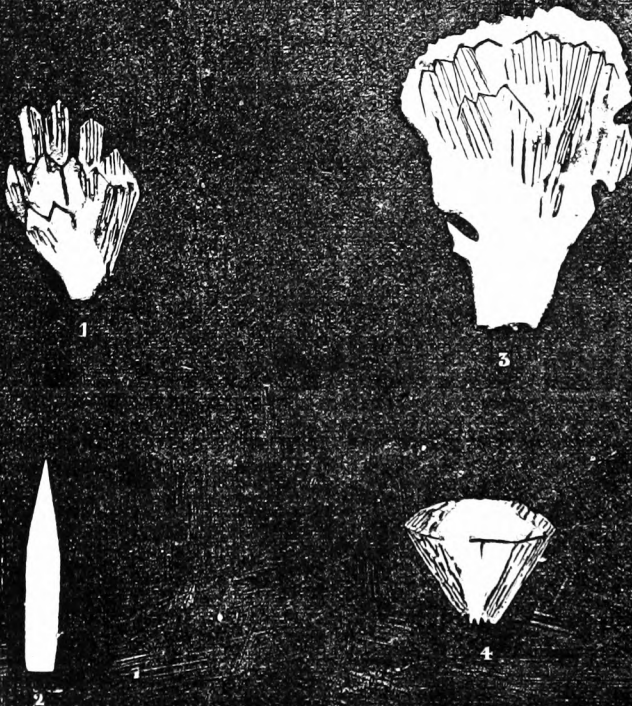
## PERIODIC (?) HAIL-BALLS ON MARCH 8TH.

Snow and hail have been so strongly the predominant feature of this month, that the query must remain attached to the above heading for another year. Although in London we had several showers of the soft hail-balls previously referred to\*, they were diminutive specimens, very slightly larger than ordinary sleet. The largest that we saw were less than a quarter of an inch in diameter. Although, therefore, they were of the same form as in previous years, and fell on the same day, they fell also on other days, and were in no respect remarkable.

For the convenience of future recognition, we give engravings of the balls which fell in 1857, from a photograph by Mr. Glaisher, (figures 1 and 3); also (fig. 4) those of 1817, copied from Luke Howard's "Climate of London;" and a single spike, reduced (fig. 2) from Mr. Rowell's sketches of hailstones picked up after the Calne hurricane in 1859. Without running into desultory comments, we may point out that the angles in each case closely approach  $60^\circ$ , *i.e.* that of the ordinary crystallization of water; secondly, that even the small balls of the present year generally broke at that angle; lastly, that Mr. Rowell's outline is quoted, in case it may be considered to throw light on how the balls are built up.

---

\* *Met. Mag.*, Vol. I. p. 17—18.



*To the Editor of the Meteorological Magazine.*

SIR,—On the 8th inst. at about 4—5 p.m., a slight shower of soft hail fell here, only lasting a few minutes, the balls were about  $\frac{1}{8}$  in. in diameter.

I remain, yours truly,  
Woodland Mount, Nortonthorpe, near Huddersfield.  
March 12th, 1866. A. M. BOX.

SIR,—Since my last communication on the 6th, I have been carefully watching for any further fall of “soft hail,” but none has fallen here except on the afternoon of the 7th, on which I made the following note :—

March 7th, at 1 p.m. a fall of “soft hail” or “miniature snowballs” occurred. of much less duration than yesterday’s fall ; the “balls,” too, were smaller and by no means so compact as those of the 6th. They gave me, and one or two others whose attention I called to it, the idea of one or two snowflakes bound together to form miniature snowballs. The wet and dry bulb were both at 33° F. ; at about 2.30 a dense fall of ordinary snow took place, which lasted for some little time.—I remain, yours sincerely,

ROWLAND HILL FAWCETT.  
Staff College, Farnboro’ Station, March 12th, 1867.

SIR,—On the evening of the 11th inst. we had a fall of large half-liquid flakes of snow, much resembling the “natural snowballs” noticed by you in former years. The quantity in my gauge on the morning of the 12th was 0.49 in. On the 8th itself, no snow or rain fell here, but on the evening of the 9th, and through the night there was rain to the quantity of 0.44 in. The rain did not begin till dark, and I did not go out afterwards, but from the sound on the roof of a conservatory, I should think it very likely to have been something more solid than rain,—Yours truly,

Trowbridge, March 14th, 1867. W. J. MANN.

P.S.—In 1866 we had no snow or rain on the 6th, 7th, 8th, 9th, or 10th of March.

SIR,—On the 6th, 7th, and 8th, I watched for the periodic (?) snow balls with some interest, and send you the following notes from my journal :—

March 6th.—Cloudless till the end of the eclipse—11.20 a.m. : small half-melted flakes of snow fell—12 : small balls or pellets fell, and some few crystals. This continued till 4 p.m., but very few balls fell after 12.10 p.m.—9 p.m. to 11 p.m. : snow flakes at intervals.

March 7th.—6 a.m. to 10 a.m. : snow falling fast in flakes, which fall to pieces when received upon the arm ; these pieces were found to be 5 and 6 rayed crystals—12 to 3 p.m. : snow fell heavily—3.10 p.m. : snow balls  $\frac{1}{8}$  size of pea, fell in a heavy shower, and were followed by a storm of dense flakes till 6 p.m.—9 p.m. : snow flakes falling fast, composed of small crystals.

March 8th—9 a.m. : crystals fell—12 : crystals and balls—3.35 p.m. : crystals and grains—4 p.m. : ditto—5 p.m. : ditto,—I am, Sir, your obedient servant,  
King Cross, Halifax, JOSEPH GLEDHILL, F.G.S., F.M.S.

March 19th, 1867.

P.S.—Snow balls also fell at 10.30 a.m. on 12th, and at 6 p.m. on 17th.

## RADIATION TEMPERATURES.

*To the Editor of the Meteorological Magazine.*

SIR,—On the mornings of Feb. 26th & 28th, I noticed what I do not remember having seen before at this time of the year, that the min. temp on the grass for the previous 24 hours had not been so low as at the height of the 4 feet—e. g. :—

26th	At 4 feet—Min. temp.	39°·75.	
„	On Grass— „ „	41°·00.	Excess 1·25.
28th	At 4 feet— „ „	36°·00.	
„	On Grass— „ „	38°·00.	Excess 2·00.

Probably you, or some of your readers could explain the cause of this.

I observe in the last No. of the *Meteorological Magazine* that the min. temp. at some places, is entered as having occurred on the 4th, and others on the 5th; these may possibly be meant for the same time, but some observers may enter it to the day on which they register it, and others to the one previous. Would it not be well in this case, as with the rainfall, to count up to 9 a.m. on each day as belonging to the previous one?

ARTHUR PIM.

[We can hardly reply to the first question more appropriately than by the following extract from "Observations in Meteorology," by the Rev. Leonard Jenyns, M.A. :—

"But there is a phenomenon relating to terrestrial radiation at night, occurring in certain states of the weather, which is still more remarkable; and that is, that occasionally the radiating thermometer, instead of merely rising under the influence of a cloudy sky to the temperature of the air, will be found *higher* than that temperature. This anomalous circumstance, as at first it appears, seems to be the effect of the sudden increase of temperature in the night beyond what prevailed the day previous; such as not unfrequently takes place in winter, on the change from frost to thaw, as also in spring and autumn, but never that I noticed in summer, the nights being hardly ever hotter than the days at that season. This increase of temperature is due to the wind shifting from some point more or less northerly to W. or S.W., and bringing up, not only currents of warmer air, often at a greater elevation than those nearest the earth, but *clouds charged with warm vapours*, which radiate their heat downwards, and thus cause a rise in the radiating thermometer. The rise of the thermometer which marks the temperature of the air is more gradual, the air being only mediately affected through conduction from the earth, with which it is in contact. The following instances in which this occurrence took place are extracted from my Meteorological Register :—

"1848, February 5th.—Radiating ther. last night  $3^{\circ}$  higher than the other. Mild and generally clouded throughout yesterday: temp. at 10 p.m.  $48^{\circ}$ ; at 10 a.m. this morning risen to  $53^{\circ}5$ .

"1848, February 9th.—Radiating ther. last night  $1^{\circ}5$  higher than the other. Yesterday mild, and fine till towards evening; wind then veering to S.W., bringing up clouds and rain. Temp. at 10 p.m.  $46^{\circ}$ ; at 10 a.m. this morning risen to  $49^{\circ}$ .

"1848, October 3rd.—Radiating ther. last night  $4^{\circ}$  higher than the other. Mild and fine yesterday, but clouding over in p.m., with rain at night. Temp. at 10 p.m.  $57^{\circ}$ ; at 10 a.m. this morning risen to  $60^{\circ}5$ .

"1849, January 19th.—Radiating ther. last night  $1^{\circ}$  higher than the other. Very fine and mild both yesterday and to-day, but the temp. of to-day rather higher. Ther. at 10 p.m.  $49^{\circ}$ ; this morning at 10 a.m.  $50^{\circ}$ .

"1849, February 2nd.—Radiating ther. last night  $3^{\circ}$  higher than the other. Fine and frosty yesterday morning, with the wind N.W.; towards evening wind shifting to S.W., sky at the same time becoming thick and misty, followed by rain. Ther. at 10 p.m.  $39^{\circ}$ ; at 10 this morning risen to  $44^{\circ}5$ . Much milder all day than yesterday.

"1849, March 1st.—Radiating ther. last night  $1^{\circ}$  higher than the other. Weather yesterday very stormy, with rain and snow in p.m. Temp. at 10 p.m.  $31^{\circ}5$ ; at 10 this morning risen to  $38^{\circ}5$ .

"It will be seen that in all the above cases the weather the next morning was warmer than on the evening previous, the increase of temperature amounting in the last instance to  $7^{\circ}$ , though this was not the one in which the difference between the two thermometers was greatest. Mr. Glaisher, in like manner, found that during cloudy nights a ther. with the bulb placed in the focus of a metallic parabolic reflector, fully exposed to the sky, was frequently higher than a ther. 4 ft. from the ground, and protected from the effect of radiation.—*Phil. Trans.*, 1847, p. 193."

With respect to the second query we must give an emphatic negative. The cases of rain and temperature are not strictly parallel, the former falls pretty equally at all hours, (at least so far as we know at present), the latter has regular hours of maximum and minimum, the minimum with which we are at present concerned, occurs probably 19 times out of 20, at or about the time of sunrise, therefore obviously the minimum read at 9 a.m. is the minimum of *that day*, while the maximum if then read belongs to the day before.]



## WIND AT LINTON PARK, STAPLEHURST, KENT.

*Number of Days on which the Wind was in the direction given below, the record being taken at noon each day.*

	WIND AND NO. OF DAYS.								Not ascertained.	RAIN.		Frosty Days.
	E.	S.E.	S.	S.W.	W.	N.W.	N.	N.E.		Total Quantity.	No. of Days	
1850	17	36	21	60	76	38	40	74	3	inches.		
1851	14	28	29	53	47	55	59	76	4			
1852	36	32	46	93	40	22	25	69	3			
1853	34	27	25	76	59	36	36	68	4			112
1854	32	17	29	100	62	41	36	47	1			122
1855	21	32	23	63	36	48	25	115	2	20·84	160	114
1856	14	44	34	99	29	42	28	72	4	27·79	169	89
1857	14	47	37	81	37	38	21	86	4	24·33	137	
1858	16	71	16	73	24	58	19	87	1	16·33	116	93
1859	8	53	21	125	11	59	9	78	1	29·55	151	93
1860	13	27	64	88	29	49	42	54		33·66	216	93
1861	12	28	66	110	34	21	45	47	2	24·01	158	85
1862	8	24	77	95	33	18	73	37		26·93	195	67
1863	12	31	82	118	29	25	36	31	1	22·75	169	64
1864	30	40	65	66	26	28	35	71	5	21·25	156	96
1865	28	45	59	74	36	29	35	55	4	35·18	172	80
1866	16	32	54	89	71	31	35	31	6	30·82	179	66
Average	19	36	44	86	40	38	35	65	2½			90

From the above table it will be seen that the prevailing winds last year were S., S.W., and W., these three points counting 214 days, and the W. and S. much above the average; it is possibly to this cause that the small number of frosty days is due, and in like manner the increased rainfall may be traced, as most of the rains we have are from that direction; occasionally, however, we have a down fall from an opposite direction, and when it is so, it is unusually heavy; our highest winds are generally from S.W., but the one doing the most damage the past year was from S.E., on 11th February; the driest wind we have is E. but they are few compared with those from N.E., which are usually dry also, but less parching to vegetation than due E.; a steady N.E. wind is usually a dry period, and the barometer keeps high; perhaps, however, the highest point this instrument attains is in a fog, when no trace of wind is perceptible, so that no positive rule can be laid down whereby we can judge of the future. Sudden changes of wind often bring rain, but not always so; for the longest dry period we had the past year without any rain was in the middle of July, when there were 20 days without rain, and during that time the wind was in all directions, and never more than two days in one. It is needless to say the N. and N.W. winds are the coldest, the E. and N.E. the driest, and that warmth and moisture usually proceed from the opposite quarters. I may observe, however, that there have been fewer high winds the past autumn than usual, and, as will be seen elsewhere, these months have been dry ones.

JOHN ROBSON.

*Sunshine and Showers: their Influence throughout Creation. A Compendium of Popular Meteorology.* By ANDREW STEINMETZ. Reeve and Co., xvi., 432 pages, Cloth 8vo.

TAKEN as a whole, the most pleasantly written, chatty book on Meteorology which has appeared,—a work, moreover, which will probably augment the yearly increasing number of persons who are patiently

chronicling their barometers and thermometers, in the hopes that some good must ultimately come of it, although perhaps at present, they feel the lack of a master-mind at the helm, to teach them and guide them aright. When this Newton of Meteorology is to arise, we know not; Mr. Steinmetz neither takes, nor aims at, any such position. He says:—

“My object has been to make the book entertaining as well as instructive; and it will be found replete with practical suggestions which may be useful to all classes of readers, whilst the leading topic—the curiosities of the weather, and weather wisdom—is, I trust, explained with a fullness never before attempted.”

This object has been fully attained, so far as we are able to judge—we say so far, because, all through the volume, proverbs and rules for judging the future, keep cropping up, and upon the reliability of these, we can express no opinion. Here is a group which will serve as a type of the whole.

“In low-lying lands, but with a good sunny aspect, a cold and windy May is a good prospect for the harvest; hence the special proverb:—

A cold May and windy  
Makes a full barn and findy.

“Much wet in May is worse than excessive drought; hence the proverb:—

A May flood,  
Never did good.

“If the last eight days of February, and the first twenty days of March are for the most part rainy, then the spring and summer quarters will be so too. It is said that a great drought always enters at that season.”

There are many useful hints as to the management and indications of several instruments, and two new ones are suggested and described, one of these, called a “vaporimeter,” seems by far the most convenient instrument yet introduced for measuring the amount of evaporation. We hope on a future occasion to notice it at length.

Almost the only faults in the work are evident oversights, but a trivial one jars if repeated, and Kaemtz (who, rightly enough, is constantly quoted) is after the first few pages, always spelled Kaemst; Connel is Coumel; Kew Observatory is Royal Kew Observatory; Buys Ballot is Buys Biot; and here and there something is omitted or stated twice over. But these are small errors, and do not materially detract from the unquestionable merits of the book.

Concerning the decrease of rainfall, noticed in certain districts, Mr. Steinmetz eloquently adopts the theory of Becquerel and G. P. Marsh as to the influence of clearing large forests.

“Rain clouds are attracted to certain localities more than others, and probably nature's conductors are the points of the leaves of all vegetation, particularly trees; and hence, to the cutting down of trees, we may trace their ultimate sterility—such as the present sterility of the once fertile, but now deserted and desolate, regions of Syria, Barbary, and Chaldæa. The Euphrates often menaced ancient Babylon with inundation, but at present, thanks to the clearance of the woods from the mountains of Armenia, the river is modestly confined to its banks. The ancient river Scamander, which was navigable at the commencement of the Christian era, has completely disappeared with the cedars of Mount Ida, where it took its rise. If trees do not prevent the drought of countries, their roots open the soil for the percolation of water, and they oppose the scattering of the sands of the seashore upon the plains, another cause of infertility.

## MARCH, 1867.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.				Days on which .01 or more fell.	TEMPERATURE.				No. of nights below 32°.
		Total Fall.	Difference from average 1860-5	Greatest Fall in 24 hours.			Max.		Min.		
				Dpth	Date.		Deg.	Date.	Deg.	Date.	
I.	Camden Town .....	inches 2.48	inches. + .40	.48	9	21	57.1	24	25	17	17
II.	Staplehurst (Linton Park) ...	3.42	+ .93	.62	10	23	62	24	21	8	23
III.	Selborne (The Wakes).....	3.10	+ .50	.68	13	17	53	31	20	++ 16	25
IV.	Hitchen .....	2.46	+ .29	.44	19	16	56	26	17	16	20
V.	Banbury .....	3.17	+ .97	.72	23	19	54	26	21	17	22
VI.	Wisbech .....	1.54	...	.39	19	14	59.6	27	24	16	12
VII.	Bury St. Edmunds (Culford).	1.47	— .73	.35	9	13	57	+24	17	16	16
VIII.	Calne .....	3.11	...	.76	23	...	62.5	26	21	16	17
IX.	Plymouth (Goodamoor) .....	...	...	...	...	...	...	...	...	...	...
X.	Barnstaple.....	3.21	+ .06	.76	12	19	...	...	...	...	...
XI.	Taunton (Fulland's School)	3.81	+1.35	.56	23	17	...	...	25.5	++1	18
XII.	Shrewsbury (Highfield) .....	2.70	+ .56	.42	23	22	...	...	16.5	21	...
XIII.	Tenbury (Orleton) .....	3.84	+1.42	.67	23	22	56	24	17.7	16	17
XIV.	Leicester (Wigston) .....	2.88	+ .77	.81	23	16	59	27	18	16	19
XV.	West Retford .....	...	...	...	...	...	...	...	...	...	...
XVI.	Derby.....	2.09	— .16	.60	23	17	55	24	24	17	18
XVII.	Manchester .....	1.44	—1.25	.30	23	15	58.5	24	20.6	17	15
XVIII.	York .....	1.44	— .55	.60	23	14	52.5	24	22	17	16
XIX.	Skipton (Arncliffe) ...	3.46	—1.35	.82	23	12	45	25	20	17	20
XX.	North Shields .....	1.69	— .66	.28	8	22	52.8	24	22.8	16	16
XXI.	Borrowdale (Seathwaite) .....	8.32	—5.08	2.53	26	11	...	...	...	...	...
XXII.	Abercarn .....	5.34	...	1.40	23	12	51	\$24	26	15	13
XXIII.	Haverfordwest .....	5.68	+2.23	1.91	23	13	55	25	25	3	23
XXIV.	Rhayader (Cefnfaes).....	4.03	+ .19	1.66	24	14	52	...	15	...	8
XXV.	Llanberis (R. Victoria Hotel)	4.94	...	1.69	23	8	...	...	...	...	...
XXVI.	Dumfries .....	1.72	—1.26	.72	23	9	51	25	19.5	17	16
XXVII.	Hawick (Silverbut Hall) ...	1.70	...	.30	23	16	...	...	17	20	20
XXVIII.	Ayr (Auchendrane House) ...	1.09	—2.64	.28	23	11	56	24	16	§§ 16	21
XXIX.	Otter House .....	2.00	—2.64	.66	24	8	53	4	23	16	13
XXX.	Leven (Nookton) .....	1.18	— .89	.32	9	16	56	24	22.4	27	17
XXXI.	Stirling (Deanston) .....	2.07	—1.46	.71	23	18	58	26	16.3	17	...
XXXII.	Logierait .....	2.61	...	1.22	23	11	...	...	...	...	...
XXXIII.	Ballater .....	5.54	...	1.49	23	23	54	3	1	17	24
XXXIV.	Aberdeen .....	2.29	...	.66	23	20	54.8	24	18.2	17	14
XXXV.	Inverness (Culloden) .....	.93	...	...	...	...	...	...	...	...	...
XXXVI.	Fort William .....	2.45	...	.56	29	11	52	25	17	21	16
XXXVII.	Portree .....	2.62	—6.41	.68	23	11	53.5	25	13.4	16	12
XXXVIII.	Loch Broom .....	2.53	...	.56	10*	13	...	...	...	...	...
XXXIX.	Helmsdale .....	2.73	...	.41	23+	16	...	...	...	...	...
XL.	Sandwick .....	2.08	—1.25	.53	23	15	...	...	6	16	...
XLI.	Cork .....	2.03	...	1.73	18	14	...	...	...	...	...
XLII.	Waterford .....	4.71	+1.82	.90	22	20	...	...	...	...	...
XLIII.	Killaloe .....	3.06	—1.26	.53	25	15	58	24	22	16	11
XLIV.	Portarlinton .....	3.02	— .29	.31	12	27	49.5	24	23	17	17
XLV.	Monkstown .....	5.07	+2.58	1.08	26	23	58.7	24	23	2	8
XLVI.	Galway .....	3.37	...	.90	18	17	58	2	25	16	8
XLVII.	Buninadden (Doo Castle) ...	2.70	...	.75	25	12	54	24	...	...	16
XLVIII.	Bawnboy (Owendoon) .....	3.93	...	.90	27	15	...	...	...	...	...
XLIX.	Waringstown .....	1.95	...	.45	23	16	54	*23	17	15	18
L.	Strabane (Leekpatrick) .....	2.27	...	.61	25	13	59	24	19	16	21

\* And 30th. † And 27th. ‡ And 25th. § And on 25th, 27th, &amp; 31st. || And 4th &amp; 30th.

\*\* And 26th. †† And 17th. ‡‡ And 17th &amp; 21st. §§ And 17th. ||| And 17th.

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

## METEOROLOGICAL NOTES ON THE MONTH.

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 Hall; S for Snow.

## ENGLAND.

CAMDEN TOWN.—TS on 30th. Frequent S showers during the month.

LINTON PARK.—The first five days dry, the rest a continuance of sleet, S or R, with very little sunshine, and fewer high winds than is usual in March. Very distinct T and L on evening of 30th. Prevailing winds E., N.E., and N.; 23 frosty nights, and altogether the most wintry March for many years.

SELBORNE.—Frequent S from 7th to 22nd, when the wind changed from N.E. (whence it had blown almost without interruption from the 1st) to S.W., with a dense fog and sudden rise of temp. Aurora on 26th. The temp. of the month lower than I have ever known it in March since I have kept a register. In the first three weeks the mean max. was 35°, mean min. 26°; mean max. for whole month 40°; mean min. 29°. From 29th to the end of the month violent and cutting winds from N.

HITCHEN.—Very frequent S between the 7th and 23rd.

BANBURY.—S on 13 days between the 6th and 22nd. Fog on 23rd, and higher floods on 24th than known for many years. Vegetation scarcely advanced since the end of last month. Bar. on 2nd (reduced), 30·83; mean temp. of month, 36°; mean of first three weeks, 33°·3. L on 9th.

WISBECH.—A wintry month. Lunar halo on 16th. Peach in bloom on 30th.

CULFORD.—March is generally expected to be a trying month in this part, from the prevalence of east winds, but the one just closed is supposed by the oldest inhabitants to be the roughest in their remembrance, and it maintained its character to the last, the max. on 31st being only 49°, and min. 24°. Mean, 37°·5.

TAUNTON.—Prevalence of E. and N.E. winds. Inundations very general, and higher than known for many years.

ORLETON.—The average temp. at 9 a.m., for the first 22 days was only 33°·9, and the ground was covered with S to a depth varying from three to six inches where not drifted. S fell on 6th and following days till the 14th; also on 17th, 18th, 19th, 21st, and 22nd, frequently accompanied by strong winds, which, on the 19th and 21st, rendered many of the roads impassable from S drifts till cut through. On 23rd a rapid thaw, which caused the greatest flood in the river Teme since 1852. The Severn was also greatly flooded. After the 22nd the weather was rainy and warm, but the temp. of the whole month was 4° below the average.

WIGSTON.—The total rainfall for January, February and March is nearly 2 in. above the average of the last 11 years. The temp. much below the average.

DERBY.—The month up to 23rd remarkably cold, with biting N.E. wind. The temp. on 16 nights far below freezing.

MANCHESTER.—H and T on 30th. Very cold month, and for the first three weeks continuance of cold N.E. winds.

ARNcliffe.—E. winds. A very heavy fall of S in the second week; the whole month wild and ungenial.

NORTH SHIELDS.—S on every day from the 6th to the 22nd except two—the 10th and 21st. Fog and solar halo on 25th.

SEATHWAITE.—Drought to the 24th, except a little S. Hard frost with strong E. winds during the first three weeks.

## WALES.

ABERCARN.—A very severe month, 20 inches of S having fallen in these parts. It snowed more or less for 11 days, and continuously for nearly 3 days. A most trying month for aged or weak persons. A great loss in sheep and lambs. Heavy and destructive floods at the latter part of the month from the melted S.

HAVERFORDWEST.—One of the most severe months of March on my record. Temp. uniformly low night and day to the 23rd, when a thaw commenced, accompanied by enormous quantities of R and terrible storms of wind. Air bleak and cold to the end, with the exception of the 28th and 31st, which were fine. The rainfall in this month should, in my judgment, be stated as more (say +·70)

than was actually registered, the S having fallen heavily on 8 days, and drifted in many places to the depth of 10 or 12 ft., but having been so dry that it blew out of the funnel during the violent winds.

**CEFNFAES.**—The weather during the whole month very inclement, and the storm of frost and S from the 1st to the 21st more severe than any recorded here since 1814. Great loss in sheep and lambs.

#### SCOTLAND.

**DUMFRIES.**—The weather very ungenial. Wind from N.E. to the 23rd. S or H on 11 days, but the fall not heavy except on the higher hills, which continued white till the 31st. Temp. below the average for February, and lowest for March for eight years. Vegetation much checked thereby. From the 23rd the weather milder, but R, and occasionally S, less or more nearly every day.

**SILVERBUT HALL.**—Old men of 70 are of opinion that this has been the coldest March ever felt by them. Farmers are loud in their lamentations over the scarcity of fodder, and gardeners moan over the death of their favourite plants.

**AUCHENDRANE HOUSE.**—Under the influence of Polar currents of air, this month was cold and dry, with a considerable amount of sunshine, and frequently chilly winds; after the 23rd the weather became mild, wet, and boisterous; there was a slight snow-storm on the 12th, which melted as it fell; none of the great snow-storms of the month reached this locality. The pools in the river were frequently covered with ice, and loose ice occasionally floated about on the streams, as in January. There were no inundations from rivers here, as in so many other places. There was ice from the 12th to the 22nd, when the game of curling was played on a loch near Kilmarnock, an event that is said never within memory to have happened at so advanced a period of the spring.

**OTTER HOUSE.**—T on 27th; cold, dry, and severe frost till the 23rd; afterwards R or S and H showers, with equinoctial gales, almost to the end; at the close of the month mild, birds singing, trees budding, and flowers blooming.

**LOGIERAIT.**—Month opened with severe frost to the 9th; then cold E. winds till the 20th; afterwards a heavy fall of S on the 22nd and 23rd; since then more mild and genial; distant T on 27th. Agricultural labour much retarded.

**BALLATER.**—A very stormy month after the first week, with occasional heavy falls of S. The railway blocked up on the 15th, and again on 22nd; the temp. continued low throughout, falling to 1° above zero on 17th and 21st, and below 10° on 13th, 14th, and 18th. The lower grounds were free from S by the end of the month, and agricultural operations resumed.

**ABERDEEN.**—The month has been one of cold, unseasonable weather, with bare frosts, and though S or sleet fell on 15 days, there never was sufficient depth to protect vegetation; the greatest depth at any one time was not more than 1½ or 2 inches. Mean temp. 36°·5. being 2°·6 below the ten years' mean. Frequent auroræ during the month.

**CULLODEN.**—Fog on 4th. Aurora on 7th, also L and some H. A few hailstones alone on the 8th. S nearly every day.

**ROSSE PARSONAGE, FORT WILLIAM.**—Here as elsewhere the early part of the month was very dry and bitterly cold, but we have had no S except a little sprinkle, which a high wind prevented getting into the gauge. The wind till the 21st was from E. and N.E., it then changed to S.E. and blew a gale; since that day it has been moist, and generally rather mild, with occasional sleet and S. on the hills. A luminous arch, very distinct and defined, spanned the heavens from E. to W. on the night of the 6th, the day of the solar eclipse.

**LOCHBROOM.**—This month had truly a peacock's head but an adder's tail. The beginning was beautiful; much labour was done, but about the 9th intense frost commenced, and continued until the 24th, which was a terribly showery day, but that week turned out the first sowing days of the season, which is a fortnight later than usual; the last three days again turned out as boisterous and sweeping as the tradition of the ancients ever made them.

**PORTREE.**—Very dry month; from the 25th of February to the 23rd of March only 0·14 in. of rain fell—a most unusual occurrence in this locality. A very cold month; frost on every day except the 2nd, 6th, 26th, 27th, and 28th; the last

week very stormy, with S, H, and strong, cold winds, very trying for the young lambs.

SANDWICK.—A very cold, dry month, both R and temp. below the average; a long continuance of snow-storms from the 10th to the 23rd. The min. temp. on grass, registered on the 17th and 18th (6°), lower than I ever recorded.

#### I R E L A N D.

KILLALOE.—A month of unusual severity here for March; great prevalence of violent and very cold N.E. winds, with frequent snow showers.

MONKSTOWN.—Aurora on the 7th and 28th.—A most severe month, the most so for many years. It commenced fine and frosty, but on the 7th the S again fell, and continued to do so at intervals till the 21st. On 22 days the wind was easterly, and frequently very wild. On the morning of the 16th the atmosphere was so clear that the mountains 60 miles distant, with their snow-capped peaks, were very distinctly seen, and in the evening the Dublin mountains, covered with S down to their bases, were beautifully depicted. This preceded as violent a storm as we have had here for a long time from S.E., and during which a small steamer was wrecked on our coast. Gales also on 21st and 23rd.

GALWAY.—Slight fall of S on 15th, and a heavy fall on 18th.

DOO CASTLE.—TS with H on 25th. One of the most severe months on record; a cold, strong wind, generally from the E., prevailed for three weeks, with frost every night from the 1st to 23rd; to complete the sad character of this blighting month, it closed with heavy R, which completely saturated the land. Very little attempted in the way of spring culture till the end of the month, and no grain to my knowledge sown in this locality to this date, 3rd April.

OWENDOON.—T on 23rd and 25th. H on 24th. Latter part of month very wet.

WARINGSTOWN.—Cold, parching easterly winds, accompanied by frost and occasional slight falls of S from 1st to 23rd, when the wind changed to S.E. with heavy R, and a week of fine though showery weather followed. The last two days intensely cold, with H showers.

LECKPATRICK.—From 1st to 21st constant E. winds, which changed on that day to S.E. Gale from S.E. on 23rd, ending in S. On 25th squalls, heavy downpour and T. 29th, gale from W. Farming operations much retarded.

### DERIVATION OF THE WORD "ANEROID."

*To the Editor of the Meteorological Magazine.*

SIR,—Your correspondent "F. W. S.," rather overstates his case. The word "*νηρός*" is not only "somewhat rare," but never once occurs in the Classics, so far as I can discover. Moreover, his assertion that the form *vapós* "was good enough for Sophocles and Eschylus" indicates (at first sight) something more than its occurrence in a single fragment of either poet, cited respectively by a grammarian and a lexicographer, and resting upon no other authority. "A rare and old word, probably contracted from *veapós*," is the dictum of Liddell and Scott.

"F. W. S." explains away the terminal *είδες* in a very ingenious manner; but as a scholar he must feel that his explanation is quite unsound; *ἀνρροίδες* (supposing such a word to be coined) would mean "unfluid-like"; not "unlike fluid"; much less "belonging to a class of *ἀνρρᾶ*."

A man sufficiently versed in Greek to be acquainted with the word *νηρός*, would scarce think of adding the terminal *είδες* (neut. *είδες*) to a privative compound.

As Mr. Barham well observed, the only practicable derivation for aneroïd is from *ἀνρρ*. Supposing the automatic idea to be wholly inadmissible, may not the inventor have had in his mind some of those quaint Dutch and German figures which indicate the weather, and first have applied his new principle to some such popular form?

By the bye, no one has told us who this inventor was. Perhaps some of your correspondents, or yourself, will answer this question.—Yours obediently,

R. D. B.

[We could not venture to decide the "derivation" question, but the following brief extract may be satisfactory at once, to both F. W. S. and R. D. B.:—"As its name implies it is constructed 'without fluid.' It was invented [about 1846?] by M. Vidi of Paris."—*Negretti's Treatise on Meteorological Instruments*, page 50.—ED.]

# SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.


XVI.]

MAY, 1867.

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

## HEIGHT ABOVE SEA LEVEL.

WE conceive it to be quite needless in these pages to state the many reasons which combine to render an approximate determination of the altitude of every meteorologist's residence a *sine qua non*. And yet our uniform experience is that the wildest guesses are often made. This is certainly not the fault of the Ordnance Survey Department, whose labours in this branch are most valued by those who have followed (however distantly) in their steps. But for several reasons their labours are not available to all. In the first place, their publications



are not very accessible, their levels in many districts are untaken, or unpublished, and last, not least, many observers find great difficulty in getting a level line run from their residence to the nearest "bench mark." (See margin.)\*

For these reasons we have resolved to attempt to improve the present state of affairs, by undertaking the collection of good barometric observations, from as many stations as possible, during the 10 days, May 24th to June 2nd to be made at 9 a.m., 3 p.m., and 9 p.m.; or, if this is impracticable, at the first-named hour only, but the more complete the returns, and the more numerous, the more correct the result.

It may be well to point out that simultaneous and combined observation such as this is necessarily occasional, and therefore we would suggest that our readers should mention the arrangement to their friends, and perhaps also in the local papers, because the success, accuracy, and utility of the proposal, mainly rests on the widespread adoption of the suggested observations.

We by no means desire to substitute barometric, for spirit levelling, and are prepared to assist, as far as in us lies, (by communicating the height of nearest bench marks), in enabling observers to obtain these most correct results. But where levelling is impracticable, the plan we intend to adopt will give within 10 or 20 ft. the height of the barometer if its error is known, or the error of the barometer if its height is known. Observers whose barometers are untested, and also have not had the levels run up to their own houses, are recommended to send the exact position of the same, with reference to the nearest church, when every effort will be made to assist them. With every copy of this magazine will be sent a form prepared for the entry of the observations, additional copies will be readily furnished, and resultant altitudes shall be published as soon as the discussion is completed, but that will not probably be until the autumn.

All communications to be addressed to G. J. Symons, Esq., 136, Camden Road, N.W., the word "Altitudes" being in the corner.

\* These are usually cut on churches, milestones, bridges, &c., about 1 ft. above the ground.

## METEOROLOGICAL PERIODS.

By G. D. BRUMHAM, Esq.

IN each year the summer quarter commences within a few minutes of the same time of the day that it did 29 years before, but the other quarters, and especially the winter one, show a considerable difference in this respect. Having discovered these facts (I say discovered, because I am not aware that any one else has noticed them), I was led to think that there ought to be a corresponding return of remarkable summers, &c., and on examining a chronology of the seasons, I found that such was really the case seven times in eight. From 1746 to 1837 there were about 53 very hot, fine or dry seasons. These 53 seasons I have given below in the left hand column, and the seasons that returned after an interval of 29 years will be found in the right hand column. It may be well to state that, though, as herein shown, the recurrence is very frequent, there is apparently some cause which prevents perpetual recurrence after intervals of 29 years, the facts appearing to indicate rather a three-fold recurrence, and then modified intensity, or even the reverse—*e g*, 1750, 1779, 1808, and 1837, a year of modified intensity. The following records, which are chiefly taken from Mr. Whistlecraft's valuable works,\* will show how remarkably true is this 29 year cycle.

*Great Droughts, Heats, and fine Warm Seasons.*

1746.—An exceedingly hot and dry summer occurred this year.

1747.—Dry season.

1749.—Excessive heat at the beginning of July. Ther. 88° in the shade.

1750.—Excessively hot spring and summer. Ther. in July at least 96° in the shade on several days.

1757.—Very great heat in July.

1759.—A hot summer and dry.

1760.—Very hot and dry summer.

1762.—A very hot and dry summer, and a very dry year.

1765.—A very dry summer, and often very hot.

1771.—A very dry summer and year.

1775.—A hot and dry summer.

1776.—Great heat in July and August. Chiefly dry and fine from May.

1778.—Very hot and fine summer, especially July.

1779.—An extremely hot summer. Ther. 94° in July.

1775.—Mr. Glaisher says that this summer was dry and hot.

1776.—Great heat in July and August. Chiefly dry and fine from May.

1778.—Very hot and fine summer. Excessive heat in the first half of July.

1779.—Excessively hot spring and summer. Ther. in July 94° in the shade.

1786.—June and July were moderately fine.

1788.—A hot summer and a dry year.

1789.—A rather wet summer, but August was fine.

1791.—A very hot and dry summer, and a very dry year.

1794.—Rather a dry summer, and very hot from June 12th to July 18th.

1800.—Excessive drought from June 22nd to August 19th, then very wet.

1804.—Extremely hot and dry in September.

1805.—Very hot in August. Near 1° above the average.

1807.—Very hot and fine summer, especially July and August.

1808.—An extremely hot summer. Ther. 99° in July.

\* "Climate of England," by O. Whistlecraft, London, 1840; "Rural Gleanings," by O. Whistlecraft, London, 1851.



1780.—A very hot summer. In May, ther. 84°.

1781.—A hot, dry summer.

1783.—A remarkably hot summer.

1788.—A hot summer and dry year.

1791.—A very hot summer and dry.

1793.—Intensely hot and dry part of summer.

1794.—Very hot June 12th to July 18th, and rather a dry summer.

1795.—Most extraordinary heat at the beginning of September; the ther. on two days 90° and 91° respectively.

1797.—Heat unusually great part of summer. Ther. in July from 89° to 91° about the 16th and 27th.

1798.—A very fine hot summer.

1800.—Excessive drought for seven weeks in summer; then *very* wet.

1801.—A fine summer and good harvest.

1802.—Hot and dry two months of the summer (August and September.)

1803.—Very hot and dry summer.

1804.—A hot and dry September.

1805.—Very hot in August.

1806.—A hot summer.

1807.—Very fine and hot summer.

1808.—A fine and extremely hot summer.

1810.—Hot, with much thunder, during summer.

1811.—A very warm spring, and great heat in summer.

1813.—A fine and good summer.

1814.—Very hot in July. Ther. 88°.

1815.—Remarkably fine from March to October.

1817.—Excessive heat during part of summer. In June, on the 21st and 25th, ther. above 87°.

1818.—A remarkably dry and hot summer. Ther. in June 89°, and in July 90°.

1819.—A hot and dry summer.

1820.—Excessive heat in June and July; max. 87° in each month.

1822.—Great heat and drought part of summer. Very fine till October.

1825.—Warm and early spring. Very hot and fine summer. Ther. in July 90°.

1826.—Very hot, fine and dry summer; max. in June 90°, in July 88°.

1809.—A fickle summer, but a very hot May.

1810.—A hot summer, with much thunder. A dry year to October.

1812.—A *cold* summer.

1817.—Great heat during part of the summer.

1820.—A very hot summer. Excessive heat in June and July.

1822.—Great heat and drought part of summer.

1823.—A *cold and showery* summer.

1824.—Most extraordinary heat at the beginning of September; max. 86½°. At Greenwich the 2nd was the hottest day ever recorded in September.

1826.—Heat unusually great, with excessive drought. Ther. in June 90°, and in July 88°. A very fine summer.

1827.—Fine and hot summer.

1829.—Fine and warm for about seven weeks in May and June, then *very* wet.

1830.—Very hot July and good harvest.

1831.—Hot and dry two months of the summer (July and August). A wet year.

1832.—Summer chiefly fine.

1833.—A *changeable* time after June 11th.

1834.—Summer generally very hot.

1835.—A very hot and dry summer.

1836.—A fine summer, hot in July.

1837.—A fine and rather warm summer.

1839.—A summer of much thunder and rain, with hot intervals.

1840.—A very warm April, and great heat in summer. Also a dry year.

1842.—Fine and very hot summer.

1843.—Extreme heat in July. Ther. 90°.

1844.—Remarkably fine from March to September.

1846.—Excessive heat in June, and “notably hot summer.”

1847.—A remarkably dry and hot summer. Ther. 89° in July. In Sussex 98° in July.

1848.—A *wet* summer.

1849.—Excessive heat in July; max. 89°.

1851.—Great heat and drought part of summer. Very fine till end of October.

1854.—Warm and early spring, fine and hot summer. Ther. in July 88°.

1855.—Summer and autumn fine and very warm; max. in June 86°, in July 82°.

1827.—Fine and hot summer, and good harvest.

1830.—Warm and early spring, and a very hot July.

1832.—Summer chiefly fine. Great heat about August 10th, and very hot at the end of September.

1833.—Great heat in May; ther.  $85\frac{1}{2}^{\circ}$ ; afterwards no day all summer so hot. Fine to June 11th, then a changeable time.

1834.—Sharp drought in spring and greater part of summer, and generally very hot.

1835.—A very hot and *dry* summer, and very great drought in July and August; max. in the latter month  $86^{\circ}$ .

1836.—Fine summer, hot in July, but a wet autumn, especially October.

1837.—Fine and rather warm summer, but still the mean temp. of every month from March to September was *below* the average.

1856.—Fine and very hot summer and good harvest.

1859.—Warm and early spring, and a very hot July.

1861.—Summer chiefly fine. Great heat about August 12th, and fair and hot at the end of September.

1862.—Great heat in May; ther.  $84^{\circ}$ ; afterwards no day all summer so hot. Very fine to June 4th, then a changeable time.

1863.—Sharp drought in spring and summer, and generally very hot.

1864.—A very hot and *dry* summer, and very great drought in July and August; max. in the latter month  $86^{\circ}$ .

1865.—Very fine summer, generally hot, but a wet autumn in October.

1866.—Fine and warm part of summer, but very wet at the close, and the mean temp. of every month but one from May to September was below the average.

### *Remarkably Wet and Cold Summers, Wet Years, &c.*

1739.—A very wet season.

1756.—A wet summer.

1768.—A very wet summer and year.

1782.—A very rainy summer and year from July.

1785.—A stormy summer.

1787.—Mr. Glaisher says that there was a cold summer this year.

1792.—A very wet September, late and bad harvest.

1797.—A wet summer from August.

1799.—An extremely wet summer from July 8th, and very bad harvest.

1800.—Great rains in August and September, and a bad harvest.

1810.—Much thunder in summer. Very wet autumn after September; flooding rains in November.

1812.—A treacherous summer; rainfall much above the average in the year, but a fine September.

1816.—Very rainy and cold July and August; a very bad year.

1821.—A wet summer and year, though fine in July and August.

1823.—Showery summer, and wet in autumn, with extensive floods.

1824.—A wet summer and year.

1828.—A very wet summer.

1829.—A wet summer.

1768.—A very wet year from Feb.

1785.—A stormy summer.

1797.—A very wet summer and year from August.

1811.—A showery summer, though so hot.

1814.—Showery and cold till end of June.

1816.—A remarkably cold and wet summer, late season, and a bad year.

1821.—A wet summer and year; more than 31 inches of rain fell. A bad harvest.

1826.—*Very hot and fine summer.*

1828.—An extremely wet summer from July 9th, and very bad harvest.

1829.—Great rains in July, August, and September, and a bad harvest.

1839.—A summer of much thunder and rain. Very wet autumn, especially in November.

1841.—A wet summer; rainfall very much above the average in the year, but fine September to the 22nd.

1845.—Very wet, gloomy, and cold part of July and August; a very bad year.

1850.—A stormy summer, though so hot at times.

1852.—Extremely wet after July all through autumn.

1853.—Wet summer and year.

1857.—*A very fine summer.*

1858.—*A very fine summer.*

1831.—*Very* wet year and part of summer; 33½ in. of rain fell at Thwaite.

1833.—A fickle summer, and often wet.

1836.—A wet autumn. Extremely wet in October and November.

1837.—Although often fine and warm, in one respect this was a very cold season, for every month from March to September had a mean temp. below the average.

1860.—Very wet year and chief part of summer; 36 in. fell at Thwaite.

1862.—A fickle summer, and often wet.

1865.—Wet autumn. Extremely wet in October.

1866.—Although often fine and hot in June and July, every month but one from May to September had a mean temp. below the average. A wet year.

G. D. BRUMHAM.

## Abstracts of Meteorological Works.

UNDER this title we purpose, as opportunity offers, epitomizing the literature of Meteorology, and placing the leading contents before our readers, thus giving them access to many rare and curious works. Sometimes, perhaps, these abstracts may facilitate research either as to theories or facts, and trace ideas and discoveries to their true source. Our aim being, as far as possible, to place our readers in the same position as if they had the volume under notice, we shall generally quote *verbatim*, connecting the quotations by a running commentary on the contents of the volume.

PUBLISHED A.D. 1809.

*Meteorological and Miscellaneous Tracts, applicable to Navigation, Gardening and Farming, with Calendars of Flora, for Greece, France, England and Sweden.* By Colonel JAMES CAPPER. Cardiff: J. D. Bird. 212 pages.

Written during the warlike period at the opening of the present century, the preface of this peaceful volume opens with a sentence which reads strangely to us who are so accustomed to roam where we will, without let or hindrance.

“The first of the following tracts originated in answer to various correspondents who were anxious for information respecting the climate of such places in the South of Europe as were neither immediately under the command of, nor accessible to the enemy, and where, consequently, they might safely retire to avoid the inclemency of a severe winter in England.”

This first tract is entitled “Observations on the Causes and Consequences of the Temperature of Air in different Latitudes;” but the title is scarcely an appropriate description of a short article pointing out the advisability of persons of a delicate constitution choosing a suitable locality in our own country, rather than undertaking long journeys to the shores of the Mediterranean. The second tract is nominally on “The effects of Lunar Influence on the Weather,” but really consists mainly of two digressions, one on the indication of coming storms afforded by low barometric pressure, the other on the premonition rendered by Auroræ, in which Col. Capper quotes a letter from Mr. Winn to Dr. Franklin, dated Spithead, Aug. 12th, 1772, wherein the

writer states that in every one of twenty-three occasions when he had observed Aurora Borealis it was followed by hard southerly or south-westerly gales, with hazy weather and small rain. The question of Lunar Influence can hardly be said to be considered. Premising two points—(1) That Col. Capper attributes the effect not directly to the moon, but indirectly, that is to say through the tides; (2) that atmospheric electricity causes almost everything, especially rain, we may, as a specimen of the work, quote almost all that is said as to Lunar Influence :—

“Virgil observes that when the moon first collects the returning rays, if her horns are obscured by dark clouds, a storm both by land and sea may be expected, but should she spread a virgin blush over her face, there will be wind. If again, at her fourth rising, she appears clear and not with blunted horns, let this be considered as an infallible sign of settled weather, not only for twenty-four hours, but for the whole lunation.

“If in this place the word tide be substituted for that of the moon, this prognostic will be found to correspond nearly with our system. The middle, but not the greatest height of the spring tide being, as we have stated, nearly about the time of the moon passing the sun, the fifth flood after the conjunction which falls on the third day is the highest spring. If, therefore, at the fifth or highest tide after the syzygy (*sic*), a sufficient quantity of the electric fluid has been brought from the sea to elevate and consolidate the clouds, the horns of the moon on the fourth day will probably be clear and distinct, and then a series of fair weather may with reason be expected. But on the contrary, should an extraordinary quantity of electric fluid have been brought in by the springs, as is often the case, particularly at the equinoxes, and the land clouds at the same time be in a negative state, wind and rain will probably ensue, and the horns of the moon will at least appear obtuse, if not be wholly obscured, and the weather consequently may, in that case, continue unsettled for several days.”

The remaining tracts are scarcely within our province, their subjects being “On the Situation and Form of a Fruit and Kitchen Garden,” and on “The Physical, Moral, and Political Effects of Late Hours,” but both contain much sound advice.

The Appendix forms more than half the volume, and opens with a copy of the short “Memoir by Dr. Franklin, read before the Royal Academy at Paris, April 14th, 1779.”

Col. Capper is most at home in the next paper, “Observations on Whirlwinds and Waterspouts,” wherein he notices first the similarity of conditions producing the two phenomena, then points out their great frequency on the coast of Guinea and in the Straits of Malacca, occasional appearance in the Mediterranean, “and even in England when the summer is unusually hot.” Without binding ourselves to absolute number and date, we have no doubt that their frequency in this country of late years (one or two in each year on an average), would have rather surprised the gallant Colonel, who evidently considered a waterspout in this country quite a *rara avis*. The following is his explanation of the phenomenon :—

“Notwithstanding the superior body of air in hot seasons and places is more dense and heavy near the point of congelation in the atmosphere, yet the rarefied air below will still continue to support it whilst it remains undisturbed; but the equilibrium once destroyed, either by ascending or descending electrical fluid, the body of cold air instantly forces its way through the rarefied medium, and produces

either a hurricane, a whirlwind, a hard squall of wind and rain, or a waterspout. The force and duration of the wind, or the number of waterspouts, may, in some measure, depend on the quantity of cold air that descends, and the rarefied state of the air at that time in the atmosphere. The body of cold air in descending, as it penetrates the warmer regions filled with aqueous particles, condenses and renders the air visible in various forms. \* \* \* The form they assume, as waterspouts, is produced from the same cause as sinking any heavy body in water. The air in a whirling motion receding every way from the centre, as an axis of the waterspout, leaves there a vacuum which cannot be filled through the sides; the whirling motion of the condensed air acting as an arch prevents it, and thus the shape it assumes is that of the proboscis of an elephant. This singular resemblance is the more striking from its motion, which is sometimes serpentine; but where a great quantity of water is collected in these spouts, either by the separation of the aqueous particles, from the internal air, or possibly from the composition of water in it, by the combination of hydrogen and oxygen, the waterspout, from its gravity when filled, forms a straight line, and the water falls into the sea with a loud splashing noise, not unlike that of a great cataract. \* \* \* It is found that in some instances they have been destroyed by firing a gun at them; but the shot might as well be spared, for probably it is the explosion of the powder that rarefies and agitates the air, and consequently destroys the cohesion of the cold and dense body of it in which they are enveloped."

The next article is devoted to a recapitulation of "The Discovery of Atmospheric Electricity;" then follow chapters on the barometer, thermometer, with tables giving the mean monthly pressure, temperature, and rainfall at Cathay, near Cardiff, 60 ft. above the sea level. Very little information is given as to the time of observing or instruments employed; the barometer, however, was taken at 8 a.m. and 2 p.m. The thermometer was in a courtyard, 7 ft. above the ground. Of the size or position of the rain gauge nothing is said; from the amount we infer it must have been on a roof or wall. So far as we can ascertain, perfect uniformity of practice was maintained throughout, therefore an abstract of the results may be acceptable.

YEAR.	1800.	1801.	1802.	1803.	1804.	1805.	1806.	1807.	Mean.
Mean Bar. ....	29·74	29·81	29·82	29·87	29·78	29·99	29·99	29·90	29·79
" Temp. ...	51·9	51·8	49·8	51·0	51·0	49·0	51·0	49·8	50·7
Total Rain ...	26·82	24·10	22·77	20·59	27·01	20·28	27·86	20·68	23·76

On December 28th, 1798, the thermometer fell to 11°, being the lowest recorded there.

Concerning hail, Col. Capper remarks:—

"Hail, in the opinion of Beccaria, is an aqueous concretion formed in the higher regions of the atmosphere, where the cold is intense, and where the electric matter abounds. The form and dimensions of it are various. It sometimes assumes a pyramidal, as well as a round shape, and at others a stellated figure like snow, but both the shape and size depend very much on the height of the clouds in which they are formed. The largest and those of the most irregular figure, fall from those clouds of the least elevation. The circumstance, however, which tends to show the principal cause of its formation is, that all storms of hail are most violent where electricity is most intense. On this point Beccaria, Franklin, the Abbé Nollet, and Mr. Monges perfectly agree. \* \* \* The Count de Tressan dissolved a certain number of hailstones which fell at Toul on the 11th of July, 1753. They produced nearly a pint of water, in which were found nearly two grains of a calcareous substance, which fermented with acids, and which, no doubt, had ascended from the earth with other vapours. \* \* \* Mr. de la Hire found

the density of snow compared with water nearly as six to one. Père Cotte likewise sometimes found nearly the same proportions, but much more often one to eight. The difference may probably be ascribed to the size of the flakes and the temperature of the air. M. Van Swinden, an able and correct philosopher, observes that in 80 experiments which he made at Franeker, in Friesland, in the years 1772—75, he found in 18 cases less than six, but he seems to think the result of the whole would be  $9\frac{3}{4}$  to 1."

The remaining articles are on "The Temperature of different Latitudes, indicated by the Calendar of Flora," a second on "Late Hours," a series of French extracts bearing upon the certainty of gales following low barometric pressure, and lastly a table of Lunar Cycles for 228 years. Two points alone seem worthy of notice:—(1) Speaking of the indifferent meteorological data which then existed, he suggests that the best guide as to the time for undertaking the various operations of husbandry is afforded by the state of the hedges, shrubs, and trees. (2) Colonel Capper quotes from Toaldo's "Saggio Meteorologico," and also from his "Meteorological Saros," on behalf of the existence of a meteorological cycle of 18 years 11 days (*i.e.* a lunar cycle.) Query—Had Howard seen these works when he published his treatise on "A cycle of eighteen years?"

---

#### EDITOR'S GOSSIP, CORRECTIONS, ADDITIONS, ETC.

WE desire a few words with our readers on several points, so string them all together. In the first place, we must apologize for the badness of the engraving in the last number of this magazine; it was a first trial of a new and much vaunted process, but one we shall certainly not try again.

We are repeatedly asked to state where the best meteorological instruments are to be procured, but, however impartial our advice, it would be sure to displease, and to be called prejudice, puffing, &c., by all but those selected for recommendation, and as we believe there is no great difference between the instruments sold by the principal opticians, we think it far better to leave each observer to choose for himself.

A very provoking illustration of the mischief arising from a single wrong figure has occurred in *British Rainfall*, 1866, provoking, because it ought not to have occurred, involves several corrections, and, we presume, some discredit to ourselves. The error is, that the true total of the 24 inch gauge, belonging to Colonel Ward's magnitude series, is 33·867, not 33·167 as stated on page 34. This single error involves the correction of various errors in the tables on page 28, as shown in the corrected copy, which we have also had printed on a loose slip, so that they may be pasted over the faulty ones. In the sixth line from bottom of same page, 2 per cent. is reduced to 1. We do not see that it in the slightest degree affects the deductions or argument, except to strengthen them, by reducing the results of the three years to closer agreement.

*Relative fall indicated by gauges of different sizes at Castle House, Calne, all 1 foot above the ground.*

Receiving Surface.	1 inch diam.	2 inch diam.	4 inch diam.	5 inch diam.	6 inch diam.	8 inch diam.	12 in. diam.	24 in. diam.	5 inch square	10 in. square	5 inch flange.
1864.....	·93	·96	1·01	1·00	1·03	1·04	1·01	1·00	·98	1·00	1·02
1865.....	·94	·97	1·00	1·00	1·02	1·02	1·00	1·00	1·00	1·00	1·03
1866.....	·92	·95	1·00	·99	1·03	1·03	·99	1·00	·98	·98	1·01
Mean .....	·93	·96	1·00	1·00	1·03	1·03	1·00	1·00	·99	·99	1·02

	Gauge 24 inches diameter.	Gauge 8 inches diameter, Magnitude Series.	Gauge 8 inches diameter, Elevation Series.
1864 .....	1·00	1·04	1·04
1865 .....	1·00	1·02	1·02
1866 .....	1·00	1·03	1·01
Mean .....	1·00	1·03	1·02

The following paragraph is an interesting addition to the meteorology of 1866 (*Brit. Rainfall*, 1866, p. 51.) :—

“PENTYCH.—December 14th. At 2 a.m. a heavy T S, with H the size of peas, which lay half an inch deep. A tree was struck on the hill above my house, the bark furrowed three inches wide from top to bottom, but no branch broken.—F. G. EVANS.”

The following alterations and additions will tend to complete *Brit. Rainfall*, 1866. We do not say on whom the onus of the errors rests—some are ours, some are not—none are intentional, and what can it matter?

Page 87, 6 lines from bottom, Rev. L. M. Majendie should be Rev. H. W. Majendie.  
 „ 90, 5 „ „ top, 29·93 should be 27·93.  
 „ 92, 5 „ „ „ Strike out the asterisk.  
 „ 102, 4 „ „ „ 47·68 should be 46·68  
 „ „ 15 „ „ bottom, Patterdale could not have had 315 wet days.  
 „ 103, 12 „ „ top, For Langharne, read Carmarthen.  
 „ 108, 21 „ „ „ Before (Hynish) enter Tyree.  
 „ 111, 11 „ „ „ Holme Manse, above sea 30 ft ?  
 „ „ 6 „ „ „ Papa Westray, „ „ 80 ft.  
 In *Met. Mag.*, Vol. II., p. 35, Calne, for 3·11 read 3·35.

## ENTRY OF MINIMUM TEMPERATURES.

*To the Editor of the Meteorological Magazine.*

SIR,—I am obliged for your observations in reply to my note inserted in your last number of the *Meteorological Magazine*, but referring again to the latter portion of them, I would be glad to know how (if the rule for entering the day on which the min. temp. occurs be accepted as laid down in your remarks) an observer is to ascertain on which day the min. temp. *really* occurred, who only looks at his thermometer once in the 24 hours ; for supposing the thermometer at 9 a.m. on the 1st of any month, registers 50° and is then set, and that the next morning the minimum is found to have been 45° during the preceding 24 hours, the thermometer at the time standing at 55°, how can the observer tell whether the min. temp. was reached on the 1st, after he had set his instrument, or early on the morning of the 2nd, which is, as a rule, the coldest period of the day ?

Yours very truly,

ARTHUR PIM.

[We hope neither Mr. Pim nor any other observer will be affronted at our saying that we consider no observer should be allowed to *think* whether the min. occurred on the 1st or 2nd ; he should, we believe, act like a “manly automaton,” and enter against the 2nd whatever min. he finds at 9 a.m. on that day. We however think that a congress of observers, or some high authority, should issue a clearly-worded set of rules, and that all should yield them implicit obedience.]



APRIL, 1867.

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 1860-5	Greatest Fall in 24 hours.		Days on which 41 or more fell.	Max.		Min.			
				Dpth.	Date.		Deg.	Date.	Deg.	Date.		
I.	Camden Town .....	2·36	+ 1·23	·43	20	20	66·4	2	30·8	1	1	
II.	Staplehurst (Linton Park) ...	1·67	+ ·45	·27	20	18	62	2, 19	29	1, 12	3	
III.	Selborne (The Wakes).....	3·21	+ 1·71	·53	20	20	60	19	29	11 ††	2	
III.	Hitchin .....	2·06	+ 1·06	·39	14*	17	62	18†	32	11	0	
"	Banbury .....	2·31	+ 1·15	·42	20	22	63	19	28	1	3	
"	Wisbech.....	2·38	...	·58	20	17	67·5	18	29·2	1	1	
IV.	Bury St. Edmunds (Culford) ..	3·17	+ 2·42	·72	24	18	66	18	28	11	1	
V.	Calne .....	3·25	...	·53	23	19	63	17	27·5	1	3	
"	Plymouth (Goodamoor) .....	4·67	+ 2·42	...	...	...	...	...	...	...	...	
"	Barnstaple .....	3·49	+ 1·48	·58	20	19	...	...	...	...	...	
"	Taunton (Fulland's School) ..	1·83	+ ·29	·48	14	15	...	...	36	28	...	
VI.	Shrewsbury (Highfield) .....	2·44	+ 1·10	·52	21	16	...	...	...	...	...	
VI.	Tenbury (Orleton) .....	3·10	+ 1·56	·54	14	26	63·4	2	31	28	2	
VII.	Leicester (Wigston) .....	2·13	+ ·83	·32	21	20	67	18§	30	11	2	
"	West Retford .....	...	...	...	...	...	...	...	...	...	...	
"	Derby .....	3·42	+ 1·99	·55	24	19	64	19	32	1	1	
VIII.	Manchester .....	4·32	+ 2·57	·63	20	24	66	29	32·5	12	0	
IX.	York .....	3·11	+ 2·01	1·02	20	24	64	19	33	1	0	
X.	Skipton (Arnelliffe) .....	7·79	+ 4·75	1·12	13	19	...	...	...	...	...	
X.	North Shields .....	1·88	+ ·57	·38	30	19	60·5	19	32	1	1	
XI.	Borrowdale (Seathwaite) .....	16·92	+ 10·02	3·56	14	24	...	...	...	...	...	
XI.	Abercarn .....	5·03	...	·81	30	13	61	2	36	12	0	
"	Haverfordwest .....	7·79	+ 5·93	2·60	14	11	62	28	32	22††	0	
"	Rhayader (Cefnfaes) .....	5·93	+ 4·04	·71	12	27	60	...	31	...	2	
XII.	Llanberis (R. Victoria Hotel) ..	9·22	...	1·40	13	24	...	...	...	...	...	
XII.	Dumfries .....	3·36	+ 1·69	·55	23	25	63·5	29	35	29	0	
"	Hawick (Silverbut Hall) .....	3·52	...	·69	20	21	...	...	...	...	...	
XIV.	Ayr (Auchendrane House) ...	4·75	+ 2·53	·57	22	22	61	23	31	29	1	
XV.	Otter House .....	7·12	+ 4·37	1·45	27	25	59	23	35	12	0	
XVI.	Leven (Nookton) .....	2·83	+ 1·59	·59	10	17	59	21	34	17§§	0	
"	Stirling (Deanston) .....	5·53	+ 3·79	·69	23	26	59	19¶	31	1	5	
"	Logierait .....	3·21	...	1·11	27	20	...	...	...	...	...	
XVII.	Ballater .....	3·44	...	1·16	27	24	62	19	27·5	5	3	
"	Aberdeen .....	3·13	...	·71	10	22	61·3	1	31·7	12	1	
XVIII.	Inverness (Culloden) .....	2·93	...	·70	11	18	56·1	19	33·5	5	0	
"	Fort William .....	8·53	...	1·39	13	25	54·5	29	31	12	1	
"	Portree .....	10·02	+ 4·75	1·80	13	24	58	29	31	12	1	
"	Loch Broom .....	5·00	...	·55	7	27	...	...	...	...	...	
XIX.	Helmsdale .....	3·09	...	·43	10†	21	...	...	...	...	...	
"	Sandwick .....	4·20	+ 2·46	·57	27	26	54·1	20	30·5	12	2	
XX.	Cork .....	3·30	...	·64	29	18	...	...	...	...	...	
"	Waterford .....	3·03	+ ·80	·60	27	24	...	...	...	...	...	
XXI.	Killaloe .....	6·43	+ 4·30	·64	7, 28	26	60·5	1**	30	28	1	
XXI.	Portarlinton .....	4·33	...	·56	23	26	63	28	39	9	0	
XXII.	Monkstown .....	2·48	+ ·84	·43	29	25	67·4	23	30·8	28	1	
XXII.	Galway .....	2·88	+ ·86	·48	27	27	57	25	38	22	0	
XXIII.	Bunninadden (Doo Castle) ...	4·86	...	·78	23	26	57·8	5	32	27	0	
XXIII.	Bawnboy (Owendoon) .....	6·85	...	·70	10	27	...	...	...	...	...	
"	Waringstown .....	4·16	...	·65	23	25	66	23	30·5	11	1	
"	Strabane (Leckpatrick) .....	3·75	...	·54	25	23	62	23	31	28	1	

\* And 20th. † And 23rd. ‡ And 19th. § And 19th. || And 24th. ¶ And 28th. \*\* And 17th &amp; 19th.

†† And 28th. ‡‡ And 27th. §§ And 28th. ||| And 11th and 25th.

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



# METEOROLOGICAL NOTES ON THE MONTH.

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.

LINTON PARK.—A dull, showery month; the latter part mild and growing, T on 9th and 30th. Great progress in vegetation during the last 10 days. Prevailing winds S.W. Cuckoo heard on 18th.

SELBORNE.—H storm on 30th p.m. Bar. max. on 1st, min. on 20th. Prevailing winds from N.W. to S.W.; very high from the 5th to the 21st, with few days intermission. First martin seen on 14th, swallows on 17th, cuckoo heard on 19th.

BANBURY.—High winds on 8th and 13th. H storm at 3 a.m. on 27th. Swallows seen on 17th. Blackthorn in blossom on 18th, crab apple on 27th.

WISBECH.—Gales on 8th, 9th, 11th, 14th, and 21st, averaging more than 16lb. to the square foot. From the 8th to the 21st the weather was very stormy. The warmest days were from the 17th to the 20th, and their influence on vegetation was very marked, blossoms and leaves appearing as if by magic. Plum and cherry in blossom on 16th, pear on 19th, and apple on 27th; hawthorn in leaf on 13th, horse chesnut on 14th, common poplar 15th, lime on 18th, sycamore 20th, field elm 29th, wych elm 30th.

CULFORD.—High winds on 11th, 14th, 20th, and 21st. H storms on 11th, T on 14th. The weather comparatively mild. Swallows first seen on the 17th.

TAUNTON.—Swallows first seen on 10th, cuckoo heard on 23rd.

DERBY.—The incessant rains have greatly interfered with farming operations. The wet autumn prevented the usual seed sowing, and the ground is not yet sufficiently dry for that purpose. Fruit in average forwardness, and more than average promise.

MANCHESTER.—Seventy-three years average gives only 2.00 in., and this year we have had a fall of more than twice as much.

ARNcliffe.—Hills white with S on 21st. No swallow observed here till the 23rd, cuckoo heard on 28th. Wet, cold and ungenial.

NORTH SHIELDS.—Fog and TS with H on 24th. Solar Halo on 28th.

SEATHWAITE.—A month with a low temp.; scarce any sunshine, and nearly three times as much R as the average for April.

## W A L E S.

HAVERFORDWEST.—A terrible storm of wind and R on the 14th, when more R fell in 24 hours than is usual in the whole month. The month commenced with fine, dry weather, northerly winds and bracing air. After the 7th the weather became very precarious and cold, with violent storms of wind. A bad seed time; very little frost, but ungenial; vegetation backward.

RHAYADER.—Only three days without R. The month has been very cold and wet, with floods. Prevailing wind N.E. Seed sowing and potatoe planting delayed. Cuckoo heard on 20th, cornrake on 23rd.

## S C O T L A N D.

DUMFRIES.—The month mild and moist; only three days without R. H on 14th. S on the hills on 21st. Swallows seen on the 11th, cuckoo heard on 14th. —[Nearly a week *earlier* than in the south. ED.]—At the close of the month oats and grass beautiful, and vegetation more forward than usual, owing to the absence of frost.

HAWICK.—The month throughout has been cold, wet, windy, and sunless, with very little frost, but the hills white with S on the morning of the 24th. T on 14th. Swallows first seen on 19th, and cuckoo first heard on 28th.

AUCHENDRANE.—The cold, dry March has been succeeded by a wet warm April, the mean temp. having been 11° higher than that of March. The rainfall this April is more than six times that of April in 1865 or 1866. As April is the principal sowing month in Ayrshire, a wet April is generally followed by a bad crop. Though the rains have retarded and injured the sowing, especially on spring lands, the high temp. has produced early crops in unusual abundance.

OTTER HOUSE.—Owing to an almost continued R, agricultural operations are later (by nearly three weeks) than last year. Vegetation is also late, which

may be compensated by subsequent fine weather. Swallows were seen flying about during the last week, and the cuckoo was heard on the 27th.

DEANSTON.—From the 1st to 16th very stormy and wet; S on the hills on the 10th; whole month wet, cold, and very backward. On the 30th scarcely any leaves on any of the trees except the hawthorn.

LOGIERAIT.—A cold ungenial month, with a succession of E. winds. Vegetation backward. Swallows seen on 26th, cuckoo heard on 28th.

BALLATER.—The coldest April experienced here for many years. Frequent showers of sleet or S in the early part of the month, the neighbouring hills being covered with a fresh coating of S for several days, and the low grounds white on the evening of the 10th. More or less R fell almost daily, and the ground being thus soaked, the seed sowing was much interrupted.

ABERDEEN.—Fog on seven days. Auroræ on eight days. A very unseasonable month for the crops, characterized by excessive moisture, high mean temp. and low bar. The rainfall 1·17 in. + the average, and was spread over much time, falling principally as drizzle. More W. and N.W. wind than usual.

CULLODEN.—Fog on 6th and 20th. Solar halo on 12th.

FORT WILLIAM.—Very wet during the greater part of the month. R fell daily from the 25th of March to the 23rd of April, both inclusive. The total fall in April was nearly three times the total fall in April, 1865 or 1866. S on hills on 10th.

PORTREE.—Agricultural operations unusually late, the frosts of March and R of April having prevented the seed sowing; much is still unsown, and our prospects here are by no means good.

LOCHBROOM.—The wettest and most unpropitious April within the memory of man; only three dry days in the month. Sowing and planting have been so retarded, that they are a month, and in some cases six weeks, later than usual, but the last few days still give us hopes of a good harvest.

SANDWICK.—This April has been the wettest for 27 years, except 1859, and that was only 0·13 in. more. There was a sprinkling of S on the 12th, and on the hills on the 16th. Aurora noted on 4th and 10th.

#### I R E L A N D.

KILLALOE.—Continued storms and showers on the 8th, 9th, and 10th. TS about 8 p.m. on 18th. From 1846 to the present year, only once has the rainfall in April reached 5 in. (1862, 5·05), while this year it is 6·43 in.

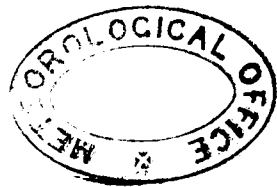
MONKSTOWN.—TS with H on 9th; H also on 14th, 21st, and 22nd. S on the higher mountains on 28th; this was also the case on the 1st of May, 1866. Gales on 10th and 15th. R almost every day, which, added to the low temp., has retarded vegetation, and also the sowing of the land much later than usual.

DOO CASTLE.—There had been so little done in the way of spring preparation since the beginning of the year, the farmers looking forward to this month to enable them to make up for past delays, that a month of almost incessant R has been a grievous affair. Even now much of the potatoe land is undug, and all is now hurry and confusion, hay, oats, &c., having nearly doubled in price, in some cases higher than ever known in this neighbourhood. The cattle have a wretched, starved look, and not without reason. I attribute this state of things to the weather, and not to want of forethought. The severe winter consumed almost all the fodder; its continuance pressed heavily on oats and potatoes, which had to be given to cattle instead of cheapening our market at the present time; hence the high prices, and hence men look aghast at our future.

OWENDON.—The month has been very wet, stormy, and inclement. Almost all the fodder has been exhausted, and much of the land is still uncropped.

WARINGTOWN.—A very wet month—only five days without R, and farming operations in consequence been retarded beyond precedent, especially in heavy soils (such as that of this district). No potatoes have been planted, and much of the oats and all the flax is still unsown.

LECKPATRICK.—T on 18th and 26th. Cuckoo heard on 23rd. Bar. very unsteady; wind likewise shifting backwards and forwards from N. to S. Very unfavourable month for farmers, the almost incessant R having prevented the seed from being sown till so very late. In the mountains some of the oats are still unsown.



# SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

---

XVII.]

JUNE, 1867.

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

---

## ANEMOMETERS.

IF any branch of meteorology is in an unsatisfactory condition, it certainly is anemometry—and this, we think, arises from causes not easily removed. In this and following articles we purpose describing the principal instruments now actually used for measuring the movements of the wind; but we think a few prefatory words on the present condition of anemometry necessary to a due application of our subsequent descriptions. The two most serious obstacles to extensive, simultaneous and fruitful anemometrical research are (1) the cost of effective anemometers, and (2) the labour of reducing the records when obtained.

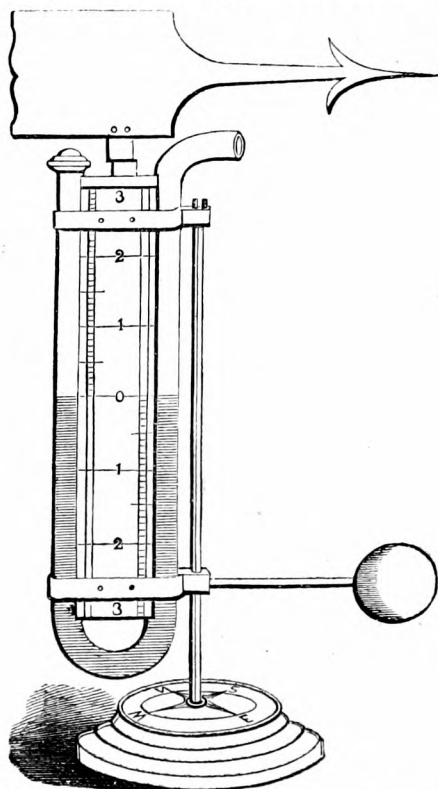
Concerning the first point, information will be given when each instrument is described; but we may premise that any one contemplating the erection of a *complete* anemometer must be prepared to spend £50; possibly opticians may differ from us there; be it so, we shall be glad to find that they are prepared to provide the instrument, transport it to its destination, erect it, and leave it in perfect working order, with recording sheets, forms for tabulating the observations, and all the inevitable et ceteras complete for a less sum; first-class instruments cost from £100 to £200.

The labour of reducing the record sheets to numerical values is also very considerable. It is not, therefore, surprising that there are in various parts of the British Isles stores of anemometrical records for many years past which await, and perhaps will long continue to await, the discussion which they ought to have received. Believing that very much may be done with these old observations, we appeal to all who possess them, and earnestly request them to make arrangements for their publication. And at the outset we would impress on our readers that it is far more useful to have a simple instrument, and thoroughly discuss its indications, than it is to establish an apparatus yielding results which the owner has not time to reduce.

Taking first the simplest form of wind measure, we have that known

as Lind's anemometer, (fig. 1), invented in 1775, the principle of which is very simple, being merely the measurement of the length of a column of water, which is supported by the direct pressure of the wind. Inspection of the figure will show that the orifice of the tube is kept face to the wind by the vane, and the water, which in a dead calm stands as shown on the diagram at 0, on the wind increasing is depressed in one leg and elevated in the other, the sum of the departures from 0 indicating the length of water column supported by the wind's force. This is readily converted into lbs. pressure per square foot by simply multiplying the weight of a cubic inch of water by 144, and converting into lbs., we then have 5.2 lbs. for each inch, and of course 0.52 lb. for 0.1 inch, 52lbs. for 10 inches, &c. ; the unit being as stated, anyone can readily deduce any intermediate point for himself.

*Fig. 1.*



Some modifications of this instrument were suggested by Sir W. Snow Harris in 1858, the leading features being (1) a bent tube of smaller bore used in the hinder part of the U, whereby an enlarged scale was obtained ; (2) an arrangement for closing the hinder part of the tube, so that the reading may be taken off at leisure ; (3) the instrument dismounted from the pivot shown in figure 1, and held by the hand towards the wind, of which the direction was shown by a very small

vane. These modifications contain elements of good. (1) improves its sensitiveness ; (2) is perhaps more promptly and thoroughly effected by the pressure of the observer's finger ; (3) we think possibly good at sea, but decidedly bad for land observers. The plate accompanying Sir Snow Harris's article (in the *Nautical Magazine* for March, 1858), and from which we know some instruments were constructed, appears wrong, as there is no provision for noting the depression in the front half of the U, and the scale is not contracted to compensate for the error. It was a singular oversight in the first instance, and, so far as we are aware, has hitherto escaped detection.

A few years ago Mr. Forbes, of Culloden, suggested a plan for making this instrument record the maximum between any two observations, viz, by putting in the hinder tube a slip of cardboard, previously steeped in a strong solution of sulphate of iron, the water in the tube having been first impregnated with a few drops of prussiate of potash. On the wind elevating the liquid, the cardboard is permanently coloured a deep blue tint, thus marking the maximum force which has occurred. It might be thought that the record of force would be vitiated by capillary action, but Mr. Forbes says that if suitable cardboard is used the difficulty is quite overcome. By cutting a groove in the pedestal marked with the compass points, and placing in it two small indices, then attaching a slight rod to the revolving part of the instrument, these indices may readily be made to record the directions between which the wind has blown, thus giving from this simple apparatus azimuth and force.

The pedestal foot hitherto supplied should be pierced for three or four screws, and the instrument fixed on a pillar four or five feet at least above the ground.

We think it is also expedient that the scale should be altered, each inch being marked as two inches, and so on ; by this means the double reading will be avoided. With these modifications, Lind's anemometer might prove a cheap yet efficient instrument ; cheap, because if there was any demand, they could surely be made for three guineas each.

(To be continued.)

### SEVERE HAILSTORM IN INDIA.

"A CORRESPONDENT of the *Madras Athenæum* at Goommanur,\* near Bellary, informs us that very bad weather was recently experienced there. On March 28th a terrific hailstorm swept over the place. All the trees in the neighbourhood were stripped of their foliage, heavy branches were torn down, and many trees torn up by the roots. People's clothes were removed from their backs, and a tent was shivered

\* Spelt Goomanoor in this article and Goommanur in the second one ; the latter is believed to be correct.

to rags. The hailstones were as large as cocoa nuts and good-sized mangoes. Some four hundred sheep and twenty head of cattle were killed, as were also several human beings, a large number of whom were severely hurt. Thirty hours after the storm, hailstones were picked up in some of the railway cuttings the size of fowls' eggs."—*Homeward Mail*, May 22nd, 1867.

"IN the early part of April the collector of the Kistna district reported to Government that on the evening of March 27, there occurred a storm of wind, accompanied by rain and hail, at the village of Goveravaram, in the Nandigama talook in this district. The hailstones were as big as limes. They continued to fall for about a quarter of an hour, and lay on the ground to the depth of a span. Men and cattle were reported to have been severely bruised by the hailstones, which remained in heaps unmelted till nine o'clock a.m. the next day. The collector of Bellary also reports that on the afternoon and night of March 28 and 29, a very severe hailstorm passed over this district. 'In Adoni to the north of the talook, at Nukkulmittah and other villages, the hail is described as being of the size from cocoa nuts to woodapples, and lying to one foot in depth; in some places destroying the wet and dry crops. In Gooty, at eight p.m. on the 28th, the hail was described as ranging from the size of bullets to limes; some sheep were killed and crops destroyed. The villages indicated are Hunchinbal, Karakamookkala, and Konacondla. In Anantapur talook the size of the hailstones is apparently incredible. I give, however, the local report, that in a field of the village of Bondalavada some of the stones were two-thirds of a cubic yard in size. In the village of Chadula a cubic span, and in other villages of six seers, or three pounds weight; this last was verified by the Tahsildar. Two men, 2,470 sheep, and eight cattle were killed, and some thatched houses were destroyed. In Alur, on March 28 and 29, to south of the talook, at Goommanur and other ten or twelve villages, the hail was described as ranging from the size of cocoa nuts to mangoes, and lying half a yard in depth in some villages, destroying the dry crops, two men were killed, and one was carried away by the flood in a nullah close to Goommanur. Looking from the talook of Hospett on that evening, a vast pile of electric clouds was seen towards the east, similar to those which collect on the western coast before the commencement of the monsoon. I have had no intelligence of hailstorms in the western talooks, or from those furthest south, so that as far as I am at present informed, the storm must have extended over the north, centre, and south-east of the district. When further details are received regarding the loss of crops a report will be made, if any, and what consideration should be shown to the sufferers.' The collector of Cuddapah reports that a severe storm, accompanied by hailstones of extraordinary size, was experienced in different villages of the three talooks, Pulivendala, Royachoty, and Kadiri. In the Pulivendala talook seven individuals received serious wounds and lost their lives. The storm in the other villages swept away the standing crops and stacks, and also killed some sheep."—*Homeward Mail*, June 4th, 1867.

# REVIEWS.

*A Handy Book of Meteorology*, by ALEXANDER BUCHAN, M.A., Secretary of the Scottish Meteorological Society. W. Blackwood and Sons. Small 8vo, 204 pages.

A VERY handy book this, for in its small compass Mr. Buchan has stored more and later information than exists in any volume with which we are acquainted. Yet it is a tantalising book, for occasionally trains of thought are started, pursued with considerable skill, and then dropped suddenly, instead of being pushed to their legitimate conclusions. The old saying that a great book was a great evil we do not accept, and look forward to the day when some one shall publish not a handy book, but a standard work of reference, detailing the steps by which meteorology has been raised to its present position in this and other countries, and pointing out (as Professor Forbes did 30 years ago) the principal subjects requiring investigation. This is not a matter to be lightly taken up, but the condensation of information which repeatedly struck us when perusing this Handy Book, convinced us that, whether or not Mr. Buchan may be inclined to attempt the more serious labour we have indicated, whosoever does undertake it, will do well to keep Mr. Buchan's book and its capital index at his elbow.

We wish authors would be a little more careful in spelling proper names. The last work we noticed was very guilty in this respect, and Mr. Buchan's is just as bad. We do not mind trifling variations, such as Trivandrum for Trevandrum, but who would recognise "Sakoutsh in Siberia," (page 71) as the same as "Yakutsk," (page 76); then we have one of Mr. Buchan's best observers repeatedly at Sandwich instead of Sandwick; and in one line we have Philip's instead of Phillips's, and Nigretti instead of Negretti.

We can hardly give a fairer specimen of the style of the work than by the following quotation on a subject which (though often discussed among observers) has not, we believe, been treated of in any previous publication:—

*Mean Temperature deduced from Maximum and Minimum Temperatures.*—Of late years, since the invention of self-registering thermometers, the mean temperature has been more commonly deduced from observations of the highest and lowest daily temperatures. How far does the mean of these two represent the mean temperature? To answer this question, I have compared the mean temperature deduced from hourly observations with the mean temperature of the daily extremes at 27 places in different parts of the globe. On an average of six months of the year, the difference between the two does not exceed the third of a degree; the difference for any month seldom exceeds a degree, and the mean annual difference seldom more than half a degree. At Rio Janeiro the difference for any month does not amount to 0°·3, whereas at Catherinenburg, in the Ural Mountains, it exceeds this amount in every month but one. In some places the differences are all in excess, in others they are all in defect; in some places an excess occurs in winter and a defect in summer, and in other places *vice versa*. In most places the great difference is in October and November, but in a few places the reverse holds good.

Comparing the Leith and Greenwich observations, we find that the mean annual deviation at Leith is 0°·2, at Greenwich 0°·7; the lowest monthly deviation at Leith 0°·1, and at Greenwich 0°·2; and the highest at Leith 0°·6, and at Greenwich 1°·1. It would appear that these differences are dependent almost entirely on local peculiarities, such as the open or confined situation of the thermometers,

the covering of the ground over which they are placed, the protection from radiation, and the degree of freeness with which the air circulates around them.

At the stations in connection with the Scottish Meteorological Society, the mean of the daily extremes is accepted as the mean temperature, and most meteorologists now adopt the same mean. Others, however, apply to this mean a correction, in order to bring it to what is conceived to be the true mean temperature. This is a practice which, for many reasons, ought to be discouraged. The mean of the daily extremes gives observation alone, whereas the "corrected" means are vitiated by misleading hypotheses. If an observer in the North of England gives the "corrected" mean temperature of August, 1865, as  $57^{\circ}3$ , what does this mean? If he has adopted the Greenwich correction for that month, the observed mean was  $58^{\circ}2$ , but if the Leith correction, it was  $57^{\circ}4$ . If two observers near each other should use the one the Leith correction, and the other the Greenwich, a difference in the climates of the two places would be indicated, which has in reality no existence.

Since penning the above remarks and extract, we have been comparing the numerical values with those given in Mr. Glaisher's Diurnal Range Tables (Taylor and Francis, 1850), the result being that we feel quite puzzled, and must appeal to Mr. Buchan for elucidation. The Greenwich table being a very short one, we quote it verbatim from the 1850 edition :—

"TABLE VIII.

*"Showing the corrections to be applied subtractively to the simple arithmetical mean of the readings of the maximum and minimum thermometers, to deduce from them the mean temperature of the air."*

January.....	0.2	May.....	1.7	September...	1.3
February ...	0.4	June .....	1.8	October.....	1.0
March .....	1.0	July.....	1.9	November ...	0.4
April.....	1.5	August ...	1.7	December ...	0.0"

The mean of these numbers is  $1.1$ , instead of  $0.7$ , the lowest is  $0.0$  instead of  $0.2$ , the highest  $1.9$  instead of  $1.1$ , and August is  $1.7$  instead of  $0.9$ . Perhaps Mr. Buchan has taken his values from some later publication; if so, we believe our readers will be as glad as we shall, to be supplied with the correct values. When this is cleared up, we may offer a few remarks on the question, which, in spite of the above-mentioned puzzle, we believe Mr. Buchan has ably investigated.

---

*Meteorological Report and Climatological Tables for 1866*, Edited by the Rev. R. F. WHEELER, M.A. 8vo, 26 pages. [Extract from the *Natural History Transactions of Northumberland and Durham*.]

AN able and interesting summary of the principal phenomena of the year, with tables of pressure, temperature, and rain, natural history calendar, &c. Among the notes on the meteor shower of November 13th-14th, 1866, is the following, by the Rev. R. E. Hooppell, M.A., of the Marine School, South Shields :—

"Immediately after the great shower of meteors a remarkable fall in the temperature took place. At Burghfield Grange [Gateshead] the average daily maximum for the seven days immediately preceding, had been  $51\frac{1}{2}^{\circ}$ , and the average daily minimum  $36^{\circ}$ . For the seven days immediately succeeding the shower the average daily maximum was only  $44^{\circ}$ , and the average daily minimum  $31^{\circ}$ . For the next seven days the average daily maximum and minimum rose again, being respectively  $47^{\circ}$  and  $39\frac{1}{2}^{\circ}$ . This remarkable diminution was very extensively observed. The Astronomer Royal's report, from the Cape of Good Hope, shows that it occurred there also, which is the more noticeable, as the season there would be approaching summer, and the temperature would be naturally increasing, not diminishing, from day to day."



*Meteorological Observations on the Humidity of the Air of Scarborough, with Chapters on Rain, Rain Gauges, and Rainfall Investigations, and on the Humidity of the Atmosphere in relation to Disease*, by CORNELIUS B. FOX, M.D. &c. Simpkin and Co. Small 8vo., vi.-40 pages. Profits arising from its sale to be devoted to the Scarborough Village Hospital.

IN this little book both author and publisher have done their best, and their best is very near perfection. It is a capital little monograph, free from favouritism, that bane of local works on climate. It is just to the beautiful Queen of British Watering Places, but it is no more than just. We only see one way in which it could have been improved, (and perhaps all would not think it an improvement,) namely, by the insertion of a table, giving the monthly and annual fall of rain at Scarborough so far as records have been preserved, instead of giving merely abstracts thereof.

Dr. Fox has done his work well, and we earnestly hope the sale of this cheap little pamphlet will equal its merits, then (though the price is but ninepence!) the Scarborough Village Hospital will reap profits even beyond Dr. Fox's anticipations.

## ENTRY OF MINIMUM TEMPERATURES.

*To the Editor of the Meteorological Magazine.*

SIR,—It will be obvious to anyone who examines the returns published in your Magazine that considerable diversity of practice exists among observers in entering the minimum temperature. For example, in the returns for April, at several places the minimum is recorded as occurring on the 1st, *i.e.*, the night March 31st–April 1st; at other places not very remote it is set down to the 11th, *i.e.*, the night April 11th–12th (the nights April 1st–2nd and 10th–11th were neither of them frosty).

I have been in the practice of entering the minimum to the preceding day, considering that by the night of 11th April would be popularly understood the night following that day. The astronomical reckoning from noon to noon is also in favour of this practice, but uniformity is so desirable that the minority should give way to the majority as soon as it can be ascertained which plan is generally adopted. Can you not obtain a general report, and settle this question?—Yours respectfully,

J. ALEXANDER.

Sudbury, May 31st, 1867.

[So far as we are at present aware, the practice of the Meteorological Society and the Scottish Meteorological Society is identical. The instructions of the former are :

“The maximum temperature usually takes place during the early afternoon hours, and whether the reading be taken after this time on the same day, or early on the next day, it must be entered opposite to the day to which it belongs—that is, on the same day as read, if taken late on the one day, or on the preceding when taken early on the morning of the following day. The minimum temperature usually takes place early in the morning, and the minimum read in the morning is generally the minimum for that day, and is to be so entered.”

The Scottish Meteorological Society direct that—

“The self-registering thermometers are to be read at 9 p.m. only, as indicating the greatest and least degrees of temperature in the 24 hours preceding. It is not a matter of indifference when the self-registering thermometers are read, since, in winter at least, the extremes may occur at any hour, and it is necessary to refer their occurrence to their proper meteorological day. In the Society's schedules the indications registered on the 3rd are those of a series of phenomena commencing at 9 p.m. on 2nd, and extending till 9 p.m. on 3rd.”

Thus both are in strict accord, and we think the sooner all observers unite in complying with these instructions the better.]—ED.

## RAINFALL AT CARDIFF.

SIR,—Just before your notice of Col. Capper's book on Meteorology, I had perused that work, and copied out the rainfall table to send to you. That table is not to be relied on as an accurate account of the rainfall in this district, the true quantity being very nearly double the colonel's measurement. There is no reason to suppose that the rainfall here has diminished, so I can only attribute the deficiency to imperfection in the colonel's rain gauge. This seems to me to raise a doubt as to the correctness of old records of rainfall, in the absence of any information stating the kind of gauge employed in taking the observations. This is especially the case when the register differs very widely from more modern measurements.—Yours faithfully,

FRANKLEN G. EVANS.

Tynant, Penttyrch, June 3rd, 1867.

[In reply to this note, we will first explain that as a rule we do not use old observations for determining the mean rainfall of the locality at which they were taken. We collect them with every care, test their accuracy as far as possible, and preserve them most securely, because they are our best and only guide to what may be termed secular rainfall variations—that is to say, the relation of each year to the mean of a series of years. In this respect it is obvious that if a gauge was so absurdly incorrect as always to indicate double the fall which actually occurred, it would not cause the least error in the ratio of fall in different years.

With reference to the case in point, we prefaced the insertion of the table by the following words, (*Meteorological Magazine*, Vol. II., p. 45):—"Of the size or position of the gauge nothing is said; from the amount we infer it must have been on a roof or wall." The letter of so careful an observer as Mr. Evans has induced us to examine the matter closely, with the following results:—

The rainfall in the years 1800-1807, we find from a table printed (but not yet published) in the forthcoming British Association Report, was 12 per cent. below the mean of the last 50 years. The observed amount being 23·76, the addition of this 12 per cent. only raises it to 26·61, which is certainly very different from the true fall, which is about 40 inches. A deficiency of one-third is therefore apparent, being the same deficiency as that found on the roof of Mr. Washington Moon's house in the Finchley-road, (*British Rainfall*, 1866, p. 27), thus supporting our suggestion that the gauge may have been on a roof. Unfortunately we have at present no records from the south-west of England or from Wales complete for these 8 years; we have therefore been compelled to fall back on distant stations for the formation of the following table:—

*Rainfall in England, 1800 to 1807.*

STATIONS.	1800	1801	1802	1803	1804	1805	1806	1807	Mean of 8yrs.
	in.	in.	in.	in.	in.	in.	in.	in.	in.
Chatsworth .....	27·73	28·35	23·34	24·27	27·90	22·23	30·08	26·37	26·28
Ferriby, Hull ...	29·50	26·25	23·92	26·25	26·50	24·50	30·87	27·00	26·85
Kendal .....	48·25	50·50	51·73	40·50	47·25	42·75	53·89	53·00	48·48
Lancaster .....	35·93	44·63	47·46	34·75	35·62	33·52	40·72	37·01	33·71
Manchester .. ...	32·34	35·05	35·74	27·47	29·31	27·54	33·49	35·50	32·06
Nottingham .....	27·00	26·50	21·00	17·00	23·50	22·12	25·56	23·33	23·25
Mean, 6 Stations	33·46	35·21	33·87	28·37	31·68	28·78	35·77	33·70	32·61
Cardiff .....	26·82	24·10	22·77	20·59	27·01	20·28	27·86	20·68	23·76
Ratio { 6 Stations	103	108	104	87	97	88	110	103	100
Cardiff ...	113	101	96	87	114	85	117	87	100

Considering the distance of Cardiff from even the nearest of these stations, we think the fluctuations as favourable to Colonel Capper's accuracy as could be expected.]—ED.

## MEASUREMENT OF SNOW.

*To the Editor of the Meteorological Magazine.*

Sir,—The following method for obtaining the equivalent volume of rain and snow might be advantageously adopted. Fill a tumbler with loose snow, which would be best done by placing the tumbler where a snow-drift is likely to occur, weigh the tumbler thus filled. Now fill with water and weigh again; subtract the weight of the tumbler in each case. Divide the weight of snow by the weight of water. A modulus will thus be obtained, by which if any given volume of snow is multiplied its equivalent in water will be found.—I am, yours obediently,  
J. S. W.

[J. S. W. is quite right in recommending us to weigh the snow instead of evaporating 10 per cent. in our attempts to melt it.].—Ed.

## METEOROLOGICAL PERIODS.

*To the Editor of the Meteorological Magazine.*

SIR,—I was faithless about the 29 years return of the same seasons until I read to the end of the statement of your correspondent, when it appears wonderful how similar *many* of the years are, and *dissimilar some*. But your correspondent does not give us 1838 to guide us as to this year of 1867; if there is any truth in it, there would be some use in being forewarned. I see, however, what 1809 was, which is 58 years ago, which was a fickle summer but a very hot May, and we may say there is some similarity thus far, for one week in May was very hot, thermometer 85° on the Monday.—I remain, Sir, yours truly,

Cambridge, May 22nd, 1867.

J. NUTTER.

## A SHOWER OF HAZEL NUTS!

*To the Editor of the Meteorological Magazine.*

SIR,—I enclose you two extracts from one of our Dublin papers relative to some berries, which are reported to have fallen in large quantities in some parts of Dublin on the night of Thursday, 9th May. I have been given two of these berries; they are in the form of a very small orange, about half an inch in diameter, black in colour, and, when cut across, seem as if made of some hard dark brown wood. They also possess a slight aromatic odour.

Various speculations have been given forth as to their origin, but none of them seem to be worth much. If you think the extracts herein, worthy of a place in your Magazine you can insert them.—Yours very truly,

ARTHUR PIM.

Monkstown, Dublin, June 1st, 1867.

### THE SHOWER OF BERRIES.

*To the Editor of the Daily Express.*

SIR,—I have been daily expecting to see some notice of the strange phenomenon which took place during the tremendous rain-fall of Thursday night. None having appeared in any of the journals, I hope, through your columns, the public may learn to what cause we are to attribute the shower of aromatic smelling berries which fell over Dublin (and, possibly, other parts) on Thursday night.

Both on the north and south sides of the river these berries fell in great quantities and with great force, some being larger than the ordinary Spanish nut.

Numbers of these strange visitors were picked up in Capel-street, in Dame-street, and Bishop-street, and I am informed that so violent was the force with which they descended that even the police, protected by unusually strong head covering, were obliged to seek shelter from the aerial fusilade!—Yours truly,

T.C.D., May 13th, 1867.

RUSTICUS EXPECTANS.

INQUIRER, who has sent us some "small balls," which he says "fell in large quantities on Thursday night," locality not specified, is informed that they are simply hazel nuts, preserved in a bog for centuries. How they came to descend on him we cannot say.

MAY, 1867.

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
		Total Fall.	Difference from average 1860-5	Greatest Fall in 24 hours.		Max.		Min.				
				Dpth	Date.	Deg.		Date.	Deg.	Date.		
		inches	Inches.	in.				Deg.	Date.	Deg.	Date.	
I.	Camden Town .....	2.45	+	.05	1.03	20	9	84	6	31.8	23	
II.	Staplehurst (Linton Park) ...	2.35	—	.11	.59	11	12	85	7	29	23†	
	Selborne (The Wakes).....	1.66	—	.81	.40	25	12	77	6	25	4	
III.	Hitchen .....	3.03	+	.55	1.13	10	11	75	6, 8	30	22§	
"	Banbury .....	3.02	+	.80	.83	10	10	79	8	29.7	23	
"	Wisbech .....	3.51	...	...	1.62	10	9	84	6	32.3	23	
IV.	Bury St. Edmunds (Culford).	2.65	+	.49	1.14	12	10	80	6	27	24	
V.	Calne .....	1.80	...	...	.49	20	9	79.5	8	28.8	25	
"	Plymouth (Goodamoor) .....	...	...	...	...	...	...	...	...	...	...	
"	Barnstaple .....	2.63	+	.20	.35	11	13	...	...	...	...	
"	Taunton (Fulland's School)	2.88	+	.83	.65	13	14	89.5	30	33	17	
VI.	Shrewsbury (Highfield) .....	2.73	+	.13	.72	12	11	...	...	...	...	
"	Tenbury (Orleton) .....	2.25	—	.64	.52	25	13	78.7	8	31.4	25	
VII.	Leicester (Wigston) .....	2.02	—	.46	1.02	11	10	85	8	27	23	
"	West Retford .....	...	...	...	...	...	...	...	...	...	...	
"	Derby .....	1.73	—	.43	.56	10	11	78	8	33	17	
VIII.	Manchester .....	1.95	—	.71	.38	27	9	76	5, 6	32	23	
IX.	York .....	1.78	—	.17	.43	26	17	71	9, 30	33	23	
"	Skipton (Arnccliffe) .....	2.42	—	.93	.40	11	12	69	30	32	23	
X.	North Shields .....	2.32	—	.32	.84	11	15	...	...	...	...	
"	Borrowdale (Seathwaite).....	5.25	—	4.29	.94	18*	14	...	...	...	...	
XI.	Abercarn .....	4.70	...	...	.93	13	13	72	9	36	23¶	
"	Haverfordwest .....	4.15	+	1.43	.84	21	14	74	8	31.9	22	
"	Rhayader (Cefnfaes).....	...	...	...	...	...	...	...	...	...	...	
"	Llanberis (R. Victoria Hotel)	2.44	...	...	.91	25	11	...	...	...	...	
XII.	Dumfries .....	2.85	+	.46	.43	11	15	73	8	31.5	25	
"	Hawick (Silverbut Hall)....	2.46	...	...	.60	26	17	...	...	...	...	
XIV.	Ayr (Auchendrane House) ...	1.51	—	1.60	.42	11	13	74	8, 31	28	22	
XV.	Otter House .....	1.67	—	2.07	.31	10	12	66	8, 30	32	22	
XVI.	Leven (Nookton) .....	4.47	+	2.47	1.08	26	15	64	6	33.4	14	
"	Stirling (Deanston) .....	3.89	+	1.24	.89	11	17	69	30	30.3	23	
"	Logierait .....	2.82	...	...	.63	11	16	...	...	...	...	
XVII.	Ballater .....	2.54	...	...	.10	11	18	66.5	6	29	26	
"	Aberdeen .....	2.68	...	...	1.15	11	18	67.3	7	32.7	14	
XVIII.	Inverness (Culloden) .....	1.59	...	...	.40	17	12	64.6	6	33.6	26	
"	Fort William .....	2.01	...	...	.40	31	16	67	8	32	23	
"	Portree .....	3.08	—	2.57	.65	16	13	76.5	27	31.8	23	
"	Loch Broom .....	1.91	...	...	.57	16	14	...	...	...	...	
XIX.	Helmsdale .....	2.18	...	...	.54	11	17	...	...	...	...	
"	Sandwick .....	1.11	—	1.15	.21	4	12	...	...	...	...	
XX.	Cork .....	5.37	...	...	1.45	25	20	...	...	...	...	
"	Waterford .....	5.19	+	2.94	1.55	26	21	67	29	39	16**	
"	Killaloe .....	3.45	+	.27	.61	10	15	70	19	29.5	23	
XXI.	Portarlinton .....	3.56	+	.37	.76	11	18	69	9	31	22	
"	Monkstown .....	3.07	+	1.17	.75	10	14	68.5	3, 12	32.5	23	
XXII.	Galway .....	4.67	...	...	.99	12	19	73	23	40	12††	
"	Bunninadden (Doo Castle) ...	4.62	...	...	.70	10	18	66	30	28	23	
XXIII.	Bawnboy (Owendoon) .....	4.94	...	...	.75	10	20	...	...	...	...	
"	Waringstown .....	2.93	...	...	.59	16	13	73	30	28	22	
"	Strabane (Leckpatrick) .....	3.12	...	...	.49	10	14	68	8†	31	23	

\* And 27th. † And 9th &amp; 30th. ‡ And 24th. § And 23rd &amp; 24th. || And 24th. ¶ And 24th.

\*\* And 23rd. †† And 14th.

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

MAY, 1867.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which Fall in 24 hours. or more fell.	TEMPERATURE.				No. of nights below 32°.
		Total Fall.	Difference from average 1860-5	Greatest Fall in 24 hours.				Max.		Min.		
				Dpth.	Date.	Deg.		Date.	Deg.	Date.		
											inches.	
I.	Camden Town .....	2.45	+ .05	1.03	20	9	84	6	31.8	23	1	
II.	Staplehurst (Linton Park) ...	2.35	— .11	.59	11	12	85	7	29	23†	5	
	Selborne (The Wakes).....	1.66	— .81	.40	25	12	77	6	25	4	6	
III.	Hitchen .....	3.03	+ .55	1.13	10	11	75	6, 8	30	22§	3	
"	Banbury .....	3.02	+ .80	.83	10	10	79	8	29.7	23	4	
"	Wisbech.....	3.51	—	1.62	10	9	84	6	32.3	23	0	
IV.	Bury St. Edmunds (Culford) ..	2.65	+ .49	1.14	12	10	80	6	27	24	3	
V.	Calne .....	1.80	—	.49	20	9	79.5	8	28.8	25	3	
ENGLAND.	Plymouth (Goodamoor) .....	...	...	...	...	...	...	...	...	...	...	
	Barnstaple .....	2.63	+ .20	.35	11	13	...	...	...	...	...	
	Taunton (Fulland's School) ..	2.88	+ .83	.65	13	14	89.5	30	33	17	0	
	Shrewsbury (Highfield) .....	2.73	+ .13	.72	12	11	...	...	...	...	...	
	Tenbury (Orleton) .....	2.25	— .64	.52	25	13	78.7	8	31.4	25	2	
	Leicester (Wigston) .....	2.02	— .46	1.02	11	10	85	8	27	23	3	
	West Retford .....	...	...	...	...	...	...	...	...	...	...	
	Derby.....	1.73	— .43	.56	10	11	78	8	33	17	1	
	Manchester .....	1.95	— .71	.38	27	9	76	5, 6	32	23	0	
	IX.	York .....	1.78	— .17	.43	26	17	71	9, 30	33	23	0
WALES.	Skipton (Arncliffe) .....	2.42	— .93	.40	11	12	69	30	32	23	0	
	North Shields .....	2.32	— .32	.84	11	15	...	...	...	...	...	
	Borrowdale (Seathwaite) .....	5.25	— 4.29	.94	18*	14	...	...	...	...	...	
	Abercarn .....	4.70	—	.93	13	13	72	9	36	23¶	0	
	Haverfordwest .....	4.15	+ 1.43	.84	21	14	74	8	31.9	22	1	
	Rhayader (Cefnfaes) .....	...	...	...	...	...	...	...	...	...	...	
	Llanberis (R. Victoria Hotel) ..	2.44	—	.91	25	11	...	...	...	...	...	
	Dunfriess .....	2.85	+ .46	.43	11	15	73	8	31.5	25	1	
	Hawick (Silverbut Hall) .....	2.46	—	.60	26	17	...	...	...	...	...	
	XIV.	Ayr (Auchendrane House) ...	1.51	— 1.60	.42	11	13	74	8, 31	28	22	2
SCOTLAND.	Otter House .....	1.67	— 2.07	.31	10	12	66	8, 30	32	22	1	
	Leven (Nookton) .....	4.47	+ 2.47	1.08	26	15	64	6	33.4	14	0	
	Stirling (Deanston) .....	3.89	+ 1.24	.89	11	17	69	30	30.3	23	3	
	Logierait .....	2.82	—	.63	11	16	...	...	...	...	...	
	Ballater .....	2.54	—	.10	11	18	66.5	6	29	26	3	
	Aberdeen .....	2.68	—	1.15	11	18	67.3	7	32.7	14	0	
	Inverness (Culloden) .....	1.59	—	.40	17	12	64.6	6	33.6	26	0	
	Fort William .....	2.01	—	.40	31	16	67	8	32	23	...	
	Portree .....	3.08	— 2.57	.65	16	13	76.5	27	31.8	23	1	
	Loch Broom .....	1.91	—	.57	16	14	...	...	...	...	...	
IRELAND.	Helmsdale .....	2.18	—	.54	11	17	...	...	...	...	...	
	Sandwick .....	1.11	— 1.15	.21	4	12	...	...	...	...	...	
	Cork .....	5.37	—	1.45	25	20	...	...	...	...	...	
	Waterford .....	5.19	+ 2.94	1.55	26	21	67	29	39	16**	0	
	Killaloe .....	3.45	+ .27	.61	10	15	70	19	29.5	23	1	
	Portarlington .....	3.56	+ .37	.76	11	18	69	9	31	22	1	
	Monkstown .....	3.07	+ 1.17	.75	10	14	68.5	3, 12	32.5	23	0	
	Galway .....	4.67	—	.99	12	19	73	23	40	12††	0	
	Bunninadden (Doo Castle) ...	4.62	—	.70	10	18	66	30	28	23	2	
	Bawnboy (Owendoon) .....	4.94	—	.75	10	20	...	...	...	...	...	
"	Waringstown .....	2.93	—	.59	16	13	73	30	28	22	2	
	Strabane (Leckpatrick) .....	3.12	—	.49	10	14	68	8†	31	23	1	

\* And 27th. † And 9th &amp; 30th. ‡ And 24th. § And 23rd &amp; 24th. || And 24th. ¶ And 24th.

\*\* And 23rd. †† And 14th.

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

# METEOROLOGICAL NOTES ON THE MONTH.

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.

LINTON PARK.—T on 10th, 11th, and 29th; frost on 17th, 22nd, 23rd, 24th, and 25th. Altogether a very remarkable month; very hot from 4th to 11th, while from the 20th to 26th it was very cold; S falling in sufficient quantities on the 23rd to cover the ground, and the frosts very destructive to vegetation; the last few days more mild.

SELBORNE.—Rapid advance in vegetation during the first part of the month, but the effects of the frosts of the 23rd to 25th, inclusive, were most disastrous, potatoes, french beans, and dahlias destroyed, young leaves of ash, walnut, and oak blackened as if burnt, gooseberries and currants as if parboiled; the cold for those four days has not been equalled in May within my memory. T with H on 10th.

HITCHEN.—On the 10th a storm almost equal to the famous one of July 7th, 1865.

BANBURY.—L on 9th, and violent TS on 10th; balls of S and H on 22nd. Lilac in flower on 4th, hawthorn on 6th.

WISBECH.—Heavy TS with very vivid L on 10th; ground covered with H on 22nd. Walnut in leaf on 3rd, oak on 6th, lilac in bloom on 3rd, laburnum on 8th, honeysuckle 9th, mountain ash 13th, syringa on 27th.

CULFORD.—The weather during the month has been of a most extraordinary character; up to the 12th day the temp. was almost tropical, when a most remarkable change took place. Sharp frost on the night of the 16th, but most severe from the 21st to the 25th; great injury to crops; shoots of oak, ash, walnuts, &c. blackened, garden vegetables injured, some destroyed, and tender flowers killed.

CALNE.—Swifts arrived on 6th; downs white with S on 22nd.

TAUNTON.—L at 10.30 p.m. on 9th, and heavy T at noon on 10th. Hot at the beginning and end of the month, but so cold in the middle as to retard vegetation for about a fortnight.

SHREWSBURY.—H storms on 22nd.

WIGSTON.—This month will be memorable for the very unusual range of temp., being 58°; the heat at the end of the month more than compensated for the coldness previous to the 25th, the mean of the month being above the average for May. Vegetation forward except corn; slight S showers on 22nd and 23rd.

DERBY.—May opened at a summer heat, then relapsed into winter, the ground frosts on several nights having injured the young potatoes and kidney beans, though at 5 feet from the ground the ther. never registered less than 33°, and that only on one night.

ARNcliffe.—S on 22nd.

NORTH SHIELDS.—TSS on 6th, 10th, and 28th; S on 15th, 23rd, and 24th; H on 13th, 14th, 21st, and 22nd.

SEATHWAITE.—Dry month, no day on which 1.00 in. of R fell.

## W A L E S.

ABERCAEN.—A cold ungenial month, with a prevalence of N. and E. winds till the 26th; a blighting hoar frost on the 24th. Alternations of heat and cold very sudden.

HAVERFORDWEST.—First week spring-like, and some days quite summerish, after which it was wet, cold, and stormy. Such a May cannot be remembered.

## S C O T L A N D.

DUMFRIES.—First ten days warm with much T and R; from 12th to 26th cold northerly winds with occasional frosts; from 26th to close, warm during the days with copious R at night. Extraordinary TSS on 6th and 8th; heavy H on 8th; S on 22nd and 26th. Vegetation checked for a fortnight in the middle of the month, but at the close great progress, with abundance of sunshine and showers; hawthorn in blossom on 19th; early potatoes injured by the frosts on 22nd & 25th.

SILVERBUT HALL, HAWICK.—T on 6th 8th and 22nd; H and S on 13th, 21st, 22nd, 23rd, and 24th; hard frost on 24th. The swallows have nearly all disappeared from this district; landrail heard on 17th.

AUCHENDRANE HOUSE.—This has been a month of very small rainfall, strong



evaporation, and most unseasonable extremes of temp. By the exposed black bulb on short grass the highest *day* temps. were on the 2nd, 14th, 22nd, 23rd, 24th and 25th, being 99°, 95°, 96°, 102°, 92°, 98° respectively, and the lowest night temps. were 33°, 30°, 26°, 24°, 32°, and 28° respectively. The destruction to early vegetation has been excessive, and even the trees have suffered, particularly in low situations; no S in this district.

OTTER HOUSE.—R much below the average. Rather a cold and ungenial month; easterly winds prevailing, and the thermometer ranging from 32° to 66°; at the end of month beautiful summer weather, and the crops looking well.

NOOKTON.—Cold and ungenial month.

DEANSTON.—Except on four days during the month, easterly winds have prevailed; these were very cold and occasionally very strong. All vegetation very backward; at the end of the month the hawthorn blossom not out, and lilac and laburnum only coming out.

LOGIERAIT.—A few fine days at commencement; cold E. winds from 12th to 27th, which greatly retarded vegetation; closing week more genial. Corncrake heard on 12th.

BALLATER.—The weather of the past month has been stormy and disagreeable; prevailing wind easterly, checking vegetation; on the 12th, 14th, and 22nd, the hills were white with S; grass and oats continue to look well in this quarter, but things generally are three weeks later than usual; H and S on 22nd.

ABERDEEN.—Ground white with S on 22nd; a month of ungenial weather, with little wind; 22 days from N.E., E., and S.E., and much fog. Bar. rather above average. Mean temp. nearly 3° below the mean of last 10 years; rainfall above the average of same period.

FORT WILLIAM.—Greater part of the month cold and ungenial, but less so probably than in England; there was S on the hills on the 16th, but none on the low ground; the total fall of R was about equal to the corresponding month last year, and less than half that of May, 1865.

PORTREE.—This month very cold, more than the usual amount of N.E. wind; frost under the average for this month. Grass is making wonderful progress; cattle much improved in condition. Solar halo on the 24th. No gales during the month.

LOCHBROOM.—This month may be considered dry, but very cold for May. Vegetation of every kind is remarkably late, and the rest of the season must be unusually favourable, or the harvest will be both late and scanty; the last two days give promise of better things.

SANDWICK.—Aurora on 1st and 2nd; cold E. winds on 22 days; mean temp. the lowest since 1855.

#### I R E L A N D.

MONKSTOWN.—A very variable month, commencing warm, very cold during part of the latter half, and closing warm and seasonable. The crops and vegetation have been considerably retarded by the cold, but no serious damage to them has taken place, the cold not having been nearly so severe as in England. On 29th the dry bulb stood at 64°·7, and the wet at 57°·5, showing a difference of 7°·2.

DOO CASTLE.—Large breadth of oats sown here at the beginning of the month, and, with regard to the state of the soil for the reception of the grain, without any visible advantage to compensate for the long delay. A wet month, except from 18th to 25th, when we had cold, piercing E. winds, and dark sunless days, which, as the farmers about here say, put everything back again into the ground. All descriptions of farming operations behind hand; frost on 22nd and 23rd which injured potatoe-tops, particularly in moory and boggy land; more than 100 sheep have died in the adjoining county from the effects of cold after being shorn.

OWENDOON.—S on mountains on 12th; T S on 27th; potatoes injured on 22nd.

WARINGSTOWN.—The early part of the month was cold, with harsh winds and bright sun; the heavy rainfall from the 25th to the 29th softened the air, and the rest of the month was genial.

LECKPATRICK.—Fine till the 9th, then a succession of R and cold easterly winds retarded all agricultural progress; only one frosty night, but cherries, gooseberries and pears injured by the cold, and the crop will be deficient. Potatoe planting very late; turnips sown last week.

# SYMONS'S

## MONTHLY

# METEOROLOGICAL MAGAZINE.

XVIII.]

JULY, 1867.

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

### ANEMOMETERS.

(Continued from page 53.)

THE next instrument requiring notice, and the one by far most frequently used, is Robinson's Hemispherical Cup Anemometer, the notice of which in Admiral Fitz Roy's *Weather Book* is so thoroughly to the point, that we can hardly do better than quote it :—

“Wind-gauges have been tried ; that by Lind—also a modification of it by Sir W. Snow Harris—and the well-known pressure plate ; but these seem to yield only partial, if not equivocal results. The beautiful cup and dial anemometer (due to Robinson chiefly, if in some degree suggested by Beaufort or Edgeworth,) is more approved, after having been tried experimentally through several years of exposure.

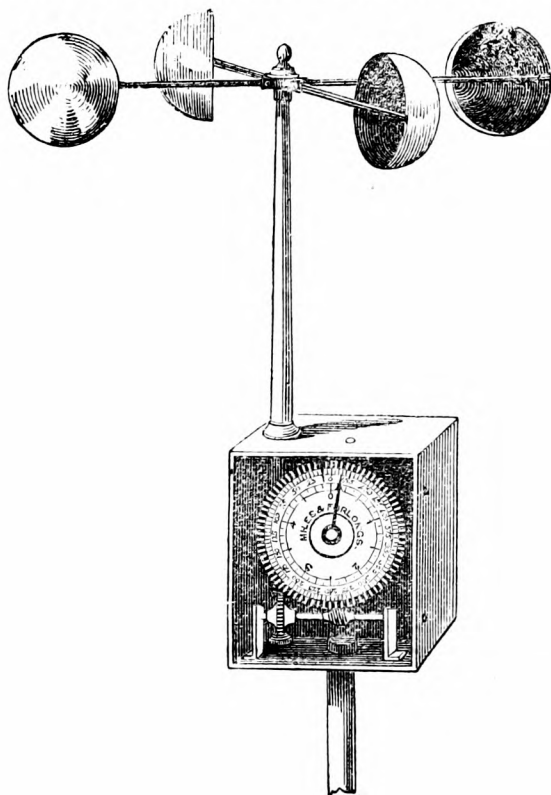
“Dr. Robinson showed (in the Transactions of the Royal Irish Academy) that a current of air is opposed by a concave hemisphere, one-fourth more than by a convex one of the same size. Thence experimental trials and mathematical reasoning induced him to adopt the arrangement now general, namely, four hemispherical cups, on horizontal arms, revolving on a friction roller axis, at a known proportional rate, one-third slower than the passage of air or wind current. Hence velocity, and, from it, pressure, are readily calculated.”

Two modes of indicating the number of revolutions made by the cups have prevailed. The first consisted of an endless screw on the axis working into the right hand of a train of 5 dials, each of which revolved ten times for one revolution of the next to the left, the dial next the endless screw showing 10 revolutions, the next showed 100, then 1,000, 10,000, and lastly 100,000. The reading was, therefore, taken as in a gas meter, from left to right, the figures being noted down as read off, it being remembered that if the index points *between* two figures, the lesser of the two is to be taken. To take an imaginary case :—At 9 a.m., June 17th, the hands (counting from left to right) pointed to 176,420, and at the same hour on the 18th they read 297,340; then  $297,340 - 176,420 = 120,920$  has been the number of revolutions in the 24 hours. The dimensions of these instruments are understood to be such that the circle described by the centre of each cup is  $\frac{1}{3} \frac{1}{6} \frac{1}{8}$  of a mile—the amount of wind requisite to produce this being  $\frac{1}{3} \frac{1}{6} \frac{1}{8}$  of a mile ; 500 revolutions equal one mile. Therefore  $(\frac{120,920}{500} = 241.84$



miles) in the case supposed, about 242 miles of wind had passed in the course of the day, that is to say, just 10 miles an hour. It is almost needless to point out that if the three left hand dials alone are read, (for example as above, 176 and 297, then  $297 - 176 = 121$ ), and the result doubled, it gives at once the miles passed  $121 \times 2 = 242$  miles.

Fig. 3.



To Mr. Casella, we believe, is due the improved mode of indicating shown in fig. 2, whereby one dial is substituted for five, and the record is read off in miles at sight. Two further improvements on fig. 2 have since been adopted, so that the record is now read off in miles and tenths, instead of miles and furlongs as shown; and secondly, by the adding another dial, it is made available for examination at long intervals. Another modification was introduced by Messrs. Negretti and Zambra, in which the registering wheels could be disconnected from the cups, and wear and tear thus avoided. Of course by this modification continuous records are not obtained. The price of these instruments ranges from £3 to £5.

*Position desirable for Anemometers.*—This all important, yet utterly neglected matter, may be advantageously considered before we proceed

to notice the more expensive class of anemometers. The only instructions we can find are, "It should be fixed in an exposed situation, as high above the ground as may be convenient for reading."\* "When in use, it may be screwed on a shaft or ordinary piece of gas pipe, which accompanies it, and elevated to any desirable altitude."† In the instructions of the Scottish Meteorological Society, it is stated that "A wind vane ought to be elevated 12 ft. at least above surrounding objects;" but though "the Council would strongly recommend that every observatory be furnished with a Hemispherical Cup Anemometer," they do not say where it should be fixed.

In this recommendation of the cup anemometer for *general* use, we fully concur, and would gladly render all the aid in our power if some one with leisure volunteers as superintendent of an Amateur Anemometrical Association. We are certain that good results are within reach, but some preliminaries must first be attended to. Of these the most important are—(1) testing the anemometers, and (2) taking observations for a few months with several instruments differently placed, but near together. The desirability (not to say necessity) of testing the instruments is so obvious, that it is unnecessary to dwell upon it. We trust that some steps will be taken to provide this security at a reasonable charge—say five shillings; and we would recommend that observers already provided with anemometers should send theirs to be tested, so that all might start fair.

We think the second preliminary indispensable, for the confusion and irregularity in the location of anemometers can only be realized by those who have visited a considerable number of observers. Let us jot down a few as examples. A has his anemometer on a pole 6 ft. above ground, while B has his on a pole 10 ft. above ground, and has a pair of steps to enable him to read it; C has it on a sentry box 12 ft. high, and with steps up the side; D goes higher still, having a stout pole 20 ft. high, with cross bars, up which he climbs like a bear; E being perhaps too stout for this performance, mounts his among the chimney pots on the top of his house, where the anemometer and himself get sadly begrimed; F has a long rod to bring the registration in doors, while G has an elaborate electrical arrangement whereby the motion of the cups on a distant hill is registered in his library. Surely the time has come when such differences should be swept away. What reliance can we place on records from instruments so variously circumstanced? Experiment alone can give us the relative motion

---

\* Negretti's Treatise on Meteorological Instruments, p. 121.

† Casella's Catalogue, p. 29.

recorded at different heights above the surface of the ground. These, however, would be very easy to conduct and discuss; the expense would probably be about £20 or £30. We conceive that an open, level station should be selected, and anemometers placed with their cups 10, 20, and 30 ft. above the ground mounted on poles, or better still, on ladders steadied by guys—not that the observer need climb daily to the top (for he can easily read them with a telescope), but that access may be practicable for oiling, &c., when necessary. One should also be placed on the roof of the house, that we may learn the amount of motion due to such a position. Without forestalling the results of the investigation (if taken up), we may record our impression that such positions always register much in excess of the truth.

(To be continued.)

## Abstracts of Meteorological Works. No II.

PUBLISHED A.D. 1783.

*Essais sur l'Hygrométrie.* Par Horace-Bénédict de Saussure, Professeur de Philosophie à Geneve. Neuchatel, Samuel Fauche; quarto, xxiv—367 pages, 2 plates.

It is rather a noteworthy coincidence that two of the most forward steps in hygrometry are mainly due to the illness of those by whom they were taken. Although Gay Lussac used a dry and wet bulb thermometer in 1822, it is to Dr. Mason that we are indebted for its introduction into this country, he being led, while residing in Madeira for the benefit of his health, to devise the arrangement so well known as Mason's hygrometer, which, slightly modified by Mr. Glaisher, now leaves nothing to be desired in that branch of research. So again with Saussure in 1780. Surprised by illness in the midst of his "*Voyages dans les Alpes*," even on the ridge of a lofty mountain, he was compelled to postpone his laborious researches, to return to Geneva, and, during his forced residence there, he perfected the hygrometer, the rough idea of which he had conceived five years previously, compiled a portion of the work now under notice, and prepared some of his new instruments for his mountain tours in 1781, the results whereof are discussed in this volume.

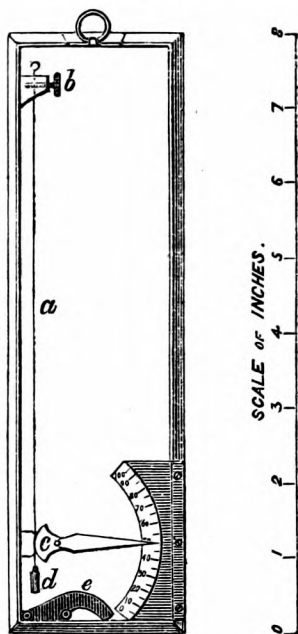
The four essays have the following titles:—

- I. Description of a new comparable hygrometer.
- II. Theory of hygrometry.
- III. Theory of evaporation.
- IV. Application of the preceding theories to some meteorological phenomena.

The first essay may be rapidly disposed of, the hygrometer therein described being now superseded. Saussure's hygrometer, as is generally known, consisted of a single hair, freed from unctuousity, and stretched by a slight weight, one end being fixed, and the other attached to the

short arm of a lever ; the long arm thereof of course multiplied the expansion and contraction of the hair produced by variations of humidity, and thus rendered them visible. The arrangement will be clearly understood by reference to fig. 3, where (a) is, the hair attached to the framework by the screw (b,) its bottom is fastened to the back of the index (c), and continued tension is ensured by the small weight (d) also attached to (c.) Of course if the hair contracts, the index will be carried towards 0, and if it elongates towards 100, the dark arm (e) is hinged to the corner of the frame, and designed to clamp the instrument when travelling.

Fig. 3.



It appears that the variation in the length of a healthy hair between the extremes of dryness and moisture is  $\frac{1}{42}$  of its length, and this, we need hardly say, afforded in careful hands a useful approximation, though one to be superseded. Many reasons rendered Saussure's hygrometer better than its precursors, many reasons caused it to give place to the dry and wet bulb thermometer. Foremost among the former was its portability, which, as compared with previous ones, was very great, while among the objections which caused its abandonment, none was greater than the loss of sensibility which gradually supervenes.

It will be interesting to quote Saussure's description of a few of the hygrometers in use before his was brought out, the first class consisting of strings, animal fibres, and other substances which elongate or contract with damp. Of course his own hair hygrometer was but the best of these, but he rightly points out that though they had been made, no one had examined the effect on any of them of variations in the pressure, density, movement, &c., of the air, nor had they even examined if the varying indications of the instrument were proportional to the amount of vapour in the air. The second class is based on the principle that the drier air is, the more water it can absorb, and on this M. Le Roi constructed an hygrometer, which Saussure says led to "enormous errors;" he goes on to describe one of these experiments, and as there is something erroneous in the account thereof, we transcribe it *literatim* :—

"On a, par exemple, renfermé une quantité d'eau bien déterminée dans un vase exactement luté ; au bout d'un certain tems on a mesuré la diminution de cette eau, et l'on a cru que l'air contenu dans le vase s'étoit chargé de tout le déficient, sans penser que cette eau avoit toujours continué de s'évaporer, même après la parfaite saturation de l'air, parce que les vapeurs se condensant contre les parois du vase, il se faisoit une vraie distillation, qui auroit pu consommer à la longue une quantité d'eau, pour ainsi dire illimitée."

The third class may be shortly described as dew point instruments. For example, the Academicians of Cimento took a conical glass vessel, which they kept full of broken ice or snow ; they suspended this vessel point downwards in the open air, the moisture was condensed on the surface of the glass, and distilled drop by drop from the point of the cone, the greater or less frequency of the drops indicated to them the degree of humidity of the air. L'Abbé Fontana rendered this more portable by taking a plate of glass, quite clean and well polished, and of known weight ; this he cooled to a certain temperature, exposed to the air for a certain time and then reweighed, the increase showing the amount of condensation. Lastly, M. Le Roi adopted a still more simple method, merely standing a glass of water in the air and at the air temperature, then gradually cooling it by the addition of iced water, until dew was deposited on the glass, when he noted the temperature of the water, and "judged the air more or less damp according to the degree of cold necessary to produce this deposition." Poor Saussure, here was the dew point instrument all but completed, and yet he proceeds to demolish it in the following paragraph :—

"These ingenious processes do honour to those who have invented them, and may even sometimes be useful, but if we consider that we can seldom make use of the closed vessel, and never employ any of them when the air is below freezing point, nor when the air is very dry, and that besides, the least particle of grease, and other causes difficult to avoid, may disturb the precipitation of this dew, and cause uncertain results, we can easily see that it will be very difficult for any such hygrometer to become universal. I have often tried M. Le Roi's process, with this difference, that instead of using ice, which is not easily carried about, I employed powdered sal ammoniac, which I throw little by little into the water, and which, when the air is not very dry, cools it sufficiently to produce condensation, but when I repeat it at short intervals, and when the air apparently remains unchanged, I do not always find the deposition commences at the same temperature."

(To be continued.)

#### DRYNESS OF THE AIR ON JUNE 27TH.

THE greatest difference between the dry and wet I remember noticing previous to this year was 20°·4 on June 28th, 1857, but as the temperature then was very high (dry 90°·4, wet 70°·0), the humidity on the natural scale was 33°, that is to say, the air contained just one-third of the quantity of moisture which it would hold if in a state of saturation.

On the 27th of last month the following readings were taken :—

*Hygrometrical Observations at Camden Road, N. W., June 27th, 1867.*

Lat. 51° 33' N. ; Lon. 0° 8' W. ; Height above Sea, 100 ft.

4 ft. above ground.				20 ft. above ground.		
Time.	Dry Bulb.	Wet Bulb.	Humidity.	Dry Bulb.	Wet Bulb.	Humidity.
	Deg.	Deg.	0—100.	Deg.	Deg.	0—100.
9 a.m. ...	67·0	51·4	35	66·8	53·3	44
Noon ...	71·4	54·6	34	71·0	57·0	41
1 p.m. ...	76·4	57·6	32	75·5	60·0	39
2 p.m. ...	78·3	58·1	30	77·1	59·9	36
3 p.m. ...	78·5	58·1	29	78·0	60·8	37
4 p.m. ...	77·6	58·0	31	76·5	60·5	38

From this we learn (1) that the dryness was 4 per cent. greater this year than previously noted at this station; (2) that the dryness was much greater near the earth than at 20 ft. above it; (3) In both cases the greatest drought was preceded by a period of easterly winds and high barometer; in both the rainfall was similar in quantity and in the few days on which it fell. Just as the dryness was greatest in 1867, so also was the range of temperature, which amounted to  $35^{\circ}\cdot 1$  ( $80\cdot 0 - 44\cdot 9$ ) in 1867, against  $31^{\circ}\cdot 3$  ( $91\cdot 7 - 60\cdot 4$ ) in 1857.

136, Camden Road, *July 1st.*

G. J. SYMONS.

P.S.—Dry as the air was here, it was even drier at Aldershot, where at the same hour as I had  $29^{\circ}$  of humidity, Mr. Arnold had only  $22^{\circ}$ , his readings at 3 p.m., 27th, being dry  $82^{\circ}\cdot 0$ , wet  $57^{\circ}\cdot 0$ , humidity  $22^{\circ}$ .

## HEAVY RAINFALL AT WORTHING, JUNE 3RD, 1867.

*To the Editor of the Meteorological Magazine.*

SIR,—I think it quite worth my while to bring before your readers some particulars of the heavy downpour of rain we had here on the night of June 2nd and 3rd.

After a magnificent summer day of intense heat, the thermometer standing at  $75^{\circ}$  Fah. in the shade, and the barometer (corrected to  $32^{\circ}$  and sea level) having fallen from  $30\cdot 031$  at 9 a.m. on the 2nd to  $29\cdot 721$  in. at 9 a.m. on the 3rd, after which period the mercury began to rise again; symptoms of an approaching storm began to show themselves in the course of the evening. Rain began to fall about 10 p.m. on the night of the 2nd, and continued without cessation for five and a half hours, viz., till about 3.30 a.m. of the 3rd. The greatest downpour, however, took place between 12 midnight and 1.15 a.m., when for about three quarters of an hour the rain came down in a perfect sheet of water, with *very* little hail. During the whole of this period the thunder was very loud, and the lightning most vivid.

On measuring the contents of my rain gauge next morning, I found the large amount of  $2\cdot 08$  inches in the receiver. This is almost equal to a fifteenth part of our yearly average, and is considerably in excess of the monthly average for June. I beg to annex to this a table, which I have deduced from the Registrar-General's returns for the town, whereby you will perceive that our yearly average for the last five years is  $30\cdot 72$  inches, and that for the month of June is  $1\cdot 98$  inches.

The thunderstorm which passed over this neighbourhood was not altogether *local*, but I am pretty sure we were almost the centre of the same.

I may, perhaps, remark that the highest reading of the barometer here this last month was (corrected and reduced to  $32^{\circ}$  and sea level)  $30\cdot 541$  inches at 9 a.m. on the 27th, the highest reading of the thermometer in the shade being  $79\cdot 75^{\circ}$ .

Yours truly,

W. J. HARRIS.

*Worthing, July 3rd, 1867.*

*Table as above, in inches.*

	Yearly Total.	Total for June.
1862 .....	32·9	1·8
1863 .....	28·7	3·6
1864 .....	24·3	1·1
1865 .....	35·7	1·1
1866 .....	32·0	2·3

Mean average for 5 yrs. 1862–66...  $30\cdot 72$       Mean for June...  $1\cdot 98$

P.S.—There have only been *five wet days* this past month, and the total fall has been  $2\cdot 45$  inches. The last 16 days of the month were perfectly fine.

## THE STORM AT STEYNING.

*To the Editor of the Meteorological Magazine.*

SIR,—The bar. fell about 0·2 in. between 9 a.m. and 9 p.m. on June 2nd, and was followed by a remarkable thunderstorm between 12.40 and 2.40 a.m. 3rd, the rain falling in a way not often known except in the tropics. The lightning was a magnificent display, one flash preceding the report only by one second, the thunder crashing or rattling according to distance, but in the nearest flash seeming to *split* the obstructing medium with a snapping explosion.

The fall of rain, which began steadily at 10 p.m. 2nd, and continued with slight intermission until the deluge of the storm began about 1 a.m. 3rd, after which it moderated about 1.50 a.m., and had ceased entirely before 5.30 a.m., amounted by my rain gauge to the enormous quantity of 2·44 inches. I believe the most of this fell between 1 and 2 a.m., and all between 10 p.m. 2nd, and 4 a.m. 3rd, but I am enquiring on this point. Of course the low parts of roads, the cellars of houses, &c., have suffered severely by the flood.

I am, Sir, yours faithfully,

HUGH INGRAM.

*Steyning, Sussex, June 3rd.*

[The storm began in the West of England in the afternoon of the 2nd, as may be inferred from the following notes :—*Calne*, Col. Ward, heavy rain in afternoon; 24 in 30 minutes, and ·88 in the 24 hours.—*Wainsford*, *Lyminster*, H. Fawcett, Esq., a heavy TS passed over the Isle of Wight between 7 and 8 p.m.—*Uckfield Observatory*, C. L. Prince, Esq., terrific TS between 1 and 3 a.m.; total rain was 1·47 in.—*Framfield Lodge* (1½ miles S. of Uckfield), Rev. T. E. Crallan, three heavy TSS between 2 and 5 a.m.; total rain 1·53 in.—T was heard at *Staplehurst*, *Hastings*, and *Royston*.—The *locale* of the heavy rainfall may be inferred from the following data :—

	in.		in.		in.
Steyning .....	2·44	Bronley Common	0·85	Ore, Hastings .....	0·69
Worthing .....	2·08	Harrow .....	0·33	Winchmore Hill...	0·62
Framfield .....	1·53	Twickenham .....	0·83	Pevensey .....	0·49
Uckfield .....	1·47	Camden Town .....	0·74	Waltham Abbey...	0·47
Seven Oaks .....	1·25	Banbury .....	0·72	Linton Park .....	0·37
Calne .....	0·88				

—Ed.]

## METEOROLOGICAL PERIODS.

*To the Editor of the Meteorological Magazine.*

SIR,—I have much pleasure in giving Mr. Nutter the information he asks relative to the weather 29 years ago. He will perceive that, in most respects, the recorded meteorology of the first half of 1838, might be used to describe the weather of the first half of 1867. The following notes are chiefly taken from Mr. Whistlecraft's "Climate of England." After a remarkably mild Christmas in 1837, we had a very severe winter with unusually intense frost; in January, 1838, the snow was excessively deep in some counties, so that the roads were impassable until excavations were made; the spring was cold. May 2nd, a delightful change, very fine and warm; 3rd, fine and warm; 4th, very fine and warm; 5th, clear and fine; 7th and 8th, fine, clear, and hot; 9th, cold morning but a hot day; 10th to the 19th, chiefly fine, but generally very cold and ungenial with piercing winds and some wintery frosts; 20th, a rise of temperature; 21st to the 26th, unsettled, but cold for the season; 28th, a rise of temperature; 29th, fine and warm; 30th and 31st, hot and sultry. At Chiswick the maximum temperature in May, 1838, was 78°, on the 8th. June had very few hot days, and the mean temperature at Greenwich was rather below the average. The 2nd of that month was hot, on which day there was heavy thunder, and to the 5th electrical showers were passing about. The rainfall, on account of the great storms, amounted to 3·37 inches (which was much more than we had in June, 1867), towards the end of the month a few days were very hot. 0·32 in. of rain and some thunder occurred in the first week of July, and a few days were very hot. In the second week several days were very hot, but after the

middle of the month the weather was frequently cool for the season. August was a cool month, indeed the whole summer was considered a very cool one and rather fickle. The hay harvest was favoured by fine weather for the greater part and so was the corn harvest, but the crops were moderate. From the latter part of August to the middle of September the weather was chiefly fine, and occasionally very hot; indeed on the whole, it was fair to the equinox, and October was chiefly fine for about 3 weeks. It is remarkable that in 1809 as well as 1838, the mean temperature of nearly every summer month was below the average, and in each of those years the rainfall was rather below the average.

I do not expect that the weather of the remaining portion of this year will occur exactly in the same order as the weather of 1838, but it will probably bear a considerable resemblance to it.

July 4th, 1867.

G. D. BRUMHAM.

## REVIEWS.

*Tableau Comparatif des Observations Pluviométriques faites dans le Sud-Ouest de la France de 1861 à 1864*, par V. Raulin.

THE "missing link" between the two works by Professor Raulin which we noticed on a previous occasion; the former included rainfall returns from 1714 to 1860, the latter the year 1865; the present rendering the series complete, we have drawn up the following abstract of the fall at a few of the principal stations during the last six years. Professor Raulin is persevering steadily with his good work, and we congratulate him on his success.

### *Rainfall in France, 1860—65.*

STATIONS.	1860	1861	1862	1863	1864	1865
	in.	in.	in.	in.	in.	in.
Paris .....	27·4	18·8	21·2	18·0	15·6	19·8
Poitiers .....	33·5	22·2	27·0	20·6	22·1	32·3
La Rochelle .....	39·3	23·0	23·7	24·8	19·5	33·6
Rochefort .....	33·9	18·7	18·1	23·3	23·0	34·9
Bordeaux .....	38·2	23·0	23·2	26·3	28·1	34·6
Bayonne .....	58·2	31·4	48·0	41·2	40·7	45·2
Aragori .....	...	...	96·1	69·5	51·8	75·8
Pau ... ..	40·7	26·1	44·4	29·8	34·6	...
Bagnères de Bigorre .....	68·9	38·2	52·0	53·2	48·3	59·0
„ de Luchon .....	...	...	40·8	40·5	33·8	42·3
Toulouse (Observatory) .....	21·9	21·7	22·2	20·8	18·9	...
Castelnaudary .....	32·0	28·3	29·3	17·5	23·2	15·6
Montpelier (Botanic Gardens) .....	40·6	33·3	52·9	32·7	40·8	30·4
Geneva .....	41·0	30·7	29·9	35·3	24·6	28·2
Great St. Bernard .....	56·2	31·7	33·0	51·0	61·6	43·7

From this we see that even at Aragori, the wettest station, the fall is not half what we have in Borrowdale.

*Remarks on the Meteorology of 1866*, by C BARHAM, Esq., M.D.

[*Extract from Journal of Royal Institution of Cornwall.*] 8vo, 10 pp.

WELL written notes on the weather in Cornwall in 1866; copious abstracts of the observations made at the Royal Institution at Truro; and monthly rainfall at eight stations.



JUNE, 1867.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.				Days on which 41 or more fell.	TEMPERATURE.				No. of nights below 32°.
		Total Fall.	Difference from average 1860-5	Greatest Fall in 24 hours.			Max.		Min.		
				Dpth	Date.		Deg.	Date.	Deg.	Date.	
		inches	inches.	in.							
I.	Camden Town .....	1.22	— 1.83	.74	2	6	82.5	12	42.8	29	0
II.	Staplehurst (Linton Park) ...	.85	— 1.89	.37	3	9	80.0	2, 11	40.0	29	0
	Selborne (The Wakes).....	1.98	— 1.26	.81	2	8	75.5	2*	34.5	29	0
III.	Hitchen .....	...	...	...	...	...	...	...	...	...	...
"	Banbury .....	1.80	— 1.48	.72	3	9	79.0	11	39.5	29	0
"	Wisbech .....	1.25	...	.30	2	13	79.0	11	40.7	8	0
IV.	Bury St. Edmunds (Culford). .	.73	— 1.85	.68	5	10	82.0	12	36.0	28	0
V.	Calne .....	2.18	...	.88	2	10	79.0	27	39.8	29	0
"	Plymouth (Goodamoor) .....	2.25	— 2.90	...	...	10	83.0	...	36.0	...	...
"	Barnstaple .....	1.02	— 3.10	.24	20	9	...	...	...	...	...
"	Taunton (Fulland's School) ..	1.39	— 1.48	.46	2	7	80	27	44.0	8	0
VI.	Shrewsbury (Highfield) .....	1.45	— 1.49	.49	3	9	76.0	26	...	...	...
"	Tenbury (Orleton) .....	1.20	— 2.33	.35	2	13	79.8	27	39.8	8	0
VII.	Leicester (Wigston) .....	2.01	— .75	.84	4	9	84.0	11	40.0	13†	0
"	West Retford .....	...	...	...	...	...	...	...	...	...	...
"	Derby .....	2.38	— .51	1.02	3	10	80.0	11†	45.0	15**	0
VIII.	Manchester .....	1.59	— 1.75	.40	3	13	81.8	12	45.0	15††	0
IX.	York .....	...	...	...	...	...	...	...	...	...	...
"	Skipton (Arnelcliffe) .....	1.81	— 2.29	.40	7	8	74.0	29	40.0	8	0
X.	North Shields .....	1.49	— 1.25	.67	3	11	71.5	27	39.2	8	0
"	Borrowdale (Seathwaite).....	4.90	— 5.61	1.96	6	13	...	...	...	...	...
XI.	Abercarn .....	1.46	...	.31	5, 7	7	84.0	28	46.0	8	0
"	Haverfordwest .....	.71	— 2.94	.33	13	...	77.5	11	43.0	30	0
"	Rhayader (Cefnfaes).....	.55	— 3.43	.20	3	8	78.0	...	37.0	..	0
"	Llanberis (R. Victoria Hotel) ..	...	...	...	...	...	...	...	...	...	...
XII.	Dumfries .....	1.72	— 1.18	.30	4	14	78.5	26	43.0	23	0
"	Hawick (Silverbut Hall) ...	1.12	...	.24	3	11	...	...	...	...	...
XIV.	Ayr (Auchendrane House) ...	3.17	— .18	1.12	4	13	75.0	11‡	38.0	8	0
XV.	Otter House .....	3.04	— .80	.50	9	12	70.0	11	38.0	8	0
XVI.	Leven (Nookton) .....	1.96	— .28	.58	3	13	70.0	29	42.0	8	0
"	Stirling (Deanston) .....	2.20	— .72	.36	6	14	74.0	26	41.0	5	0
"	Logierait .....	1.89	...	.77	3	11	...	...	...	...	...
XVII.	Ballater .....	1.37	...	.22	5	16	75.0	26	36.0	20	0
"	Aberdeen .....	1.29	...	.45	6	12	75.0	28	40.4	8	0
XVIII.	Inverness (Culloden) .....	2.38	...	.59	6	12	69.8	26	40.7	8	0
"	Fort William .....	3.95	...	.95	5	16	...	...	...	...	...
"	Portree .....	5.66	+ .88	1.46	5	13	68.0	26	32.3	8	0
"	Loch Broom .....	2.98	...	.65	3	20	...	...	...	...	...
XIX.	Helmsdale .....	1.45	...	.27	8	12	...	...	...	...	...
"	Sandwick .....	1.79	+ .26	.34	7	17	...	...	...	...	...
XX.	Cork .....	1.57	...	1.13	4	7	...	...	...	...	...
"	Waterford .....	.93	— 2.05	.43	6	12	78.0	22§	46.0	8	0
"	Killaloe .....	2.34	— 1.29	1.18	2	8	81.0	10	41.0	8	0
XXI.	Portarlinton .....	.85	— 2.40	.51	5	10	70.0	11	41.0	8	0
"	Monkstown .....	.48	— 2.14	.27	4	5	...	...	...	...	...
XXII.	Galway .....	1.75	...	.99	4	11	75.0	19	46.0	6, 8	0
"	Bunninadden (Doo Castle) ...	1.64	...	.51	3	8	71.0	27	33.0	26	0
XXIII.	Bawnboy (Owendoon) .....	1.20	...	.62	4	13	...	...	...	...	...
"	Waringstown .....	.87	...	.37	4	9	76.0	11	38.0	7	0
"	Strabane (Leckpatrick) .....	1.77	...	.57	4	15	74.0	10	37.0	26	0

\* And 10th &amp; 27th. † And 27th. ‡ And 26th. § And 24th. || And 26th &amp; 27th. ¶ And 28th.

\*\* And 16th. †† And 23rd. ||| And 14th &amp; 19th.

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

# METEOROLOGICAL NOTES ON THE MONTH.

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 TOWN.—TS on morning of 3rd.

LINTON PARK.—T on 3rd, 5th, and 7th, after which time the weather was exceedingly dry, though at no time hot, compared with former years; prevailing winds S. and S.W. up to the 14th, after that mostly N. and N.E. Wheat not generally in ear till the 21st being three days later than the average; 27th very dry day. Hay crop abundant and fine weather to mature it.

SELBORNE.—Prevailing wind N., with but little variation. The changes of temp. were remarkable, both at the beginning and end of the month. At Woolmer Forest on 30th I observed potatoes in every cottage garden cut by the frost, and the young ferns in the wood were also much cut.

BANBURY.—Wheat in bloom on 26th.

WISBECH.—Nearly half the month was dull, the wind being N.E. or N.W. was very cold; wheat in ear on 10th. There is a fine crop of hay, and as the last week was free from R, it was stacked in fine condition.

CULFORD.—A month of very variable temp. but chiefly very cold for the season, and the latter part of the month unusually dry.

CALNE.—Heavy R on 2nd, 24 fell in  $\frac{1}{2}$  hour; TS in S. at 5 p.m. on 3rd; TS on 24th.

ORLETON.—The first 8 days were cold, with R every day; the remainder of the month dull, hot, and dry, with occasionally bright days. Bar. very high on 27th and 28th, with small misty R on the latter day from 7 to 11 a.m.; temp. of month below the average; no T or L.

DERBY.—Great progress made in securing a marvellous crop of hay.

NORTH SHIELDS.—Heavy R on 3rd, T on 4th. A cloudy month, though the R was little more than half the average. St. Bernard's lily, double red flycatcher, and summer violet in flower at the beginning of the month, French rose, scarlet geranium, grass iris, and double red campion in the middle of the month, pencilled geranium, perennial blue lupine, and red catchfly on 20th, 21st, and 24th; pink mimulus and dwarf summer aster on 25th, and many others at the end.

SEATHWAITE.—Only one day on which more than 60 of R fell, the total fall being less than half the average, though the month was cold and cloudy.

## W A L E S.

ABERCARN.—A fine month, with genial harvest weather.

HAVERFORDWEST.—First three weeks of June, cloudy and cold, wind constantly from N. and N.E.; after the 18th weather more genial; general characteristic of the month, dry, evaporation rapid, and almost entire absence of R; warmer during the last fortnight but the nights cold. Turnip crop likely to be a total failure; hay crop heavy, and likely to be saved in excellent condition.

CEFNFAES.—A dry month. Cold for the season at the beginning of the month, but warm and fine after the first 10 days.

## S C O T L A N D.

DUMFRIES.—First 9 days of the month showery with a low temp. Heavy R on 14th and occasional showers up to the 24th, after which the weather was warm and dry. T on 3rd and 14th; the mean temp.  $1^{\circ}78$  lower than the corresponding month last year; the copious showers at the beginning of the month caused a vigorous growth; crops of all kinds much heavier than last year but two or three weeks later. At close of month fine weather for haymaking.

SILVERBUT HALL, HAWICK.—The most pleasant and genial month of June that we have had for some years, the crops all look well and give promise of an abundant harvest.

AUCHENDRANE.—Although the mean temp. of this June has been rather low, especially during the nights, there have been no frosts, and vegetation made great progress. Heavy R between the 5th and 8th.

OTTER HOUSE.—A calm, cloudy, and moderately warm month; ther. from  $38^{\circ}$  to  $70^{\circ}$ ; R below the average. The country may now be said to be in its fullest beauty.

DEANSTON HOUSE.—T on 3rd and 5th. Weather changeable from hot to cold; latter part of the month warm and fine; garden produce at the end of the month still backward for the season of the year.

LOGIERATT.—A fine month, and crops looking well. T on 3rd, something approaching a water-spout very closely, which cut up roads and did much damage.

BALLATER.—T on 2nd and 3rd. R fell to a considerable extent during the first week, and to the middle of the month the prevailing weather was cold for the season; after that time the temp. increased, reaching 75° on the 26th. Vegetation (which had previously been somewhat checked) advanced rapidly, and by the end of the month the country presented a very fine appearance.

ABERDEEN.—T on 4th, 6th, and 13th. A month of good, though somewhat changeable weather. Bar. about  $\frac{1}{10}$  above the average, with  $\frac{1}{10}$  greater range. R below the average. Prevailing winds N.N.W. Crops looking well, but from three weeks to a month later than last year, though much progress has been made during the last fortnight. Wild plants only coming into flower that were in seed at this time last year.

FORT WILLIAM.—T on 3rd. A pleasant month, though the fall of R, especially in the earlier portion, was rather above the average.

PORTREE.—This month on the whole has been the coldest June for many years, and consequently the crops are backward.

LOCHBROOM.—S and sleet on 7th, 8th and 9th. R daily from 1st to 17th.

#### I R E L A N D.

MONKSTOWN.—The driest month I have recorded since September, 1865, when '06 fell; also the longest period without R since that date. We had from June 6th to the 2nd of July (26 days) only '01 of R.

DOO CASTLE.—Wet to 6th, from which time to the end of the month only '10 of R fell, the wind during this period being mostly N., N.W., and N.E. The temp. low for June. The early sown corn looks healthy and luxuriant, but oats sown in April and beginning of May, though looking green at a distance, are poor and short, and the ground cracked for lack of moisture. Though the weather has been dry, there has been less sunshine than usual.

OWENDOWN.—The latter part of the month remarkably fine, and, with the exception of oats in some localities, all the crops look well. Fruit seems to have suffered much from the severity of the spring. Considering the long spell of dry weather we have had, there have been fewer sunny days than we expect in June, and evaporation consequently has been less. As an instance I may mention that there is low lying land near here, on which in winter we have a beautiful lake, and in summer excellent pasturage. Generally it is quite dry at the end of April, but this year there is water up to July, which I attribute to lack of powerful sun; others ascribe it to complete saturation of land from previous rains, probably both causes act together.

WARINGSTOWN.—First week showery, remainder of month dry and warm. Wheat very good, but flax and turnips failures.

LECKPATRICK.—Greater part of the R was measured in the first week. Most favourable weather for all growing crops; turnips promise well; meadows give heavy produce of hay. Heat moderate during the hottest period. N. winds and partial clouds prevented the ther. rising above 75°. Bar. nearly stationary at 30·75 from 10 p.m. on 26th to 10 a.m. 28th, from which time it fell gradually to 29·922 on 30th.

### EVAPORATORS.

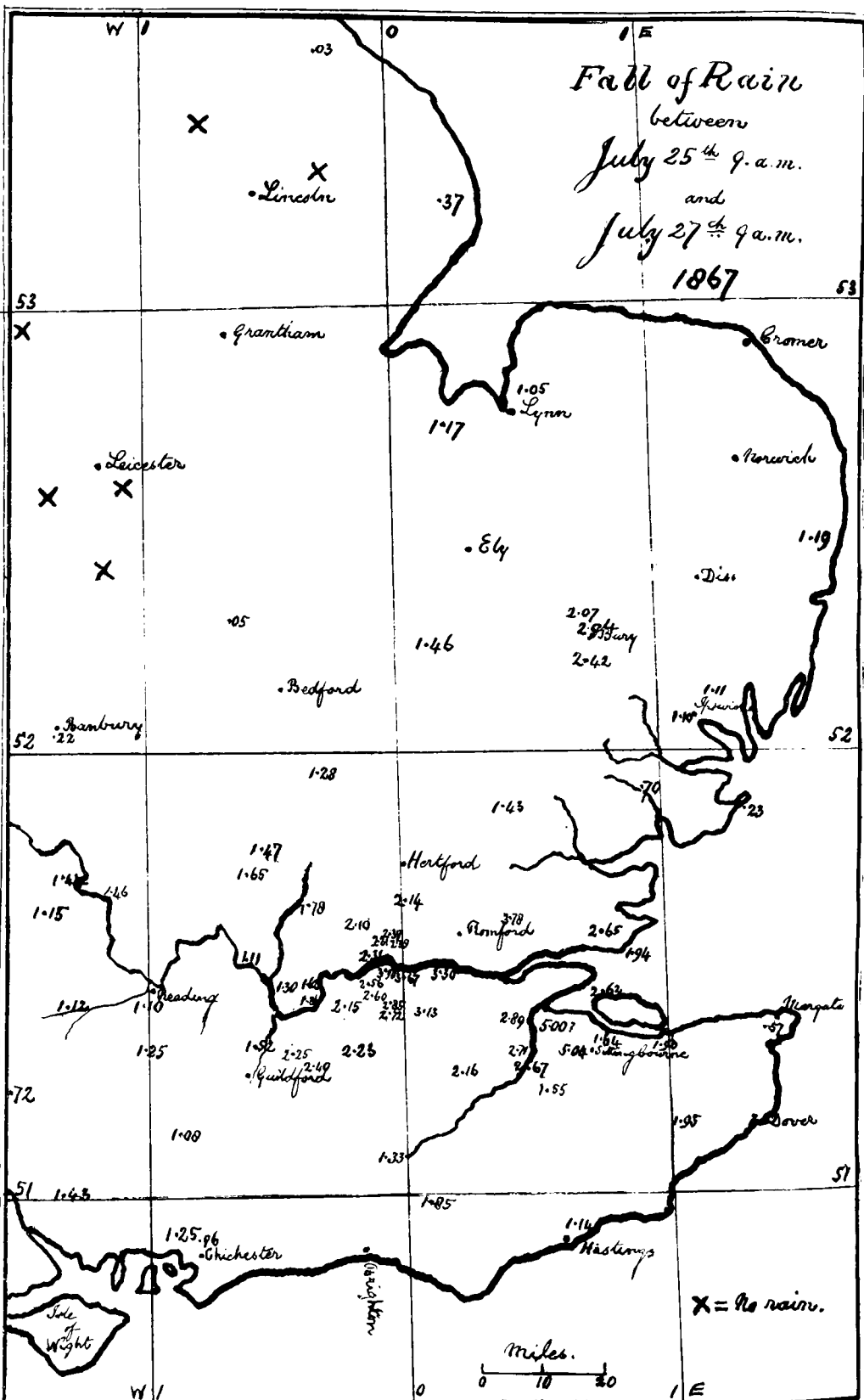
*To the Editor of the Meteorological Magazine.*

SIR,—I see that you have opened a department in the *Meteorological Magazine*, for gossip, queries, and the like. May I, therefore, enquire whether evaporating gauges give the exact loss of water from the earth? It is the custom, I believe, to leave a space unoccupied by water, in order that a sudden fall of rain may not cause the gauge to overflow. But then the sides of the vessel must shade a portion of the water surface from the sun's rays, so that evaporation must be retarded. I have an evaporator which is read at the close of each month only, and I am not aware if the leaving of a space, as described above, affects the result or not; could you inform me?—I remain, Yours truly, E. G. ALDRIDGE.

[We consider evaporators as at present constructed very unreliable, and have often expressed that opinion. We hope to discuss the matter fully before long, and shall be glad of Mr. Aldridge's assistance.—ED.]



## 1867



E. J. Symonds, Litho.

# SYMONS'S

## MONTHLY

# METEOROLOGICAL MAGAZINE.

---

XIX.]

AUGUST, 1867.

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

---

### EXCESSIVE RAINFALL, JULY 26TH, 1867.

THE rains of the last week in July were as remarkable as any that have occurred of late years—the distinguishing characteristic being the great rate of fall. Excepting the remarkable case in 1857, when on August 6th, a water-spout burst over Scarborough, and the rain-gauge, which held 9 inches, was filled and found running over; and 1864, May 20th, when at West Retford, Notts, 3·10 in. fell in 2½ hours, we can recall no rains more noteworthy than those which have lately fallen. We by no means wish to imply that such have not occurred—the converse is probably true—but if one branch of rainfall literature is poorer than another, certainly the deficiency is most absolute as concerns heavy rains—being, if we mistake not, confined to two papers by Mr. Glaisher: one in the *Proceedings of the Royal Society* in 1852, the other in the *Annual Report of the Meteorological Society* for 1858.

Complaints have been made that we have aimed too much at increasing the number of stations; to those who have made them, we commend the Map accompanying this paper, with the inquiry whether a few more stations along the banks of the Thames and the Medway would not have materially enhanced its value, though perhaps there is no county containing a better, or, as the following tables prove, a more careful and painstaking body of observers than Kent.

The rains must in equity be referred to St. Swithin, for the first fall to be noticed was one of 1½ inches, on July 15th, in Wales and Ireland; heavy rains fell almost daily until the 24th in the South of Scotland and in Ireland, resulting in heavy floods in many of the rivers. At Galashiels on the 21st the fall was ·60, and on the 22nd was 2·47; total, 3·07 in two days. Probably the most noteworthy was that which occurred in the North of Ireland on the 23rd, as described in the first two letters, (pp. 78, 79), but concerning which we can give no further particulars,

from the simple fact that there is no observer between Dungannon and Strabane, a distance of 35 miles ; in fact, between those two towns and N.E. and S.W. of the line joining them, there is an area of *more than a thousand square miles without a rain gauge*, and this though the gauges have been offered free of charge, and observers asked for in nearly every newspaper in the country. The 24th and greater part of the 25th appear to have been generally fine.

Rain is reported from various stations as beginning at different hours, between 9 p.m. and midnight, 25th, but it began so gently, and the times reported are so irregularly distributed, that we shall act most safely by dating the commencement from midnight, the time when all agree that the great downpour commenced at stations south of the Thames ; north of London it began later, for instance, Wantage and Grundisburgh, 3 a.m. 26th; Cambridge and Bury St. Edmunds, 5 a.m. ; Culford, 6 a.m. ; and Beccles not till 6.45 a.m. The duration of heavy fall appears to have been least where the fall was heaviest, and greatest where least rain fell. Slight rain fell at intervals throughout the 26th, but at Hartlip and Maidstone the heaviest rain had ceased at 5 a.m., at Sheerness at 6 a.m., and at most stations in the neighbourhood of London by 10.30 a.m. In Berks, Cambridge, and Suffolk, the fall began later, and ended proportionately later.

The time of commencement and termination is clearly shown by the following diagram, wherein the dotted horizontal lines mark these elements, and also the duration of the fall. Singularly strong confirmation of the remarks just made, is afforded by Table III., wherein an arrangement dependent on the relative fall before and after 9 a.m. 26th, classifies the stations almost as well as could have been done by means of a map—the amount of rainfall, in fact, becomes a geographer.

Very few words will suffice to explain the Map. The names are merely as guides to the returns, which are so entered that the decimal point occupies the position due to the gauge. The names of the stations are omitted, to give room for more entries, and the returns in Table I. being ranged in the order of their amount, the name of the station is directly ascertainable.

The facts appear to show that the heaviest fall was an excessively local one of about 5 inches, extending along the north side of the North Downs from Farningham nearly to Sittingbourne, Rochester, Chatham and Strood being on the northern limit of excessive fall. It was accompanied by a violent thunder storm, which was most severe between Faversham and Canterbury ; 32 sheep were killed by lightning near the latter city. At about the same hour, 1.30 a.m., it was raining very heavily at Deptford and Greenwich, where about 4 inches of rain

TABLE I.—RAINFALL BETWEEN JULY 25TH, 9 A.M., AND JULY 27TH, 9 A.M., 1867.

Measured at		STATION AND OBSERVER.		REMARKS.
Total.	9 a.m. to 9 a.m. 26th.			
5.04	4.78	KENT, SITTINGBOURNE, <i>Hartlip</i> , W. Bland Esq.	.....	{ (See Letters, page 82.) Midnight, 25th, to 9 a.m. 26th, 3.16 in. in 9 hours. 26th, 1 a.m. to 9 a.m., 2.25 in.; 9 a.m. to 10.30 a.m., 1.02. T and much L till 4 a.m. 26th. Midnight, 25th, to 10 a.m. 26th, 3.18; 1.40 p.m. to 10 p.m. .49 additional, total being greater than ever before observed. 11.45 p.m. 25th, to 5 a.m. 26th, 1.64; 5 to 9.30 a.m., 1.24; 9.30 a.m. to 8 p.m., .42. Began at 9 p.m., 25th. On 26th, between 5 a.m. and 8 a.m., .53; 8 a.m. and 5 p.m., 2.41. Began about 1.30 a.m., and nearly 2½ inches fell in as many hours.
3.98	3.16	"	.....	
3.78	2.25	ESSEX, BILLERICAY, F. Carter, Esq.	.....	
3.67	3.07	KENT, GREENWICH OBSERVATORY, J. Glaisher, Esq., F.R.S.	.....	
3.30	2.78	"	CROSSNESS, J. Grant, Esq.	{ Began about 10 p.m. 25th. Began at 11 p.m. 25th, continuous and heavy till 5 a.m. 26th, and slight all the rest of the day. All fell between 25th 11 p.m., and 26th 2 p.m. R from Midnight to 7 a.m.; especially heavy from 1.15 to 1.30 a.m., and at 3 a.m., when it again increased in violence. Much T and L. Wind E. by S. Low parts of the town inundated. Total duration, 26 hours. Wind N.W. From 10 p.m., 25th, to 6 p.m. 26th, 2.28. From 11 p.m. 25th, to 9 p.m. 26th, 2.39. T and L at 2 a.m. 26th. Total up to 10.27 a.m. 26th, 2.19. From 9.15 p.m. to 9.45 p.m. 25th, .02; Midnight 25th to 8 a.m. 26th, 1.63; 8 a.m. to 9 a.m., .23; 9 a.m. to 5 p.m., .36; 5 p.m. to 10.30 p.m., .09.
3.13	2.30	"	BROMLEY COMMON, Rev. A. Rawson	
2.94	.63	SUFFOLK, BURY ST. EDMUNDS, <i>Beech Hill</i> , H. Turner, Esq.	.....	
2.89	...	KENT, STROOD, <i>High Street</i> , Mr. F. W. Sandy	.....	
2.85	...	SURREY, SYDENHAM, <i>Lethen Grange</i> , G. F. Chambers, Esq., F.R.A.S.	.....	{ Rained a little about 9.30 p.m. 25th, and incessantly from midnight till 10.30 a.m. 26th; total, 2.02. Slight rain from 10 p.m. 25th till midnight, thence steady downpour till 11 a.m.; rain also from 2 till 9 p.m. 26th. From 11 p.m. 25th, to 6 a.m. 26th, very heavy; 6 a.m. to noon, less; heavy rain at intervals afterwards. 9 p.m. 25th, to 7 a.m. 26th, 1.28; 7 a.m. to 4 p.m., .75; 4 p.m., to 7 p.m., .12. Between 12 p.m. 25th, and 12 p.m. 26th. All fell in 12 hours, 6 a.m. to 6 p.m. 26th.
2.72	2.24	"	PENGE, <i>Laurel Grove</i> , R. F. Jarvis, Esq.	
2.71	2.49	KENT, MADSTONE, <i>Larkfield</i> , Rev. N. Dincock	.....	
2.67	2.35	"	<i>Fant Road</i> , J. H. Baverstock, Esq.	
2.65	2.30	ESSEX, ROCHFORD, <i>Clement's Hall</i> , A. Holt White, Esq.	.....	{ (See Letter, page 81.) Fell between 10 p.m. 25th, and 6 p.m. 26th. From 10 p.m. 25th, to 10 p.m. 26th. R from 3 a.m. to 3 p.m. Wind N.E. and S.W. 26th very heavy rain, with N. wind. Rain said to be much more than 1.51 at places round here. Between 10 p.m. 25th, and 8 p.m. 26th, 1.50 in. fell. From 1 a.m. 26th; rained all day with boisterous wind. From 5 a.m. 26th, to 9 a.m. .47; 9 a.m. to 8 p.m. .99. Began 12 p.m. 25th. Rain began at 1 a.m. 26th; heaviest at 3 a.m. From 11 p.m. 25th, to 11 a.m. 26th, 1.28. All fell between midnight of 25th and midnight of 26th. Wind on 26th N. strong.
2.62	2.39	KENT, SHEERNESS, J. Lund, Esq.	.....	
2.60	2.00	SURREY, BRITTON HILL, Miss Sweeting	.....	
2.56	1.95	"	STOCKWELL, <i>Burnley Road</i> , H. Doxat, Esq.	
2.42	.75	SUFFOLK, BURY ST. EDMUNDS, <i>Laurel Hill</i> , Rev. W. T. T. Drake	.....	{ Began on 25th about 9 p.m.; rained heavily at 10.30 p.m., lighter towards morning of 26th, but rained very heavily about midday on 26th. Heavy rain on 26th from 4 to 9 a.m., and continued shower till 10 p.m. From 6.45 a.m. 26th, to 6.45 a.m. 27th, 1.18. Stormy on 26th. From 3 a.m. to 3 p.m. 26th, 1.13. L during the early hours of 26th. All fell between 1 a.m. and 4 p.m. on 26th. R from 3 a.m. to 9.30 a.m. 26th; shower after 2 p.m. Over an inch of rain in three hours. Heavy and incessant rain on 26th. High wind on 26th. Rain from 11 p.m. on 25th, to 4 p.m. on 26th. Storm comparatively slight; much ozone, and on 26th strong N.E. wind. Slight shower between 5 and 8.15 a.m., 26th.
2.40	1.85	SURREY, GUILDFORD, <i>Short, Rev. Emilius Bayley, B.D.</i>	.....	
2.39	1.60	"	WINCHMORE HILL, <i>Beaulieu</i> , T. Paulin, Esq.	
2.38	1.89	"	ISLINGTON, <i>St. Mary's Road</i> , W. T. Reynolds, Esq.	
2.33	1.85	"	REGENT'S PARK, <i>Dorset Square</i> , H. E. Segrave, Esq.	{ Begun 12 p.m. 25th. Rain began at 1 a.m. 26th; heaviest at 3 a.m. From 11 p.m. 25th, to 11 a.m. 26th, 1.28. All fell between midnight of 25th and midnight of 26th. Wind on 26th N. strong.
2.31	1.86	"	PIMLICO, <i>Bloomfield Terrace</i> , C. Harding, Esq.	
2.25	1.72	SURREY, CROYDON, <i>Pyports</i> , G. Dines, Esq.	.....	
2.23	1.65	"	BANSTEAD, <i>Down House</i> , F. W. Field, Esq.	
2.22	...	MIDDLESEX, ISLINGTON, <i>Compton Terrace</i> , Dr. Ballard	.....	{ (See Letter, page 81.) Fell between 10 p.m. 25th, and 6 p.m. 26th. From 10 p.m. 25th, to 10 p.m. 26th. R from 3 a.m. to 3 p.m. Wind N.E. and S.W. 26th very heavy rain, with N. wind. Rain said to be much more than 1.51 at places round here. Between 10 p.m. 25th, and 8 p.m. 26th, 1.50 in. fell. From 1 a.m. 26th; rained all day with boisterous wind. From 5 a.m. 26th, to 9 a.m. .47; 9 a.m. to 8 p.m. .99. Began 12 p.m. 25th. Rain began at 1 a.m. 26th; heaviest at 3 a.m. From 11 p.m. 25th, to 11 a.m. 26th, 1.28. All fell between midnight of 25th and midnight of 26th. Wind on 26th N. strong.
2.21	1.82	"	CAMDEN ROAD, G. J. Symons, Esq.	
2.16	1.36	KENT, SEVENOAKS, <i>River Head</i> , Rev. J. B. Murdoch.	.....	
2.15	...	SURREY, WIMBLEDON, T. Devas, Esq.	.....	
2.14	1.40	ESSEX, WALTHAM ABBEY, Captain Smith	.....	{ (See Letter, page 81.) Fell between 10 p.m. 25th, and 6 p.m. 26th. From 10 p.m. 25th, to 10 p.m. 26th. R from 3 a.m. to 3 p.m. Wind N.E. and S.W. 26th very heavy rain, with N. wind. Rain said to be much more than 1.51 at places round here. Between 10 p.m. 25th, and 8 p.m. 26th, 1.50 in. fell. From 1 a.m. 26th; rained all day with boisterous wind. From 5 a.m. 26th, to 9 a.m. .47; 9 a.m. to 8 p.m. .99. Began 12 p.m. 25th. Rain began at 1 a.m. 26th; heaviest at 3 a.m. From 11 p.m. 25th, to 11 a.m. 26th, 1.28. All fell between midnight of 25th and midnight of 26th. Wind on 26th N. strong.
2.07	...	MIDDLESEX, HARROW, B. Haughton, Esq., C.E.	.....	
2.00	...	SUFFOLK, BURY ST. EDMUNDS, <i>Culford</i> , Mr. Griev	.....	
1.95	1.43	KENT, HYTHE, <i>Horton Park</i> , J. Kirkpatrick, Esq.	.....	
1.94	1.72	ESSEX, SOUTHEAST, <i>Shoeburyness</i> , Major Curtis	.....	{ (See Letter, page 81.) Fell between 10 p.m. 25th, and 6 p.m. 26th. From 10 p.m. 25th, to 10 p.m. 26th. R from 3 a.m. to 3 p.m. Wind N.E. and S.W. 26th very heavy rain, with N. wind. Rain said to be much more than 1.51 at places round here. Between 10 p.m. 25th, and 8 p.m. 26th, 1.50 in. fell. From 1 a.m. 26th; rained all day with boisterous wind. From 5 a.m. 26th, to 9 a.m. .47; 9 a.m. to 8 p.m. .99. Began 12 p.m. 25th. Rain began at 1 a.m. 26th; heaviest at 3 a.m. From 11 p.m. 25th, to 11 a.m. 26th, 1.28. All fell between midnight of 25th and midnight of 26th. Wind on 26th N. strong.
1.90	1.45	KENT, FAYERSHAM, <i>Brogdale</i> , W. C. Stunt, Esq.	.....	
1.86	1.44	MIDDLESEX, TEDDINGTON, <i>Goner House</i> , R. D. Blackmore, Esq.	.....	
1.85	1.33	SUSSEX, UCKFIELD OBSERVATORY, C. L. Prince, Esq., F.R.A.S.	.....	
1.78	1.43	HERTS, WATFORD HOUSE, R. Clutterbuck, Esq.	.....	{ (See Letter, page 81.) Fell between 10 p.m. 25th, and 6 p.m. 26th. From 10 p.m. 25th, to 10 p.m. 26th. R from 3 a.m. to 3 p.m. Wind N.E. and S.W. 26th very heavy rain, with N. wind. Rain said to be much more than 1.51 at places round here. Between 10 p.m. 25th, and 8 p.m. 26th, 1.50 in. fell. From 1 a.m. 26th; rained all day with boisterous wind. From 5 a.m. 26th, to 9 a.m. .47; 9 a.m. to 8 p.m. .99. Began 12 p.m. 25th. Rain began at 1 a.m. 26th; heaviest at 3 a.m. From 11 p.m. 25th, to 11 a.m. 26th, 1.28. All fell between midnight of 25th and midnight of 26th. Wind on 26th N. strong.
1.65	...	BUCKS, MESSENDEN ABBEY, J. Begbie, Esq.	.....	
1.64	1.44	KENT, SITTINGBOURNE, <i>Tong</i> , G. Eley, Esq.	.....	
1.62	1.45	MIDDLESEX, TWICKENHAM OBSERVATORY, A. Wiss, Esq.	.....	
1.55	1.51	KENT, STAPLEHURST, <i>Linton Park</i> , Mr. J. Robson.	.....	{ (See Letter, page 81.) Fell between 10 p.m. 25th, and 6 p.m. 26th. From 10 p.m. 25th, to 10 p.m. 26th. R from 3 a.m. to 3 p.m. Wind N.E. and S.W. 26th very heavy rain, with N. wind. Rain said to be much more than 1.51 at places round here. Between 10 p.m. 25th, and 8 p.m. 26th, 1.50 in. fell. From 1 a.m. 26th; rained all day with boisterous wind. From 5 a.m. 26th, to 9 a.m. .47; 9 a.m. to 8 p.m. .99. Began 12 p.m. 25th. Rain began at 1 a.m. 26th; heaviest at 3 a.m. From 11 p.m. 25th, to 11 a.m. 26th, 1.28. All fell between midnight of 25th and midnight of 26th. Wind on 26th N. strong.
1.52	1.19	SURREY, CHOBHAM, Dr. Ward	.....	
1.47	1.08	HERTS, BERKHAMPTON, W. Squire, Esq.	.....	
1.46	.47	CAMBRIDGE, CAMBRIDGE, <i>Brook House</i> , G. Warren, Esq.	.....	
1.46	...	BERKS, WALLINGFORD, <i>The Castle</i> , J. K. Hedges, Esq.	.....	{ (See Letter, page 81.) Fell between 10 p.m. 25th, and 6 p.m. 26th. From 10 p.m. 25th, to 10 p.m. 26th. R from 3 a.m. to 3 p.m. Wind N.E. and S.W. 26th very heavy rain, with N. wind. Rain said to be much more than 1.51 at places round here. Between 10 p.m. 25th, and 8 p.m. 26th, 1.50 in. fell. From 1 a.m. 26th; rained all day with boisterous wind. From 5 a.m. 26th, to 9 a.m. .47; 9 a.m. to 8 p.m. .99. Began 12 p.m. 25th. Rain began at 1 a.m. 26th; heaviest at 3 a.m. From 11 p.m. 25th, to 11 a.m. 26th, 1.28. All fell between midnight of 25th and midnight of 26th. Wind on 26th N. strong.
1.44	1.20	"	ABINGDON, <i>Long Wittenham</i> , Rev. J. C. Clutterbuck	
1.43	.99	HANTS, WIMBORNE, <i>Chilgrove</i> , W. L. Woods, Esq.	.....	
1.43	.67	ESSEX, DUNMOW, <i>High Roding</i> , Rev. E. Maxwell	.....	
1.33	1.16	SUSSEX, West HOATHLY, <i>Pearlands</i> , J. Dudgeon, Esq.	.....	{ (See Letter, page 81.) Fell between 10 p.m. 25th, and 6 p.m. 26th. From 10 p.m. 25th, to 10 p.m. 26th. R from 3 a.m. to 3 p.m. Wind N.E. and S.W. 26th very heavy rain, with N. wind. Rain said to be much more than 1.51 at places round here. Between 10 p.m. 25th, and 8 p.m. 26th, 1.50 in. fell. From 1 a.m. 26th; rained all day with boisterous wind. From 5 a.m. 26th, to 9 a.m. .47; 9 a.m. to 8 p.m. .99. Began 12 p.m. 25th. Rain began at 1 a.m. 26th; heaviest at 3 a.m. From 11 p.m. 25th, to 11 a.m. 26th, 1.28. All fell between midnight of 25th and midnight of 26th. Wind on 26th N. strong.
1.30	...	MIDDLESEX, STAINES, <i>Shortwood House</i> , H. St. J. Joyner, Esq.	.....	
1.25	1.10	HANTS, WINCHESTER, <i>Strathfield Turfies</i> , Rev. C. H. Griffith	.....	
1.25	...	SUSSEX, CHICHESTER, <i>Chilgrove</i> , W. L. Woods, Esq.	.....	
1.19	.72	SUFFOLK, BECCLES, <i>Geldston</i> , E. T. Dowson, Esq.	.....	{ (See Letter, page 81.) Fell between 10 p.m. 25th, and 6 p.m. 26th. From 10 p.m. 25th, to 10 p.m. 26th. R from 3 a.m. to 3 p.m. Wind N.E. and S.W. 26th very heavy rain, with N. wind. Rain said to be much more than 1.51 at places round here. Between 10 p.m. 25th, and 8 p.m. 26th, 1.50 in. fell. From 1 a.m. 26th; rained all day with boisterous wind. From 5 a.m. 26th, to 9 a.m. .47; 9 a.m. to 8 p.m. .99. Began 12 p.m. 25th. Rain began at 1 a.m. 26th; heaviest at 3 a.m. From 11 p.m. 25th, to 11 a.m. 26th, 1.28. All fell between midnight of 25th and midnight of 26th. Wind on 26th N. strong.
1.17	.02	CAMBRIDGE, WISBECH OBSERVATORY, S. H. Miller, Esq.	.....	
1.15	1.00	BERKS, WANTAGE, E. C. Davey, Esq.	.....	
1.14	1.02	SUSSEX, HASTINGS, <i>Ore</i> , T. H. Morgan, Esq.	.....	
1.12	.80	BERKS, NEWBURY, <i>Greenham</i> , J. Ward, Esq.	.....	{ (See Letter, page 81.) Fell between 10 p.m. 25th, and 6 p.m. 26th. From 10 p.m. 25th, to 10 p.m. 26th. R from 3 a.m. to 3 p.m. Wind N.E. and S.W. 26th very heavy rain, with N. wind. Rain said to be much more than 1.51 at places round here. Between 10 p.m. 25th, and 8 p.m. 26th, 1.50 in. fell. From 1 a.m. 26th; rained all day with boisterous wind. From 5 a.m. 26th, to 9 a.m. .47; 9 a.m. to 8 p.m. .99. Began 12 p.m. 25th. Rain began at 1 a.m. 26th; heaviest at 3 a.m. From 11 p.m. 25th, to 11 a.m. 26th, 1.28. All fell between midnight of 25th and midnight of 26th. Wind on 26th N. strong.
1.11	.93	BUCKS, ETON COLLEGE, Rev. H. Snow	.....	
1.11	.98	SUFFOLK, WOODBRIDGE, <i>Grundisburgh</i> , P. Harris, Esq.	.....	
1.10	1.07	"	IPSWICH, <i>St. Peters</i> , M. Oliver, Esq.	
1.10	.85	BERKS, READING, <i>Forbury Gardens</i> , Mr. T. Davis	.....	{ (See Letter, page 81.) Fell between 10 p.m. 25th, and 6 p.m. 26th. From 10 p.m. 25th, to 10 p.m. 26th. R from 3 a.m. to 3 p.m. Wind N.E. and S.W. 26th very heavy rain, with N. wind. Rain said to be much more than 1.51 at places round here. Between 10 p.m. 25th, and 8 p.m. 26th, 1.50 in. fell. From 1 a.m. 26th; rained all day with boisterous wind. From 5 a.m. 26th, to 9 a.m. .47; 9 a.m. to 8 p.m. .99. Began 12 p.m. 25th. Rain began at 1 a.m. 26th; heaviest at 3 a.m. From 11 p.m. 25th, to 11 a.m. 26th, 1.28. All fell between midnight of 25th and midnight of 26th. Wind on 26th N. strong.
1.08	.95	HANTS, ALTON, <i>Selborne</i> , T. Bell, Esq.	.....	
1.05	...	NORFOLK, LYNN, <i>Hallington</i> , Rev. H. Folkes	.....	
.96	.78	SUSSEX, CHICHESTER, <i>West Dean</i> , H. Paxton, Esq.	.....	
.81	.81	SOMERSET, TAUNTON, <i>Falland's School</i> , W. Reed, Esq.	.....	{ (See Letter, page 81.) Fell between 10 p.m. 25th, and 6 p.m. 26th. From 10 p.m. 25th, to 10 p.m. 26th. R from 3 a.m. to 3 p.m. Wind N.E. and S.W. 26th very heavy rain, with N. wind. Rain said to be much more than 1.51 at places round here. Between 10 p.m. 25th, and 8 p.m. 26th, 1.50 in. fell. From 1 a.m. 26th; rained all day with boisterous wind. From 5 a.m. 26th, to 9 a.m. .47; 9 a.m. to 8 p.m. .99. Began 12 p.m. 25th. Rain began at 1 a.m. 26th; heaviest at 3 a.m. From 11 p.m. 25th, to 11 a.m. 26th, 1.28. All fell between midnight of 25th and midnight of 26th. Wind on 26th N. strong.
.72	...	WILTS, LUDGESHALL, E. G. Fawcett, Esq.	.....	
.70	.52	ESSEX, COLCHESTER, <i>Broom Hill House</i> , Capt. Walker	.....	
.57	.57	KENT, MARGATE, <i>Acol</i> , E. S. Lendon, Esq.	.....	
.37	.13	LINCOLN, SPILSBY, <i>Welton-le-Marsh</i> , Rev. A. Wright	.....	{ (See Letter, page 81.) Fell between 10 p.m. 25th, and 6 p.m. 26th. From 10 p.m. 25th, to 10 p.m. 26th. R from 3 a.m. to 3 p.m. Wind N.E. and S.W. 26th very heavy rain, with N. wind. Rain said to be much more than 1.51 at places round here. Between 10 p.m. 25th, and 8 p.m. 26th, 1.50 in. fell. From 1 a.m. 26th; rained all day with boisterous wind. From 5 a.m. 26th, to 9 a.m. .47; 9 a.m. to 8 p.m. .99. Began 12 p.m. 25th. Rain began at 1 a.m. 26th; heaviest at 3 a.m. From 11 p.m. 25th, to 11 a.m. 26th, 1.28. All fell between midnight of 25th and midnight of 26th. Wind on 26th N. strong.
.23	...	ESSEX, WALTON-ON-THE-NAZE, H. Dixon, Esq.	.....	
.22	.14	OXFORD, BANBURY, <i>High Street</i> , T. Beesley, Esq., F.C.S.	.....	
.07	.03	YORKS, MIDDLESBOROUGH, W. Fallows, Esq.	.....	
.05	.05	WORCESTER, EVESTON, <i>Lansdowne</i> , R. Burlingham, Esq.	.....	{ (See Letter, page 81.) Fell between 10 p.m. 25th, and 6 p.m. 26th. From 10 p.m. 25th, to 10 p.m. 26th. R from 3 a.m. to 3 p.m. Wind N.E. and S.W. 26th very heavy rain, with N. wind. Rain said to be much more than 1.51 at places round here. Between 10 p.m. 25th, and 8 p.m. 26th, 1.50 in. fell. From 1 a.m. 26th; rained all day with boisterous wind. From 5 a.m. 26th, to 9 a.m. .47; 9 a.m. to 8 p.m. .99. Began 12 p.m. 25th. Rain began at 1 a.m. 26th; heaviest at 3 a.m. From 11 p.m. 25th, to 11 a.m. 26th, 1.28. All fell between midnight of 25th and midnight of 26th. Wind on 26th N. strong.
.05	...	NORTHAMPTON, WELLINGBOROUGH, E. Sharnan, Esq.	.....	
.05	...	LINCOLN, ULCEBY, <i>Killingholme</i> , Rev. J. Byron	.....	
.03	.00	...	.....	





fell. Nearly 4 inches fell at Billericay in Essex, but whether or not the district between there and Deptford had an equal quantity, there is not at present evidence to prove. Later still, there was an excessive fall of nearly 3 inches at Bury St. Edmunds, but this appears to have been quite separate from the other falls.

We do not presume to state *why* the downpour on the 26th was so excessive, any more than *why* nearly twice as much rain fell at Deptford as at Camden Town, one having 4 inches and the other 2 $\frac{1}{4}$ , though only 7 miles distant; or *why* Maidstone had 2·7 in. and Linton Park 1·5 in., though also only 7 miles apart; or *why* Hartlip had 5·04 and Tong, 6 miles off, had only 1·64. These anomalies are the special attribute of violent rains, and at present must remain unexplained. Their locality varies; possibly it may be a century before the places which have had such excessive falls have the like again, but such will occur, and it is the duty of all to be prepared for them. As to the rest, let the tables and letters speak for themselves.

TABLE II.—*Approximate Commencement, Duration, and Termination of Rain.*

[illegible]

TABLE III.—*Per Centage, of Total Rainfall in the two days, which fell before 9 a.m. July 26th.*

(Stations arranged according to per centage—*e. g.*, at Hartlip nearly all the rain fell before 9 a.m. 26th, the amount then measured being 95 per cent. of the total measured on 26th and 27th.)

Per cent.		Per cent.	
95	Kent, Hartlip.	77	Middlesex, Holloway.
92	„ Maidstone.	77	Surrey, Brixton Hill.
91	„ Sheerness.	77	„ Guildford.
88	„ Maidstone F.R.	77	„ Cobham.
87	Essex, Rochford.	76	„ Stockwell.
84	Kent, Greenwich.	74	„ Banstead.
84	„ Crossness.	73	Kent, Bromley Common.
82	Surrey, Penge.	65	Essex, Waltham Abbey.
82	Middlesex, Camden Town.	63	Kent, Seven Oaks.
81	„ Pimlico.	59	Essex, Billericay.
79	Kent, Deptford.	31	Suffolk, Lawshall.
79	Middlesex, Islington.	21	„ Bury.

## ALPHABETICAL LIST OF TOWNS &amp; VILLAGES HAVING NO RAIN.

Abercarn, Monmouth.  
 Aberdeen, Aberdeen.  
 Ayr, Ayr.  
 Ballater, Aberdeen.  
 Barnstaple, Devon.  
 Bishopscastle, Salop.  
 Cardiff, Glamorgan.  
 Chepstow, Monmouth.  
 Clumber, Notts.  
 Deanston, Perth.  
 Derby, Derbyshire.  
 Dumfries, Dumfries.  
 Dymock, Gloucestershire.  
 Gainsborough, Lincolnshire.  
 Haverfordwest, Pembroke.  
 Hawick, Hawick.  
 Hineckley, Leicestershire.  
 Ilkley, Yorkshire.

Knaptoft, Leicester.  
 Lancaster, Lancashire.  
 Leicester, Leicestershire.  
 Leominster, Herefordshire.  
 Logierait, Perth.  
 Malvern W., Worcestershire  
 Manchester, Lancashire.  
 Market Drayton, Salop.  
 Matlock, Derby.  
 Neath, Glamorgan.  
 Orleton, Worcester.  
 Penttyrch, Glamorgan.  
 Rhayader, Radnor.  
 Shrewsbury, Salop.  
 Wigston, Leicestershire.  
 Willersley, Derby.  
 Wragby, Lincoln.  
 York, York.

## REMARKABLE RAINFALL IN IRELAND, JULY 23RD.

*To the Editor of the Meteorological Magazine.*

SIR,—By your letter in the *Times*, it appears that communications on the subject of the late heavy rains will be acceptable. Here more has fallen than at any time the last five years, during which regular measurements have been taken. In the memory of the oldest inhabitant (to whose appeal, and not, I am sorry to say, to old registers, reference must be made) the inundation of Strabane has never reached to such a height. The main street of the town was traversed by a rapid stream about 3 or 4 feet deep, the cellars and lower stories of all the houses being flooded. Communication was kept up by boats through the principal streets of the town.

On the 16th there was measured 1·38 ; wind S.E.

During the three days, 20th, 21st, 22nd, there was measured again 1·65, with N.E. wind.

On the 23rd, Tuesday, at one o'clock, light wind still blowing from N.E., but not a cold wind ; the fall commenced and continued without intermission for 17 hours, until six o'clock next morning (Wednesday, 24th, 6 a.m.) There was measured in the rain gauge that day, at the usual hour, the large quantity of 2·90 in., being nearly one inch more than ever fell here. The receiving vessel

inside my Glaisher rain gauge overflowed into the body of the instrument. The maximum rainfall hitherto has been—

17th June, 1863 ... ..	1.19	15th November, 1866 ...	1.17
23th August, 1865 .....	1.29	24th July, 1867 .....	2.90
28th November, 1865....	1.95		

This excessive rainfall, with North Easterly wind, is unparalleled ; its occurrence at this season of the year has been very destructive to growing crops on all the lowlands ; cattle, grazing on the islands of the river, in many cases were carried down the flood and drowned ; most of the embankments have been destroyed, hay stacks in numbers have been floated out to sea, and general damage done, of which it is impossible to form an estimate. A promising turnip field near this house is in one part completely covered over with gravel, having the appearance of a macadamized road ; a wooden foot-bridge was carried away, not a morsel of it has been recovered.

It is a cause of surprise on reading the Meteorological Report in the *Times* of July 24th, that the rainfall was generally so small in other places (there are only two from Ireland.) The greatest quantity in that return was at Greencastle, about 20 miles north of Strabane, only .65. The wind generally appears to have been blowing from N.E. all over Ireland, and was westerly in England, with corresponding low and high temperatures in each country (51° and 59°) during the whole of the rainy interval from Tuesday to Friday, the heavy rain ceasing here on Wednesday at 6 a.m., and beginning in London on Thursday at 10 p.m.

You promise a map, showing the relative fall in different localities. Would it not be well to distinguish the two rainfalls—that which commenced with such tremendous force in the North of Ireland on 23rd, 24th, and that which you describe in South of England on 25th, 26th? Also, to notice the direction of wind at each place of observation. The opposite directions of wind in northern portions of these Islands and the southern, are evident from the *Times* returns. Are these not such as might have enabled a weather prophet on that morning to have foretold heavy rains in the South of England?

The barometer was at its lowest on 22nd, 9 a.m., 29.30 nearly, from which date it has gradually risen every day.—Yours truly,

C. MAXWELL.

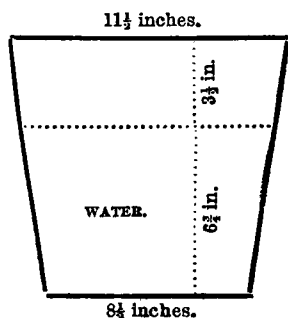
Leckpatrick Rectory, Strabane, July 29th, 1867.

*To the Editor of the Meteorological Magazine.*

SIR,—In your letter in the *Times*, dated the 26th ult., you express a wish that any great fall of rain should be communicated to you ; and I therefore send you an account of a very severe storm of rain, lightning, and thunder, which occurred here on the 23rd ult., and I may begin by stating that what I write I know to *my own knowledge*, and not from hearsay evidence.

The storm began here about 11.45 a.m., and lasted till about 3 p.m. ; such a storm is not remembered here by “the oldest inhabitant.” There was in my garden, in an open space, an ordinary galvanized iron circular bucket, which had been left there *quite empty* just before the rain began, and when I looked at it about 4 p.m., I was so struck with the amount of water in it that I measured it accurately, and in the accompanying sketch I send you the measurements of the bucket, and also the depth of water that was in it, 6½ in., and which must all have been rain that fell during the time I have mentioned. I sent a copy of the sketch to Dr. Robinson, of the Observatory, Armagh, and he computes the rainfall to have been 4.84 inches, to which is to be added, in his opinion, about half-an-inch for loss of water caused by the splashing of the rain. He states that this is nearly triple anything he has known at Armagh for the last 35 years.

Owing to this neighbourhood being hilly, not much damage has been done, and I think I am the largest loser ; but a small stream in a gentleman's garden near here, that usually runs in its proper course, became a torrent, and went



right through his *drawing-room*, flooding it to the depth of 39 inches. Should you think this of any importance, I shall feel obliged if you would calculate the rainfall, and let me know if your calculation agrees with Dr. Robinson's.

Sincerely yours,

A. S. NICHOLSON.

Lisduh, Dungannon, co. Tyrone, Ireland, Aug. 4, 1867.

### PREVIOUS HEAVY RAINS.

*To the Editor of the Times.*

SIR,—The excessive rain of the early hours of this day will probably render a few particulars concerning its amount generally acceptable.

Those who have perused my various publications on the subject are aware that there was a considerable drought in the years 1854 to 1858 inclusive, the five years yielding little more than four years usually do; and that the subsequent eight years (up to January 1, 1867) have given the ordinary average fall. The first six months of the present year have also given the average fall—rather above it in England and Ireland, and below it in Scotland. On the whole, we may therefore say that (the deficiency from 1854 to 1858 being written off “hopeless”) our rain accounts were fairly balanced at the beginning of the present month.

Of course in a dry district like London, with only 24 in. of rain yearly, it is not likely that our “heavy rains” can compete in quantity with mountainous stations which have six or eight times as much as we have; but, relatively to our total fall, I have shown (*British Rainfall*, 1866, p. 72) that we have much the most remarkable rains. For example, the greatest rain in 24 hours I find recorded at Greenwich was on the 14th of July, 1853, when 2·63 inches fell, being 11 per cent., or 1·9th of the yearly average; a ninth of the yearly average at Seathwaite (140 inches) is 15·6 inches, yet they have never had more than 6·6 inches in 24 hours—that is to say, not 5 per cent., against our 11 per cent.

The amount registered here between the 25th of July, 10 p.m., and the 26th of July, 9 a.m., was 1·82 in.

The following are all the instances in which the fall in the suburbs of London has amounted to  $1\frac{1}{2}$  in. or upwards in 24 hours upon which I can at present put my hands:—

#### GREENWICH OBSERVATORY, 1837 TO 1866.

	Inches.		Inches.
1843—August 23... ..	2·16	1853—July 14... ..	2·63
1851—August 17... ..	1·71	1857—October 22 ...	2·59
1852—July 25 ... ..	1·97	1859—September 26 ...	1·55

#### PLAISTOW AND TOTTENHAM, 1807 TO 1827.

	Inches.		Inches.
1808—July 27 ... ..	1·88	1820—September 17 ...	1·52
1811—July 21 ... ..	1·61	1824—May 15 ... ..	1·67
1816—June 26 ... ..	2·05	1825—May 12 ... ..	1·70
1818—February 22 ...	1·62	1826—July 22 ... ..	1·83

#### CAMDEN TOWN, 1858 TO 1867.

	Inches.		Inches.
1859—September 26 ...	1·66	1867—July 25 ... ..	1·82
1863—June 19 ... ..	1·55		

Although the rain of this morning stands correctly entered as above for the rain-fall-day-ending at 9 a.m., it may be well to mention that the total fall between 10 p.m. last night and the same hour this night is 2·21 inches. From the above it will be seen (1) that it is rather more than ten years since we had so heavy a rain as last night, (2) that in 52 years there have only been seven days on which the rain has been greater than in the present instance, or (3) if we take the 24 hours from the commencement of the rain, then only two instances out of 52 years. Moreover, during the same 52 years there have been 85 days on which an inch or more of rain has fallen; of these 11 occurred between the 21st and 27th of July; and in the 17 instances quoted above, five are in that week.

Communications on the subject will be very acceptable, as I intend to prepare a map showing the relative fall in different localities.

I am, Sir, your obedient servant,

136, Camden Road, N.W., July 26th.

G. J. SYMONS.

# PREMONITIONS OF THE FALL.

*To the Editor of the Meteorological Magazine.*

SIR,—From your letter in the *Times*, I conclude that you may like to have my observations as to the recent rainfall.

On the evening of the 24th we noticed a very peculiar appearance in the S.E. after sunset. The sky was chiefly overcast, with a free display of red streamers all over the east and south, but in the south-east was a beautiful fan of blue divergent radii rising 30° above the horizon and breaking across the redness, like a windmill, with blue sails to it. Calling to mind my Georgics,

“Densa inter nubila sese,

Diversi erumpunt radii,”

I expected heavy rain, but as only a few drops fell that night, I put it down as an error. Neither on the 25th was there, until the evening, any indication that St. James would do his best to drown St. Swithin. But towards sunset a heavy nucleus of cloud appeared in S.E., with a sultry breeze from that quarter, and the sky became filled with darkness. Some drops of rain fell about 9 o'clock, and one or two flashes of distant lightning were seen. However, it did not begin in earnest until past 11 p.m., and then it came down pretty quietly, without any wind or thunder. In the morning I was surprised to find 1.44 in. in my rain gauge at 9 a.m., and domestic pets still falling. From 9 to 10 a.m., 0.14 was the measure, and 0.10 at 11 o'clock when the clouds relaxed a little. It rained again for most part of the day, seeming not to know when to stop. I believe, however, that all was over about 11 p.m. on the 26th, being 24 hours complete. The entire depth was 1.86, less (I see) than you had. The wind, during the downpour, backed from S.E. to N.E., and thence (half a gale) to N.W., with low temperature for July. To-day the sky looks exhausted, and I trust we shall have fine weather.

Yours faithfully,

Teddington, July 27th, 1867.

R. D. BLACKMORE.

[The above allusion to a windmill-like appearance is singularly corroborated by a friend, who has sent us a sketch of the W. sky, as seen from Kentish Town on the 25th, at 9 p.m., with the four sails as complete as possible. It is a strange story, but true nevertheless.—ED.]

## EXCESSIVE FALL OF RAIN.

On Thursday night (25th), shortly before 12 o'clock, rain began to fall in torrents in London, accompanied with heavy gusts of wind from the W.N.W., and occasional flashes of lightning. The rain fell without intermission till 11 o'clock yesterday forenoon. It then ceased, but it began again at 2 o'clock, and continued until a late hour in the evening. The fall of rain was heavier than any we have had this season, and it has flooded the Thames and its tributaries. As the tide rose yesterday various parts of the banks of the river, particularly on the southern side, between Greenwich and Wandsworth, including a considerable portion of the Southern Embankment, became flooded, and very serious damage has been done by flooding to cellars in all parts of South London. At Chatham and Rochester the rain fell in sheets of water, resembling more the torrents occasionally met with in tropical countries than anything usually experienced in these latitudes. In both Rochester and Chatham the principal streets were turned into water-courses, in many parts both roadway and pavement being several inches under water. In the lower parts of the town the results of the storm were exceedingly disastrous, there being scarcely a house which was not flooded, while in the neighbourhood of the lower part of High Street, Chatham, most of the houses were submerged, and the cellars and lower apartments were filled with water. During the greater of yesterday the unusual spectacle was to be witnessed of powerful steam fire-engines from Chatham Dockyard pumping the water out of the cellars of the houses inundated in High Street.

By the arrival of the morning and mid-day trains at London, yesterday, intelligence was brought of the existence of floods from Stratford to Cambridge, on the Great Eastern Railway, the greater part of the land on each side of the line presenting the appearance of an immense river.—*Times*, July 27th, 1867.

*To the Editor of the Meteorological Magazine.*

SIR,—I lose no time to inform you that on measuring the rainfall this morning, the result gave  $4\frac{1}{2}$  inches and 3 hundredths, which fell in the night and morning, between the hours of one and five; almost a calm.

I am that oft-named person "the oldest man in the village," and certainly I never measured such a large rainfall before.

The bottle I found quite full of water, and a considerable quantity more in the tin case, which would otherwise have been lost.

My old rain gauge proved of no use, as the bottle could not contain all that fell.

Believe me, very truly yours,

Hartlip, July 26th, 1867.

WM. BLAND.

*To the Editor of the Meteorological Magazine.*

SIR,—I have just received from my friend the dimensions of the pail, which were given to him by the person who placed the empty pail on the ground (1 mile S. of Chatham), free from buildings and trees, and who also witnessed the overflowing of the rain-water from the same.

Dimensions of the pail:—size across the top,  $10\frac{1}{2}$  inches; size across the bottom,  $6\frac{3}{4}$  inches; depth,  $9\frac{1}{8}$  inches.

I have further to mention, that the roads after the storm were found much torn up, exhibiting deep gullies, and heaps of stones and soil in places.

In the neighbourhood of the parish of Meopham, on the London Chatham and Dover Line, a few miles on the London side of Rochester, the roads were greatly broken up by the storm of rain, which excavated gullies deep enough to bury a horse (so my friend informed me). This being the state of the case, a larger quantity of rain must have taken place there than at Hartlip,

Believe me, very truly yours,

Hartlip, Sittingbourne, August 10th, 1867.

WM. BLAND.

## NOTES AND SUNDRIES.

*To the Editor of the Meteorological Magazine.*

SIR,—Perhaps it may be interesting to compare the humidity of the air here on the 27th June with the table you have given.

The thermometers are 4 ft. above the ground, and about 410 feet above the sea. The comparison seems to show that there is very little difference due to elevation above the sea compared with that which you found to result from elevation above the ground.

*Humidity at Tunbridge Wells, June 27th, 1867.—4 ft. above ground, and 410 ft. above sea.*

Hour.	Dry Bulb.	Wet Bulb	Deg. of humidity	Dewpoint	Hour.	Dry Bulb	Wet Bulb	Deg. of humidity	Dewpoint
	°	°	0—100	°	p.m.	°	°	0—100	°
9 a.m.	66·0	53·0	42	42·5	2.30	77·2	57·0	29·6	42·9
10.30	71·0	54·5	35	42·0	5	71·0	56·5	39	45·5
11.15	74·0	56·5	34	43·7	7.30	66·5	54·0	43	44·0
12	74·0	55·0	31	41·1	8.0	60·2	50·8	52	42·9
1 p.m.	76·3	56·2	30	42·0	10.30	58·5	50·0	55	42·4
2	77·0	57·0	30	43·0					

This table shows that the air contained least vapour at noon, and most at five p.m., while the relative humidity was least at 2.30, and greatest (of the observed times) at 10.30. The temperature of the dew point was so uniform throughout the day, that from the temperature of the air the reading of the wet bulb, almost at any time, might have been predicted, when it had once been observed and the dew point found. This seems generally to be the case, at least in dry weather.

In July we have had 4·6 inches of rain, but the downfall on the 25th, which washed people elsewhere, was more moderate—only 0·93 inch. The mean temperature was 58·6, cold for July. The sun maximum in vacuo reached  $157^{\circ}\cdot 5$  on the 1st, but never exceeded  $141^{\circ}$  on any other day. The highest in the shade was

81° on the 1st. If ozone be healthy, Tunbridge Wells must be a healthy place, for the average was 6 on Schonbein's scale.

I think in a previous number you remarked upon Mr. Buchan's plan of deducing the mean temperature from the simple mean of the daily maxima and minima, as opposed to the Greenwich plan. I think the subject is very important. Here the Greenwich corrections seem to answer very well, but I do not find that they answer at all in Yorkshire. I believe that two causes produce this result. The mean temperature of Kent is but little above that of Yorkshire, but the daily maximum is always considerably higher, owing to the increased power of the sun, due to 3 degrees difference in latitude, while nocturnal radiation is about equal. (By the way, Mr. Buchan is obviously wrong in supposing solar radiation to increase as you go north; the records of the Meteorological Society show exactly the contrary, if all records are omitted where the black bulb in vacuo is not placed, as it is at Greenwich, on the ground or grass, and where the stations are not approximately at the same level.) The minimum is also somewhat lower in Yorkshire. The following table, extracted from the last four reports, shows the elevation of the maximum in the South East of England to an extent disproportioned to the excess of its mean temperature.

NEAR LONDON (4 Stations.)					
	Mean Min.		Mean Max.		Mean Temp.
1st quarter, 1867 ...	33·1	.....	45·4	.....	39·2
2nd „ 1866 ...	43·7	.....	63·7	.....	52·7
3rd „ 1866 ...	50·9	.....	69·4	.....	59·0
4th „ 1866 ...	40·0	.....	52·8	.....	46·4
	41·9		57·8		49·3
YORKSHIRE (4 Stations.)					
1st quarter, 1867 ...	32·0	.....	42·0	.....	37·1
2nd „ 1866 ...	41·8	.....	59·3	.....	50·6
3rd „ 1866 ...	49·5	.....	65·1	.....	56·4
4th „ 1866 ...	38·9	.....	49·6	.....	45·2
	40·5		54·0		47·3

TAKING THE WHOLE YEAR.				
	Mean Temp.	Simple Mean of Max. & Min.		Correction required.
Near London .....	49·3	.....	49·9	—0·6
Yorkshire .....	47·3	.....	47·2	+0·1

Thus it appears that as the Greenwich corrections are on an average 1°·1, the mean temperature of the stations near London (including Greenwich) for the year ending March, 1867, would have been 0°·5 too low if they had been calculated solely from the corrected mean of the maxima and minima, and that of the Yorkshire stations 1°·2 too low. I assume, of course, that the mean temperatures given in the Registrar-General's Report are correct. Comparing the Yorkshire stations with Greenwich, we have for same period—

	Mean Temp.	Simple Mean of Max. & Min.		Correction required.
Greenwich .....	49·2	.....	50·1	—0·9
Yorkshire .....	47·3	.....	47·2	+0·1

So that the Greenwich corrections do for Greenwich, as was to be expected, but not perfectly for other stations in the neighbourhood, and not at all for Yorkshire. There, is, therefore, another reason besides difference of latitude, which also affects the correction required. A station in a valley will have a lower minimum than a station on a hill or rising ground, but the maximum will not be much higher, and yet the mean temperature will be higher in the valley. Therefore, for stations in the South of England on rising ground, especially if facing the sun, I should expect the Greenwich corrections to be right, but for places in a valley, I should take say half of the correction given. In the North of England, places in a valley should use the simple mean, but for places on a hill I can only guess that perhaps half the Greenwich correction might do.

One thing is clear, that the subject ought to be very carefully investigated.

I am, Sir, yours truly,

F. W. STOW.

Tunbridge Wells, August 1st,



JULY, 1867.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which "1 or more fell.	TEMPERATURE.				No. of nights
		Total Fall.	Differ- ence from average 1860-5	Greatest Fall in 24 hours.		Max.		Min.				
				Dpth.	Date.	Deg.		Date.	Deg.	Date.		
		inches	inches.	in.				Deg.	Date.	Deg.	Date.	
I.	Camden Town .....	4.30	+ 2.51	1.82	25	14	76.9	1	44.0	28		
II.	Staplehurst (Linton Park) ...	4.53	+ 2.55	1.51	25	16	80.0	12	43.0	9†		
III.	Selborne (The Wakes).....	4.82	+ 2.62	.95	25	14	73.0	12‡	39.5	25§		
IV.	Hitchin .....	4.24	+ 2.34	.72	26	17	73.0	1, 10	42.0	27		
V.	Banbury .....	2.17	+ .11	.43	15	18	75.0	10	40.0	28		
VI.	Wisbech .....	3.40	...	1.15	26	14	79.0	10	42.0	6		
VII.	Bury St. Edmunds (Culford).	4.49	+ 2.50	...	...	15	82.0	10	39.0	8		
VIII.	Calne .....	6.63	+ 2.35	...	...	...	82.0	...	38.0	...		
IX.	Plymouth (Goodamoor) .....	3.73	+ .87	.76	16	16	...	...	...	...		
X.	Barnstaple .....	3.35	+ 1.45	.81	25	14	80.5	11	43.5	24		
XI.	Taunton (Fulland's School) ..	1.65	— .42	.67	15	11	83.0	...	...	...		
XII.	Shrewsbury (Highfield) .....	2.97	+ .58	.55	2	15	77.8	10	36.8	28		
XIII.	Tenbury (Orleton) .....	2.24	+ .14	.69	16	12	85.0	10	40.0	7		
XIV.	Leicester (Wigston) .....	...	...	...	...	...	...	...	...	...		
XV.	West Retford .....	1.92	— .27	.39	15	12	79.0	10	44.0	25		
XVI.	Derby .....	4.23	+ 1.59	1.11	16	14	86.6	11	41.7	6		
XVII.	Manchester .....	2.40	+ .46	.44	3	13	75.5	11	44.0	6		
XVIII.	York .....	4.29	+ 1.06	.74	15	14	73.0	1, 10	39.0	29		
XIX.	Skipton (Arncliffe) .....	3.20	+ 1.39	.81	18	15	70.0	4, 14	45.0	6		
XX.	North Shields .....	10.43	+ 2.29	2.67	17	16	...	...	...	...		
XXI.	Borrowdale (Seathwaite) .....	5.13	...	1.74	15	12	79.0	12	47.0	6, 31		
XXII.	Abercarn .....	3.01	— .29	1.27	16	...	78.6	11	41.0	31		
XXIII.	Haverfordwest .....	4.53	+ 1.68	1.35	15	14	78.0	...	37.0	...		
XXIV.	Rhayader (Cefnfaes) .....	3.92	...	1.73	16	16	...	...	...	...		
XXV.	Llanberis (R. Victoria Hotel) ..	5.63	+ 3.39	1.45	23	13	...	...	...	...		
XXVI.	Dumfries .....	6.89	...	1.92	22	15	...	...	...	...		
XXVII.	Hawick (Silverbut Hall) ...	5.48	+ 2.17	1.91	22	13	75.0	9	38.0	7		
XXVIII.	Ayr (Auchendrane House) ...	3.43	+ .12	.58	12	12	75.0	13	43.0	20		
XXIX.	Otter House .....	6.49	+ 4.22	1.77	14	17	76.0	10	42.0	29		
XXX.	Leven (Nookton) .....	4.18	+ .78	.56	11*	15	76.8	10	37.0	29		
XXXI.	Stirling (Deanston) .....	6.07	...	1.51	14	16	...	...	...	...		
XXXII.	Logierait .....	4.89	...	1.12	15	20	79.2	9	34.5	7		
XXXIII.	Ballater .....	3.40	...	.94	15	18	70.0	10	41.7	7, 8		
XXXIV.	Aberdeen .....	2.71	...	.72	19	14	71.2	10	45.7	25		
XXXV.	Inverness (Culloden) .....	4.77	...	.82	12	17	...	...	...	...		
XXXVI.	Fort William .....	2.97	— 3.10	1.26	12	10	73.8	10	35.2	3		
XXXVII.	Portree .....	2.10	...	.55	18	18	...	...	...	...		
XXXVIII.	Loch Broom .....	2.72	...	.49	16	15	...	...	...	...		
XXXIX.	Helmsdale .....	1.58	— .31	.38	3	12	64.2	14	37.4	2		
XL.	Sandwick .....	2.93	...	.65	26	19	...	...	...	...		
XLI.	Cork .....	5.02	+ 1.71	.84	22	13	79.0	4	48.0	24		
XLII.	Waterford .....	3.62	+ .43	.85	21	15	82.5	8	39.0	29		
XLIII.	Killaloe .....	2.65	— .89	.81	13	21	73.0	11	41.0	6		
XLIV.	Portarlinton .....	2.56	+ .13	1.28	15	17	76.5	10	39.8	20		
XLV.	Monkstown .....	3.15	...	1.49	13	18	77.0	10	47.0	20¶		
XLVI.	Galway .....	4.63	...	1.15	3	16	75.0	8	35.0	30		
XLVII.	Bunninadden (Doo Castle) ...	5.40	...	1.25	11	20	79.5	8 & 9	38.0	5		
XLVIII.	Bawnboy (Owendoon) .....	6.04	...	1.30	15	14	82.0	8	37.0	5		
XLIX.	Waringstown .....	8.45	...	2.90	23	16	79.0	9	34.0	6		
L.	Strabane (Leckpatrick) .....	...	...	...	...	...	...	...	...	...		

\* And 22nd. † And 13th. ‡ And 24th & 29th. § And 30th. || And 27th & 29th. ¶ And 25th  
 + Shows that the fall was above the average ; — that it was below it.

JULY, 1867.

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 1860-5	Greatest Fall in 24 hours.		Days on which <sup>or more</sup> fell.	Max.		Min.			
				Dpth.	Date.		Deg.	Date.	Deg.	Date.		
		inches.	inches.	in.								
I.	Camden Town .....	4.30	+ 2.51	1.82	25	14	76.9	1	44.0	28	0	
II.	Staplehurst (Linton Park) ...	4.53	+ 2.55	1.51	25	16	80.0	12	43.0	9†	0	
III.	Selborne (The Wakes).....	4.82	+ 2.62	.95	25	14	73.0	1, 10	39.5	25§	0	
"	Hitchen .....	4.24	+ 2.34	.72	26	17	73.0	1, 10	42.0	27	0	
"	Banbury .....	2.17	+ .11	.43	15	18	75.0	10	40.0	28	0	
"	Wisbech .....	3.40	...	1.15	26	14	79.0	10	42.0	6	0	
IV.	Bury St. Edmunds (Culford). ..	4.49	+ 2.50	...	...	15	82.0	10	39.0	8	0	
V.	Calne .....	...	...	...	...	...	...	...	...	...	...	
"	Plymouth (Goodamoor) .....	6.63	+ 2.35	...	...	...	82.0	...	38.0	...	...	
"	Barnstaple .....	3.73	+ .87	.76	16	16	...	...	...	...	...	
"	Taunton (Fulland's School) ..	3.35	+ 1.45	.81	25	14	80.5	11	43.5	24	0	
VI.	Shrewsbury (Highfield) .....	1.65	— .42	.67	15	11	83.0	...	...	...	...	
"	Tenbury (Orleton) .....	2.97	+ .58	.55	2	15	77.8	10	36.8	28	0	
VII.	Leicester (Wigston) .....	2.24	+ .14	.69	16	12	85.0	10	40.0	7	0	
"	West Retford .....	...	...	...	...	...	...	...	...	...	...	
"	Derby .....	1.92	— .27	.39	15	12	79.0	10	44.0	25	0	
VIII.	Manchester .....	4.23	+ 1.59	1.11	16	14	86.6	11	41.7	6	0	
IX.	York .....	2.40	+ .46	.44	3	13	75.5	11	44.0	6	...	
"	Skipton (Armcliffe) .....	4.29	+ 1.06	.74	15	14	73.0	1, 10	39.0	29	0	
X.	North Shields .....	3.20	+ 1.39	.81	18	15	70.0	4, 14	45.0	6	0	
"	Borrowdale (Seathwaite).....	10.43	+ 2.29	2.67	17	16	...	...	...	...	...	
XI.	Abercarn .....	5.13	...	1.74	15	12	79.0	12	47.0	6, 31	0	
"	Haverfordwest .....	3.01	— .29	1.27	16	...	78.6	11	41.0	31	0	
"	Rhayader (Cefnfaes).....	4.53	+ 1.68	1.35	15	14	78.0	...	37.0	...	0	
"	Llanberis (R. Victoria Hotel) ..	8.92	...	1.73	16	16	...	...	...	...	...	
XII.	Dumfries .....	5.63	+ 3.39	1.45	23	13	...	...	...	...	0	
"	Hawick (Silverbut Hall).....	6.89	...	1.92	22	15	...	...	...	...	...	
XIV.	Ayr (Auchendrane House) ...	5.48	+ 2.17	1.91	22	13	75.0	9	38.0	7	0	
XV.	Otter House .....	3.43	+ .12	.58	12	12	75.0	13	43.0	20	0	
XVI.	Leven (Nookton) .....	6.49	+ 4.22	1.77	14	17	76.0	10	42.0	29	0	
"	Stirling (Deanston) .....	4.18	+ .78	.56	11*	15	76.8	10	37.0	29	0	
"	Logierait .....	6.07	...	1.51	14	16	...	...	...	...	...	
XVII.	Ballater .....	4.89	...	1.12	15	20	79.2	9	34.5	7	0	
"	Aberdeen .....	3.40	...	.94	15	18	70.0	10	41.7	7, 8	0	
XVIII.	Inverness (Culloden) .....	2.71	...	.72	19	14	71.2	10	45.7	25	0	
"	Fort William .....	4.77	...	.82	12	17	...	...	...	...	...	
"	Portree .....	2.97	— 3.10	1.26	12	10	73.8	10	35.2	3	0	
"	Loch Broom .....	2.10	...	.55	18	18	...	...	...	...	...	
XIX.	Helmsdale .....	2.72	...	.49	16	15	...	...	...	...	...	
"	Sandwick .....	1.58	— .31	.38	3	12	64.2	14	37.4	2	...	
XX.	Cork .....	2.93	...	.65	26	19	...	...	...	...	...	
"	Waterford .....	5.02	+ 1.71	.84	22	13	79.0	4	48.0	24	0	
"	Killaloe .....	3.62	+ .43	.85	21	15	82.5	8	39.0	29	0	
XXI.	Portarlington .....	2.65	— .89	.81	13	21	73.0	11	41.0	6	0	
"	Monkstown .....	2.56	+ .13	1.23	15	17	76.5	10	39.8	20	0	
XXII.	Galway .....	3.15	...	1.49	13	18	77.0	10	47.0	20¶	0	
XXIII.	Bunninadden (Doo Castle) ..	4.63	...	1.15	3	16	75.0	8	35.0	30	0	
"	Bawnboy (Owendoon) .....	5.40	...	1.25	11	20	79.5	8 & 9	38.0	5	...	
"	Waringstown .....	6.04	...	1.30	15	14	82.0	8	37.0	5	0	
"	Strabane (Leckpatrick) .....	8.45	...	2.90	23	16	79.0	9	34.0	6	0	

\* And 22nd. † And 13th. ‡ And 24th & 29th. § And 30th. || And 27th & 29th. ¶ And 25th.

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

# METEOROLOGICAL NOTES ON THE MONTH.

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 TOWN.—TS on 13th. Excessive R on morning of 26th.

LINTON PARK.—Distant T on 2nd, 13th, 14th, 26th, and 27th. High wind on 15th and 16th. A cold wet month for July, the rainfall of 26th exceeding that of any day for upwards of 12 years. Winds mostly S., but the rain of the 26th came from N. The harvest will be late, many fields scarcely changing color at the end of the month, but the hay has in general been secured in good condition; the rainfall of the 26th was said to be much greater in some places than here.

SELBORNE.—Oppressively hot, with L on the 1st. Prevailing wind from 10th to 25th S. to S.W., the remainder N.W. T on 14th; TS on 28th, with H from 3 to 5 p.m. This storm was very partial; at Newton Valence (W.) and at Greatham (S.E.) violent hail, while at Alton (N.) they had not any. During this storm the ther. here fell 10 degrees, viz., from 59° to 49°.

BANBURY.—TS on 4th and 13th; H on 14th; T with H on 28th.

WISBECH.—From the 4th to 12th fair, the rest of the month cold and unsettled. The corn crops much laid by the R and wind on the 26th; the harvest will be at least a week later than during the last five years. T on 15th.

CULFORD.—T on 2nd, 13th, and 28th. Month generally dull and cold for the season. Great fall of R on Friday, the 26th, commencing a few minutes before 6 a.m., and never slackening till 6 p.m., when the fall was found to be 2.07 in.

TAUNTON.—Bar. fell 1 in. between the 9th and 15th.

ORLETON, WORCESTERSHIRE.—A fine month upon the whole, but the temp. below the average, with a prevalence of N. and E. winds. Max. temp. on four days only reached 76°, and the nights were generally cold. On the morning of the 28th the grass min. fell to 33°·8; distant T heard on 4th, 13th, and 14th. At the end of the month the land became very dry.

WIGSTON.—Temp. very variable and ungenial for vegetation. Harvest backward; hay harvest abundant and well secured.

MANCHESTER.—T on 13th and 18th. Excessively heavy R on the 16th.

YORK.—T at 4 p.m. on 10th.

NORTH SHIELDS.—Yellow turncap lily in flower on 1st. A cloudy month, with R much above the average. TS on 18th.

SEATHWAITE.—Only 3 days with more than 1 in. of R, but total fall much above the average. Hot from 6th to 12th, rest of month cold and cloudy. TS on 17th.

## W A L E S.

ABERCARN.—Rainy weather from the 2nd to 5th, then fine and generally clear to the 14th, when a period of rainy weather again set in up to the 23rd; afterwards fine and calm to the end of the month. On the 15th there was a heavy downpour, yielding 1.74 of R in 9 hours. Very little T during the month.

HAVERFORDWEST.—First fortnight warm and pleasant; daily temp. above 70° with warm nights. No R till the 4th, when .45 in. fell; drought much felt. On the 13th heavy R, with T and sheet L, following a red sunset with dark lurid clouds in N.E., and being followed at 1.30 a.m. by a fine lunar rainbow. On 15th (St. Swithin) 1.27 in. fell nearly in one fall, at least in the 24 hours.

CEFNFAES.—Temp. low during the month; the last fortnight the evenings and nights have been very cold, with slight frosts.

## S C O T L A N D.

DUMFRIES.—With the exception of 3rd and 4th, the weather dry to the 13th, thence to the 24th only one day without R; the rainfall on the 23rd excessive, such a heavy fall not known for years. The close of the month dry, but cold for end of July. Harvest will be three weeks (at least) later than that of last year, but green crops are much heavier. 83°·5 in the shade on the 11th. T on 11th & 13th.

SILVERBUT HALL, HAWICK.—A singularly beautiful rainbow at sunset on the 4th. TS on 10th, T on 11th and 14th. The copious rains have been most beneficial to the crops, which were suffering from the drought of June. Oats were much laid by the heavy rains of the 21st and 22nd, but they have got up their heads again, and they, with the other crops, now promise abundance.

AUCHENDRANE.—On the forenoon of the 11th distant T was heard in the W. about 8 p.m. ; the storm came very near from the S., and the L glare was intensely red ; about 10.30 the L flashed in all directions, and the roar of the T was almost continuous from that time till 8 a.m. 12th, about which time the L rod on the house was struck ; the noise was terrific, and at the same moment a neighbouring silver fir, 90 ft. high and 13 ft in girth, was shattered to pieces, only leaving a bare and fractured stump rising from the ground 30 ft. There has been no such night of electric disturbance in the memory of the present generation. The storm extended over a large district, especially towards the S., but with less violence. On 22nd, day of greatest rainfall, the wind from calm became N. and N.E. moderate ; the sky was densely overcast with clouds from S., and afterwards E.

DEANSTON.—Last fortnight very cold from E. winds, which blew on 22 days.

LOGIERAIT.—Warm and dry from 1st to 11th, thence to the 25th heavy R, with a greatly reduced temp. ; afterwards warm. Crops promise well.

BALLATER.—An unusually cold and stormy month. The amount of R much above the average. Pasture for cattle exceptionally luxuriant, but sunshine now much wanted to ripen the crops, which must be late. T on 10th and 12th.

ABERDEEN.—The early part of the month was fine, warm and genial, but from about the 18th the month was cold, wet, and ungenial. Temp. nearly 3° below the mean of July for the last ten years. Rainfall more than 1 in. above the average.

CULLODEN.—From 1st to 15th only two days on which R was measured, thence to end of month R on every day but four. T on 9th, 12th, and 13th.

FORT WILLIAM.—T at 8 a.m. on 12th, and T S from 1 to 2 p.m. ; T till evening. 22nd to 27th, cold N. winds ; fires comfortable.

PORTREE.—The month on the whole has been favourable, although generally very cold, from the prevalence of N. and N.E. winds, and dry, so that the peats have been well secured for winter fuel. Crops look well ; the hay generally is abundant, but still unsecured ; oats and barley look well, but will be very late ; there will be no harvest, I think, before October ; potatoes are abundant, but the blight has made its appearance amongst them. Very loud peal of T at 2 p.m. on 12th.

LOCHBROOM.—The month has been very cold and wet. A terrific T S on the afternoon of the 11th. The weather at the end of the month beautiful, and though late, the crops look very promising, and with fine harvest weather there is every probability of abundance both for man and beast.

SANDWICK.—July has been dry and very cold, having been colder than any July for the last 40 years, except that of 1837, when the mean was 50°·6, while this year it was 51°·4, the mean of the last 40 years being 54°·8. The cold was caused by the prevalence of N. wind (21 days) ; it was also very cloudy, though during the last 11 days there was no appreciable quantity of R.

#### I R E L A N D.

DOO CASTLE.—The heavy rains of this month, alternating with the great heat, have much improved the crops and meadow land. From 25th to the end of the month weather delightful. The myriads of small brown snails which swarmed on grass walks, and have been so destructive to vegetables for the last two months, have entirely disappeared. Extraordinary landslip on the 13th in the west of this county (Mayo), about 40 acres of surface soil slipping off into the Atlantic.

OWENDOON.—The heavy rainfall of this month has been most opportune.

[In *Meteorological Magazine*, No. 18, p. 74, OWENDOON.—The remarks from "Considering" to end belong to Doo Castle.]

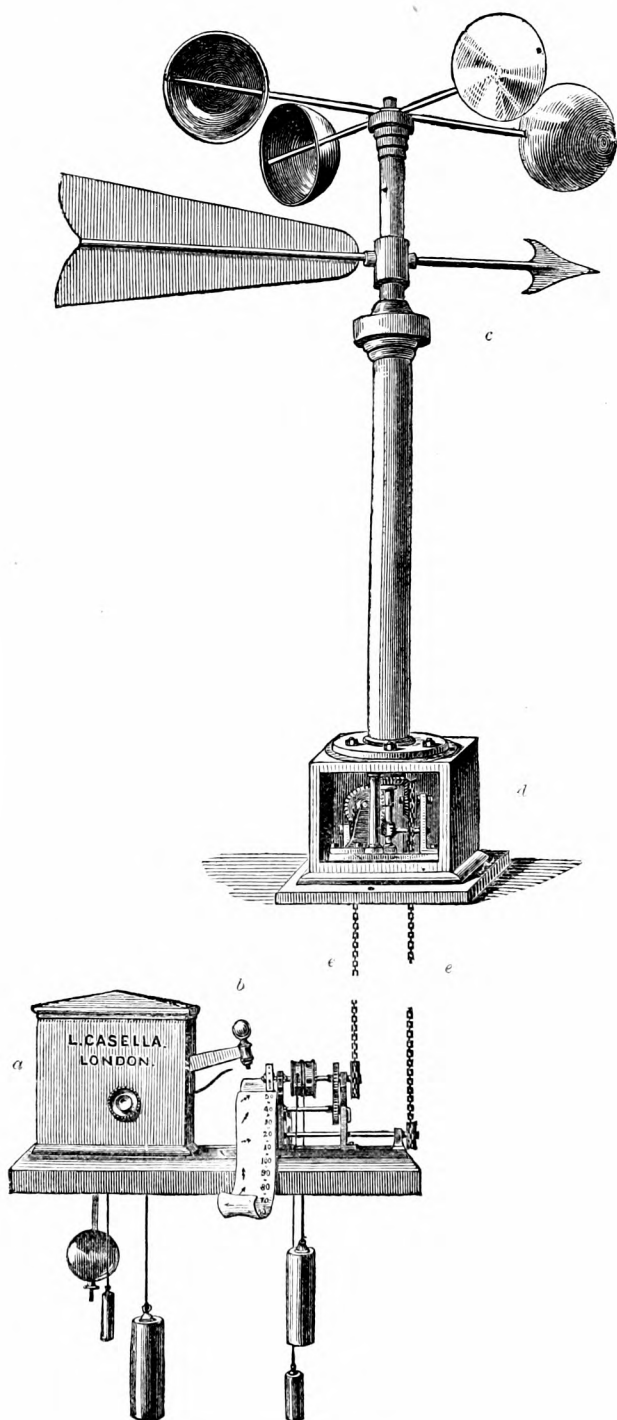
WARINGSTOWN.—The first ten days and the last seven were fine and warm, during the intervening fortnight a large quantity of R was measured daily except on 19th ; the fall here of the 15th was unprecedented, though the 23rd and 24th seem to have exceeded it elsewhere. On the night of the 11th a most terrific T S, and T continued at intervals for several days. 23rd, heavy rains at night, causing inundations all over the country. Crops generally looking well.

LECKPATRICK.—From the 11th to the 23rd constant R, rendering the saving of hay a work of difficulty. Complaints of turnip crop from the wet. I never remember two entries of three figures in one month before. Wind generally N.E.

[In consequence of the unusual space occupied by the rainfall of July 26th, several articles are unavoidably postponed.—Ed.]



# CASELLA'S EMBOSSING ANEMOMETER.



# SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

---

XX.]

SEPTEMBER, 1867.

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

---

## ANEMOMETERS.

(Continued from page 66.)

WE have on the present occasion to describe the different arrangements which have been devised for rendering the velocity or pressure and direction of the wind self-recording, by which is understood not merely the registering of the total velocity or maximum pressure, but the automatic recording of the strength and direction of every breeze.

Of late years preference has been given to velocity instruments on the principle of Robinson's cups, described in our last article. We will, therefore, proceed to notice them first.

The Beckley-Robinson, otherwise called the Kew Anemometer, was, as its names imply, a modification of Robinson's arranged by Mr. Beckley, of Kew Observatory; it was described by him in the *British Association Report* for 1858, where will be found ample working drawings of the instrument. It consists of four Robinson's cups, as on page 64, but twice the size there described; these, by means of clockwork, turn a cylinder, round which is a single spiral of metal, which, pressing on metallic paper, produces a continuous tracing of the rate at which the wind has passed; a couple of fans or windmill governors, as they are sometimes called, are employed to record the direction, their motion being communicated to a cylinder pressing on the metallic paper side by side with the velocity pencil, the paper itself being carried by a clock under the pencils at a uniform rate. Several of these instruments have been made by Mr. Adie, of the Strand, for the British and other Governments, and they have given the highest satisfaction. The price is necessarily high (£65), but a smaller instrument on the same model has been produced by Mr. Adie at £21, which we believe to be a thoroughly serviceable anemometer. Both these require a fresh paper, and to be wound up daily.

A novel mode of registering the revolution of the cups has been adopted at Greenwich, but it gives velocity alone, and has not hitherto been copied elsewhere. The action is very direct, and we should imagine that a direction record might be combined with it, with ease, advantage, and economy.

The last velocity anemometer which we have to notice is Casella's, whereof we give an illustration, and which is thus described :—

“The paper employed is a narrow strip, wrapped round a small attached roller, from which it is drawn, and embossed on one edge by the action of the rollers, as shown in the sketch.

“The rollers are divided to represent single miles ; they are figured at every ten, and one revolution shows the wind to have travelled fifty miles.

“The clock (*a*) raises the small hammer (*b*) which falls once in every hour, impressing the other edge of the paper with a small arrow, whose movements are identical with the larger one at the top, and thus shows the exact direction of the wind at the time, and the distance between the arrows shows its rate of speed during each hour.

“The paper is of sufficient length to last six weeks, and the clock may be wound up daily or weekly, as desired.

“The projection (*c*) contains metal balls, which firmly support the top and give freedom of action. The box (*d*) of cast iron, contains the stronger portion of the wheel work, and has holes in the flange for screws or nails, by means of which it is easily fixed to the roof of a house, or on a pole in a garden or field, or by the sea-side.

“The chains (*e e*) act on *improved* rollers, over which they *cannot pass* without turning them, and are brought into connection with the clock work and registering parts, placed in a room or box for protection, at any vertical distance from the base (*d*), from three to twenty-five feet.

“In size, the height of the upper part is 39 inches from the base of the box (*d*), the diameter over the cups is 24 inches, and its strength and general construction such as to bear the vicissitudes of the severest storm. Where frequent absence is requisite, or in places of difficult access, the little attention required in using this instrument can hardly be over-estimated. The action of each is tested, and guaranteed to give precisely the same rate of speed as that of the Standard Anemometer of the British Association at Kew.”

The cost of this instrument is £32.

## Abstracts of Meteorological Works. No. II.

(*Saussure's Hygrometry, continued from page 68.*)

PUBLISHED A.D. 1783.

WE need not follow in detail the chapters devoted to The examination of hair hygrometers ; Is it moisture alone that elongates the hair ? Hygrometrical effects of heat on air and on hair ; What correspondence exists between hygrometrical degrees and the quantity of water in the air ? Effect on the hygrometer of rarefied and of condensed air ; What is the effect of agitation of the air on the hygrometer ? His experience and experiments on this head are worthy of notice, the facts being briefly as follows :—Saussure often suspended his hygrometer 4 ft. above the ground in the middle of a large plain, waited until it took exactly the humidity of the air, and observed afterwards its momentary variations. We know that there are days when the air is calm, or no violent or decided wind agitates it, but nevertheless in a place perfectly open there arise from time to time slight breezes, which give a



momentary agitation. He invariably remarked that these slight breezes, from whatever quarter they came, caused the hygrometer to go towards dry sometimes  $1^{\circ}$ , sometimes even  $2^{\circ}$ ; after which, when the air became calm, it retreated little by little to the point at which it was previously. Reflecting that these puffs arising all at once in the middle of a calm cannot surely come from far, that they are in fact but portions of the surface air of the same plain, compelled by a momentary rupture of equilibrium to change places; in such a plain when the air is calm it may be assumed that the whole was of nearly the same humidity. Why then should these breezes *always* give drier indications. Returning home, he suspended the same hygrometer in the middle of a room, closed the doors and windows, sat down 6 ft. from the hygrometer, over which he had suspended a large screen, waited quietly until he was certain that the screen and hygrometer were in the same state as the air of the room, and had taken up all possible effect from the presence of his body, then, without changing his position, he agitated the screen rapidly (like a fan); at the end of eight or ten minutes he found the hygrometer indicated about three quarters of a degree drier. From subsequent rough experiments, Saussure decided that these effects were due to the mingling of air from a higher level, which he assumed to be always drier. We think the point open to further investigation, the relation of aspirated and ordinary dry and wet thermometers being, we believe, only a partially investigated question.

The third essay, devoted to evaporation, is an excellent *résumé* of the subject, far more advanced than many would have expected from the date of publication. For instance, when speaking of evaporators, he ridicules the idea of evaporation from a small vessel of water in a garden representing that of a large water surface like a lake or sea, and says, "in order to do this fairly, we should have the vessel floating even on the surface of the sea, and with the water as near as may be at the same level." Then he discusses the most suitable size and form for evaporators, arriving at the conclusion that the result is the same if they are of such a size that the water is at the same temperatures. He proceeds to quote Richman's suggestion that, with a view to keeping the water surface nearly at a constant level, the evaporator should be connected with a second vessel of larger area and covered over. Chapter VI. opens with a statement which, if true in 1783, is certainly not true in 1867, namely, "Everybody knows that ice is subject to evaporation;" *everybody* does not know it, though probably all our readers do; we need, therefore, only mention that he not only proves it in various ways, but also shows that the rate of evaporation is proportional to the humidity of the air.

Having already dwelt upon this interesting volume at great length, we can only add a few fragments from the fourth and last essay. For instance, "It is the coldness of the upper regions of the air which retains and imprisons the water which nourishes the surface of the earth." Again, he almost stumbles on the theory of dew, in the following paragraph:—

"Dew, which we may regard as a species of rain without clouds, is explained in the same manner, nevertheless it is sometimes accompanied by fog, and even this vapour which renders the air slightly thick when the dew falls, is produced, probably, by some of the vesicles which are formed when cooled air is depositing its superfluous humidity. But I leave to Mr. Pictet the details of the explanation of dew and of the new and singular thermometric phenonema which he has observed at the instant of its formation."

Again, he criticises Bouguer for limiting the altitude of clouds to 8,000 ft., and rightly pronounces this far too low, though he surely errs in the contrary direction in saying "they may consequently exist at 877,500 ft., or 168 miles!"

From the many excellent suggestions in the closing chapter we must select in conclusion the following, which is as necessary now as then, if not more so :—

"In many respects a *diaphanometer*, that is to say, an instrument which will measure the transparency of the air, would be an important addition to meteorological instruments, and one I believe not yet suggested. This would help to estimate the quantity, and aid, perhaps in recognizing the nature of that singular exhalation which diminishes the transparency of the air and gives it a bluish colour, even in very dry weather, and when the air is certainly free from aqueous vapour in its vesicular form."

---

## REVIEWS.

*An Explanation of the Popular Weather Prognostics of Scotland on Scientific Principles.* By the Rev. CHARLES CLOUSTON, Minister of Sandwick, &c. Large 8vo., 53 pages.

THE sayings, proverbs, or axioms about the signs of coming weather were the foundation of meteorology; and, whether proved to be true or false, they will doubtless endure as long as any other proverbs. Curiously enough, they serve to show the long line of descent connecting all races of men in some way or another; for they are everywhere similar in import, as recorded in the writings of the earliest authors, sacred and profane, in the Old and New Testaments, in the ancient poems of Greece and Rome. In the *Diosemeia* ("Signs of the Sky") of the Greek poet Aratus, we find all our popular saws about the weather, and yet the poem was composed more than 2,000 years ago, being itself chiefly a collection from earlier writers—Hesiod, Aristotle, and Theophrastus.

Now, although the duration of opinions is not a conclusive proof of their truth, yet, in the present instance, as every generation has had the opportunity of testing their accuracy and value, they would soon have ceased to be handed down if they had not been found to contain some measure of truth and foundation in fact.

Indeed, when instruments were more expensive and less understood than they are in our time, this class of observation was the only guide the farmer possessed; and even at the present day, as Admiral FitzRoy suggested, every prudent observer will combine observations of the elements as derived from the appearances of the atmosphere and the country, with such indications as he may obtain from instruments, for he will find that the more accurately the two sources of knowledge are

compared and combined, the more are the probabilities of arriving at the truth increased, if not insured. Moreover, considering the uncertainty and difficulties in the way of prognosticating the weather in our country many hours in advance of the change, we need hardly say that the eye should be always ready to detect the slightest indication of any change; and that constant and careful attention to these points will prove of infinitely more use to the farmer than all the empirical predictions extant.

But such a class of weather-indicators as are afforded to the careful observer, without the aid of scientific instruments, are valuable only as far as they are founded upon physical facts, and are in accordance with the observed laws of nature; such, in short, as the why and wherefore of which we can explain, showing us not only that such and such will follow certain appearances, but also *why* such appearances as we observe do precede certain changes of weather.

Doubtless the most reliable information on this head is to be found in Sir Humphrey Davy's "*Salmonia*," and the explanations of this acute philosopher have been laid under contribution by all who have since undertaken to give the why and because of our popular prognostics.

The present explanation refers to a collection of the Popular Weather Prognostics of Scotland, by Dr. A. Mitchell, published a few years ago when the Marquis of Tweeddale offered a prize of a gold medal, a piece of plate, or 20 guineas, for the best scientific explanation of them. We are informed that the prize was duly awarded, but the successful work has not been published, which is to be regretted, since under the circumstances, we may suppose that it was a complete exposition of the curious topic. Perhaps we should state that Mr. Steinmetz, in his "*Sunshine and Showers*," (recently noticed in our pages), devotes a long chapter to the explanation of this very collection, and so between these two authors, perhaps we have as much as can be said on the subject.

Mr. Clouston does not appear to put much faith in *lunar* prognostics; he says:—

"Ever since I considered the subject, I have been of opinion that changes of weather are not more probable a few days after full or new moon than at other times; and with regard to 'lying on her back' being a prognostic, it seems too absurd to require refutation, for astronomers could tell us the angle at which she would lie a hundred lunations hence, though no one could pretend to give us a very correct description of the weather immediately to follow. It depends on her position when first seen, and as she appears to lie more on her back *when seen early*, or a little above the sun, than when she has made considerable progress in growth and from the sun."

We are as yet very far from being converted to the theory of lunar influence on the weather; but still it should be known that recent investigations instituted by Mr. Glaisher seem to open the question once more with some chance of arriving at definite conclusions on the subject. In his interesting paper on "*The Influence of the Moon on the Direction of the Wind*,"\* this scientific meteorologist avers that

---

\* Proceedings of Meteorological Society, March 20, 1867.

"from the discussion of the observations [extending over seven years], it seems that when the sun and moon were in and near conjunction the air was less frequently calm; the duration of the north wind with its east compounds was less frequent; the south wind with its west compounds was more frequent than when the sun and moon were in and near opposition. From this it would seem that the position of the moon in respect to the sun has exercised an influence on the direction of the wind in these years."

Now, as wind and weather go together, it would seem that the popular belief is becoming avenged on the learned authorities (Arago, among them), who have hitherto ridiculed it as unfounded in fact and reason. (Oddly enough, this very saying about the moon lying on her back, which Mr. Clouston thinks ridiculous, is confirmed by Mr. Glaisher's investigations. It occurs only at *new moon*, and this is the period, according to Mr. Glaisher, that a *sou'wester* will blow if at any time, and everybody knows what sort of weather this wind generally makes.

It is curious to find that the adage is at least as old as Aratus (2,000 years ago), and that Mr. Glaisher should have been destined to prove its correctness. Aratus not only refers the south wind to the moon's *lying on her back*, but the north wind to her upright *nodding*. With all our vaunted scientific progress, the influence of declination, thus early pointed out, has we believe, never been thoroughly tested.

Here is the axiom of Aratus:—

Εἰ δὲ κέν οἱ κερῶν τὸ μετῆρορ ἐν ἐπινεύοι  
Δειδέχθαι βορέω· ὅτε δ' ὑπτιάζῃ, νότοιο\*

Respecting the saying that "rain with a south-east wind is expected to last for some time," Mr. Clouston observes:—

"This saying is very common, but I was much at a loss to account for the fact till the idea now prevalent regarding the winds came under my notice, as there is no great mass of water in a south-east direction to send us its evaporation; but the south-east wind is now viewed as a combination of a polar and tropical current, deflected in this direction by the rotation of the earth, and no mixture of currents is more likely to supply us with continued rain than this—the cold polar current condensing the moisture in the watery tropical one, and causing rain."

This is Admiral FitzRoy's view, but it appears to us that the explanation given long ago by Luke Howard was equally rational:—

"Vapour brought to us by such a wind [S. or S.E., to be decomposed by the prevalent N.W., W., and S.W. winds] must have been generated in countries lying to the south and east of our island. It is, therefore, probably in the extensive valleys watered by the Meuse, the Moselle, and the Rhine, if not from the more distant Elbe, the Oder, and Weser, that the water rises, in the midst of sunshine, which is soon afterwards to form *our* clouds, and pour down in *our* thundershowers. And this island, in all probability, does the same office for Ireland—nay, the eastern for the western counties of South Britain . . . . After nearly

---

\* *Diosmeia*, 794. "When her upper horn nods well forward, expect the north wind; but when she lies on her back, the south wind.

"When the moon lies on her back,  
Then the Sou'-west wind will crack;  
When she rises up and nods,  
Then North-easters dry the sods."

nine days wet weather, attended as usual with mixed winds, in our district, upon the wind changing from S.E. to N.E., it became fair with us ; and on the same day (26th May, 1817) a rain of three days and nights commenced in the country east of the Upper Rhine about Stuttgard, so heavy as to produce a serious inundation. In the meantime we had no rain, though the barometer was very low, and the change of the wind above mentioned had been attended with thunder. The rain ceased in those parts upon the evening of the 28th, and on the next two days it rained again with us.”\*

“Easterly gales without rain during the spring equinox, foretell a dry summer.” On this axiom Mr Clouston says :—

“The *new* views on this subject are very important indeed. It will be most advantageous if we can make sure, according to the theory of Mr. de Boulay, that ‘extraordinary weather at the vernal equinox, is followed by a repetition of that weather, and of the aerial movements which caused it, during the succeeding summer.’”

Now, if we admit the importance of these views, they are certainly not *new*. It was Dr. Kirwan who long ago propounded them from observations made during the series of years from 1677 to 1789, and they were quoted and verified by Luke Howard in 1808 (vol. ii., 41). Dr. Kirwan’s rules are—(1) when there has been *no storm* before or after the vernal equinox, the ensuing summer is generally *dry*, at least four times in six ; (2) when a storm happens from an easterly point on the 19th, 20th, or 21st of March, the succeeding summer is *dry*, four times in five ; (3) when a storm rises on the 25th, 26th, or 27th March, and not before, *in any point*, the succeeding summer is generally *dry*, four times in five ; (4) if there should be a storm at S.W. or W.S.W., on the 19th, 20th, or 22nd of March, the succeeding summer is generally *wet*, five times in six.

*Dry* summers, says Kirwan, are the consequence of *uniform* winds, from whatever quarter they may blow ; as *wet* summers are of variable winds, particularly in opposite directions. Now, southerly winds are most frequently accompanied with rain in most parts of Europe, at least, and probably in most parts of our hemisphere, but northerly and easterly, with clear, dry, and serene weather, and, as Luke Howard observes, it seems reasonable to suppose that the wind which is to prevail during the summer, *may most frequently set in with the vernal equinox*. In one case we get a *tropical* summer, incessantly pouring, in the other a *polar* summer, as most strikingly exemplified this year, when during June and July we sweltered on the south side of a street, and shivered on the north—whilst the sun shone—with a huge “daily range” of the thermometer. Kirwan’s second maxim was verified in spring. Last March began with N.E. or N.N.E. winds, continuing with scarcely a change to the 17th when the wind advanced to a point or so to the S. of E., but returned to E.N.E. on the 19th, and so continued to the 21st ; stormy, with a 12-pound pressure from S.E. on the 22nd. Consequently, the summer should have been dry, which, however, it was not.

Mr. de Boulay’s prediction for this year is not clearly expressed as to whether it will be wet or dry, but he distinctly says that “the

---

\* Climate of London, i., 122.

coming season in Great Britain does not promise to be a bountiful one as regards the yield of cereals." (*Mark Lane Express*, April 29th).

The study of periodic phenomena will throw great light on practical meteorology, so that in time we may hope to have something like a weather almanac not destined to be right by chance, and wrong on principle.

No one is in a better position to aid in this development than Mr. Clouston, a veteran meteorologist of 40 years' experience, and furnished with the best instruments—among the rest, one of the self-registering anemometers belonging to the Government. Not only should he be able to test the periodic variations of temperature, but especially the grand question of lunar influence on the weather, as apparently involved in the winds that may characterize not only her mere *phases* (which the vulgar note,) but her positions in declination apogee and perigee, as shown by the *Nautical Almanac*, with reference to the sun's all-important declination. If Mr. Clouston will institute this process, *de lunatico inquirendo*, we doubt not that something will come of it, and shall always endeavour to find a monthly place for his results in the *Meteorological Magazine*. *Verb Sap.*

*Report on the unusual intensity of the Frost of December, 1860, and January, 1861, with its injurious effects on Trees, Shrubs, Pines (coniferous), &c.; and a Comparison between the great Cold of this Period and that experienced in the severe Winters of 1837-8, 1841, and 1855; with some Remarks on the intense Frost of January in the present Year [1867.]* By DUNCAN FORBES, of Culloden. Aberdeen: G. Clark & Sons. Large 8vo, 30 pages.

NOTWITHSTANDING its lengthy title, this is a capital pamphlet, giving in double columns the minimum temperatures at the principal gardens and nurseries in the North of Scotland, and the coniferous pines, &c., which have borne those temperatures without injury. This able report should be in the hands of all who take interest in the ornamentation of our parks by the acclimatization of the rarer pines; botanists and meteorologists here meet on common ground, and each has much to learn from the other. We presume not to dictate on botanical matters, but find even in this pamphlet ample proof that it is not alone intensity of frost that determines its destructive power; the previous condition of the plants, the dampness or dryness of the soil and of the air, and the duration of the low temperature, these, and perchance other conditions which we know not of, all have their influences; and such labours of love as this now under notice must be pushed on, not alone in one district, or by one person, however zealous, but in different districts and by many minds, and then without doubt the practical benefits conferred by the present publication will continue to extend in ever widening circles. Just as a type of the information contained in the pamphlet, we may state that particulars are given of 21 localities where specimens of the *Wellingtonia Gigantea* were exposed to temperatures of which several were near zero, and the lowest was  $-8^{\circ}$ , and yet in every case they escaped uninjured.

*Everybody's Weather Guide.* By A. STEINMETZ. Reeve. Large 8vo, 24 pages.

A WELL designed epitome of the weather wisdom of the present day, which will we think enable "everybody . . . to form a probable opinion of coming weather;" but Mr. Steinmetz's readers will be far ahead of the rest of us if they are by it "enabled to know when they are likely to need umbrellas and when they may leave the encumbrance at home, although the sky be overcast and cloudy." Mr. Steinmetz is the most likely man to achieve this, and we would not presume to suppose he was ever caught in a shower, though our own carelessness or want of skill often places us in that predicament. The author of the "Manual of Weathercasts" and of "Sunshine and Showers," comes before us crowned with the laurels they have won for him; he has succeeded to a great extent in popularizing meteorology; may he be equally successful in the matter he has now taken up.

Reference is made in the body of the pamphlet to a set of meteorological instruments prepared Mr. Pastorelli, of Piccadilly, and on the cover an engraving is given of the stand which is supplied with them. We have made some enquiries on the subject, and find that the set consists of *barometer*, oak and ivory, (certified by Mr. Glaisher as having no greater error than 0.02,) with double scale thermometer; *dry and wet bulb* thermometers, divided on their own stems, metal scales; *maximum and minimum* thermometers, similarly mounted; *rain gauge* and *thermometer stand*; the last alone requires altering, by the addition of wings to keep off the morning and evening sun. The price of the set is £5 or £5 5s., we forget which; but either is low, considering the quality of the instruments. We should much prefer a metal scale barometer, even if the set cost £1 more, but with the certificate above mentioned, the wooden barometer is obviously correct enough for all ordinary purposes.

### HEAVY RAINFALL IN THE UNITED STATES.

For the past three weeks the Atlantic coast of the United States has been visited by the most heavy and long-continued rain storms. These storms have prevailed all along the coast from Boston to Savannah, and in the interior as far back as the Alleghanies. An enormous amount of water has fallen, and for the month of August in this part of the world the rainfall has been unprecedented. Between the 1st and the 15th of August inclusive the rainfall at Philadelphia was 14.56 inches, of which no less than 6.68 inches fell on the 15th. These heavy rains, which have been seldom accompanied by thunder, a very strange circumstance for the season, have generally been in the form of drenching showers of short duration, coming at frequent intervals. On August 15th the rain fell in torrents and was more like the bursting of a waterspout than anything else. The floods made the streets impassable, and put a stop to all business, and this effect is not alone reported from this city, but from New York, Baltimore, Washington, and elsewhere. On August 16th, owing to the great freshets in the streams, there was scarcely a railroad or highway passable in New York, Pennsylvania, New Jersey, Maryland, or Virginia. Our great rivers ran as mountain torrents, carrying everything before them, and overflowing all the low portions of the cities. Scarcely a telegraph wire was in operation, and the damage to roads and canals and other property is almost incalculable. Of course, such drenching rains have had a bad effect upon the few crops in the ground at this late season; and the great fall of water for August is the subject of universal remark.



## AUGUST, 1867.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which 61 or more fell.	TEMPERATURE.				No. of nights below 32°.
		Total Fall.	Difference from average 1860-5	Greatest Fall in 24 hours.		Deg.		Date.	Deg.	Date.		
				Dpth.	Date.							
inches.	inches.	in.										
I.	Camden Town .....	2.63	— .01	.89	19	10	88.2	14	40.9	3	0	
II.	Staplehurst (Linton Park) ...	1.55	— 1.16	.41	6	10	90.0	14	44.0	2	0	
	Selborne (The Wakes).....	2.43	— .74	.54	5	11	79.0	14	39.5	1	0	
III.	Hitchen .....	1.86	— .49	.58	6	12	80.0	14	40.0	2	0	
"	Banbury .....	2.75	+ .62	1.39	15	12	83.2	13	41.0	8	0	
"	Wisbech.....	2.15	...	.59	6	12	88.6	14	42.8	3	0	
IV.	Bury St. Edmunds (Culford). ..	1.49	— .95	.52	6	7	87.0	14	36.0	2	0	
V.	Calne .....	3.07	...	1.33	15	11	86.0	13	42.5	27	...	
"	Plymouth (Goodamoor) .....	1.93	— 3.06	...	...	...	83.0	...	43.0	...	...	
"	Barnstaple .....	2.06	— 2.13	.35	29	14	85.6	14	47.0	22	...	
"	Taunton (Fulland's School) .....	1.47	— 1.20	.38	5	12	94.0	12	45.5	20	0	
VI.	Shrewsbury (Highfield) .....	.79	— 2.10	.30	31	12	83.0	13	...	...	...	
"	Tenbury (Orleton) .....	2.19	— .69	.61	31	16	86.3	13	40.0	28	0	
VII.	Leicester (Wigston) .....	2.18	— .02	1.24	16	10	90.0	13.†	41.0	27	0	
"	West Retford .....	...	...	...	...	...	...	...	...	...	...	
"	Derby .....	4.21	+ 1.61	2.11	19	15	87.0	13	46.0	7, 22	0	
VIII.	Manchester .....	1.41	— 2.09	.27	15	16	90.0	13	45.0	27	0	
IX.	York .....	4.34	+ 1.63	2.40	15	9	83.0	13	47.5	22	...	
"	Skipton (Arncliffe) .....	4.05	— .89	.95	15	15	71.0	14	45.0	27	0	
X.	North Shields .....	2.35	— .50	.70	15	13	73.0	13	46.2	7	0	
"	Borrowdale (Seathwaite).....	13.05	— 1.03	1.73	6	21	...	...	...	...	...	
XI.	Abercarn .....	1.76	...	.35	6, 8	12	83.0	14	47.0	28	0	
"	Haverfordwest .....	3.45	— 1.43	.96	9	14	80.5	13	44.0	12	0	
"	Rhayader (Cefnfaes).....	1.24	— 3.42	.30	17*	13	86.0	...	42.0	...	0	
"	Llanberis (R. Victoria Hotel) ..	3.78	...	.68	5	16	...	...	...	...	...	
XII.	Dumfries .....	3.36	— .52	.47	12	20	82.0	13	43.5	27	0	
"	Hawick (Silverbut Hall).....	2.31	...	.25	6	20	...	...	...	...	...	
XIV.	Ayr (Auchendrane House) ...	3.69	— .28	.49	30	22	76.0	12	41.0	27	0	
XV.	Otter House .....	5.06	— .96	.99	7	16	75.0	14	43.0	1	0	
XVI.	Leven (Nookton) .....	2.04	— .95	.57	20	...	73.0	27	43.0	27	0	
"	Stirling (Deanston) .....	4.48	— .14	1.36	20	20	76.0	14	41.0	27	0	
"	Logierait .....	3.32	...	1.61	20	14	...	...	...	...	...	
XVII.	Ballater .....	2.85	...	1.08	20	13	81.0	14	34.5	2	0	
"	Aberdeen .....	3.56	...	.72	20	19	75.0	14	43.6	27	0	
XVIII.	Inverness (Culloden) .....	2.03	...	1.33	31	6	72.0	13	45.4	2	0	
"	Fort William .....	4.75	...	.59	20†	25	...	...	...	...	...	
"	Portree .....	6.32	— 1.13	1.39	24	18	74.0	14	38.8	1	0	
"	Loch Broom .....	1.86	...	.46	20	15	...	...	...	...	...	
XIX.	Helmsdale.....	1.95	...	.84	20	10	...	...	...	...	...	
"	Sandwick .....	1.72	— 1.99	.34	20	15	69.2	12	45.0	20	...	
XX.	Cork .....	2.29	...	.44	31	18	...	...	...	...	...	
"	Waterford .....	3.35	— .10	.80	30	22	77.0	14	49.0	27	0	
"	Killaloe .....	4.70	— .23	.96	19	23	80.5	13	42.5	27	0	
XXI.	Portarlinton .....	2.79	— 1.71	.47	14	22	74.0	13	43.0	27	0	
"	Monkstown .....	1.53	— 1.68	.40	31	15	77.5	13	40.0	1	0	
XXII.	Galway .....	4.39	...	.48	25	22	77.0	1, 14	47.0	27	0	
"	Bunninadden (Doo Castle) ...	2.78	...	...	...	...	...	...	...	...	...	
XXIII.	Bawnboy (Owendoon).....	3.85	...	.68	22	21	81.0	13	21.0?	2	2	
"	Waringstown .....	2.72	...	.84	30	18	82.0	13	41.0	6	0	
"	Strabane (Leckpatrick) .....	3.05	...	.54	30	21	77.0	12	40.0	2	0	

\* And 30th. † And 24th. ‡ And 14th. And 29th.

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



## AUGUST, 1867.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which 61 or more fell.	TEMPERATURE.				No. of nights
		Total Fall.	Differ- ence from average 1860-5	Greatest Fall in 24 hours.		Max.		Min.				
				Dpth	Date.			Deg.	Date.	Deg.	Date.	
		inches	inches.	in.				Deg.	Date.	Deg.	Date.	
I.	Camden Town .....	2·63	—	'01	'89	19	10	88·2	14	40·9	3	
II.	Staplehurst (Linton Park) ...	1·55	—	1·16	'41	6	10	90·0	14	44·0	2	
	Selborne (The Wakes).....	2·43	—	'74	'54	5	11	79·0	14	39·5	1	
III.	Hitchin .....	1·86	—	'49	'58	6	12	80·0	14	40·0	2	
"	Banbury .....	2·75	+	'62	1·39	15	12	83·2	13	41·0	8	
"	Wisbech .....	2·15	...	...	'59	6	12	88·6	14	42·8	3	
IV.	Bury St. Edmunds (Culford) ..	1·49	—	'95	'52	6	7	87·0	14	36·0	2	
V.	Calne .....	3·07	...	...	1·33	15	11	86·0	13	42·5	27	
"	Plymouth (Goodamoor) .....	1·93	—	3·06	...	...	...	83·0	...	43·0	...	
"	Barnstaple .....	2·06	—	2·13	'35	29	14	85·6	14	47·0	22	
"	Taunton (Fulland's School) ..	1·47	—	1·20	'38	5	12	94·0	12	45·5	20	
VI.	Shrewsbury (Highfield) .....	'79	—	2·10	'30	31	12	88·0	13	...	...	
"	Tenbury (Orleton) .....	2·19	—	'69	'61	31	16	86·3	13	40·0	28	
VII.	Leicester (Wigston) .....	2·18	—	'02	1·24	16	10	90·0	13½	41·0	27	
"	West Retford .....	...	...	...	...	...	...	...	...	...	...	
"	Derby.....	4·21	+	1·61	2·11	19	15	87·0	13	46·0	7, 22	
VIII.	Manchester .....	1·41	—	2·09	'27	15	16	90·0	13	45·0	27	
IX.	York .....	4·34	+	1·63	2·40	15	9	83·0	13	47·5	22	
"	Skipton (Arncliffe) .....	4·05	—	'89	'95	15	15	71·0	14	45·0	27	
X.	North Shields .....	2·35	—	'50	'70	15	13	73·0	13	46·2	7	
"	Borrowdale (Seathwaite).....	13·05	—	1·03	1·73	6	21	...	...	...	...	
XI.	Abercarn .....	1·76	...	...	'35	6, 8	12	83·0	14	47·0	28	
"	Haverfordwest .....	3·45	—	1·43	'96	9	14	80·5	13	44·0	12	
"	Rhayader (Cefnfaes).....	1·24	—	3·42	'30	17*	13	86·0	...	42·0	...	
"	Llanberis (R. Victoria Hotel) ..	3·78	...	...	'68	5	16	...	...	...	...	
XII.	Dumfries .....	3·36	—	'52	'47	12	20	82·0	13	43·5	27	
"	Hawick (Silverbut Hall) ...	2·31	...	...	'25	6	20	...	...	...	...	
XIV.	Ayr (Auchendrane House) ...	3·69	—	'28	'49	30	22	76·0	12	41·0	27	
XV.	Otter House .....	5·06	—	'96	'99	7	16	75·0	14	43·0	1	
XVI.	Leven (Nookton) .....	2·04	—	'95	'57	20	...	73·0	27	43·0	27	
"	Stirling (Deanston) .....	4·48	—	'14	1·36	20	20	76·0	14	41·0	27	
"	Logierait .....	3·32	...	...	1·61	20	14	...	...	...	...	
XVII.	Ballater .....	2·85	...	...	1·08	20	13	81·0	14	34·5	2	
"	Aberdeen .....	3·56	...	...	'72	20	19	75·0	14	43·6	27	
XVIII.	Inverness (Culloden) .....	2·03	...	...	1·33	31	6	72·0	13	45·4	2	
"	Fort William .....	4·75	...	...	'59	20†	25	...	...	...	...	
"	Portree .....	6·32	—	1·13	1·39	24	18	74·0	14	38·8	1	
"	Loch Broom .....	1·86	...	...	'46	20	15	...	...	...	...	
XIX.	Helmisdale .....	1·95	...	...	'84	20	10	...	...	...	...	
"	Sandwick .....	1·72	—	1·99	'34	20	15	69·2	12	45·0	20	
XX.	Cork .....	2·29	...	...	'44	31	18	...	...	...	...	
"	Waterford .....	3·35	—	'10	'80	30	22	77·0	14	49·0	27	
"	Killaloe .....	4·70	—	'23	'96	19	23	80·5	13	42·5	27	
XXI.	Portarlinton .....	2·79	—	1·71	'47	14	22	74·0	13	43·0	27	
"	Monkstown .....	1·53	—	1·68	'40	31	15	77·5	13	40·0	1	
XXII.	Galway .....	4·39	...	...	'48	25	22	77·0	1, 14	47·0	27	
"	Bunminadden (Doo Castle) ...	2·78	...	...	...	...	...	...	...	...	...	
XXIII.	Bawnboy (Owendoon) .....	3·85	...	...	'68	22	21	81·0	13	21·0?	2	
"	Waringstown .....	2·72	...	...	'84	30	18	82·0	13	41·0	6	
"	Strabane (Leekpatrick) .....	3·05	...	...	'54	30	21	77·0	12	40·0	2	

\* And 30th. † And 24th. ‡ And 14th. And 29th.

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

# METEOROLOGICAL NOTES ON THE MONTH.

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 TOWN.—L from 9 p.m. on 19th almost without intermission till 3 a.m. on the 20th; 14th very hot and unusually damp with such great heat.

LINTON PARK.—TS on 14th, 15th, and 20th, and but very little L at any other time; no high winds, and the weather on the whole favorable for harvest operations.

BANBURY.—Mean temp. slightly above the average for August; harvest about two-thirds completed. T on 15th, TS on 19th and 20th.

WISBECH.—Generally fine month, with temp. above the average; TS on morning of 20th, but not heavy.

CULFRO.—A month of favourable weather for the harvest, which has in many instances finished with the month; T on 19th.

TAUNTON.—TS 9.50 p.m. 19th. The heat on the 11th, 12th, and 13th was very oppressive; it was like a heavy heat wave passing through the valley of Taunton Deane.

ORLETON.—TS from evening of 19th to morning of 20th.

DERBY.—We were visited on the morning of the 19th with a TS of unusual magnificence, commencing about 1 a.m. and continuing for three hours; 2.11 in. of R fell but as there was no wind the corn was not laid to any great extent, and though we have had R on 15 days it seems scarcely to have interfered with harvest operations.

YORK.—Heavy R from 9 p.m. on 19th to morning of 20th, equal to 1.48 in., and 20 hours steady R on 15th, equal to 2.40 in.

## WALES.

ABERCARN.—Distant TS, with very vivid L, to the S. on 20th. A very calm month, generally dry and warm, temp. very even but rather higher, towards the end than the beginning of the month.

HAVERFORDWEST.—Till the 11th fine, air pleasant, moderate heat, with light R chiefly at night, from that time to the 15th very warm indeed, remainder of the month warm and pleasant, the R falling mostly at night, there were many fine days, and on the whole fine harvest weather.

CEFNFAES.—Excessively hot on 12th, 13th, and 14th.

## SCOTLAND.

DUMFRIES.—The first four days very fine, the rest of the month showery. Temp. both of day and night above that of last year. On the 24th the night temp. was 60°. Harvest commenced on 8th, but not general till the 26th. The weather has been unfavourable for harvest operations. Barley, average crop; wheat fully an average; oats good and above the average, and potatoes considerably above the average, but some disease appearing.

HAWICK.—Leading hay first four days; falling stars on the 10th; TS on 12th; first barley cut on the 20th, but it will take another week's ripening weather before the harvest will be general in this district.

OTTER HOUSE.—A cloudy wet month, not favourable for harvest; the cutting of barley will commence here next week if the weather is propitious.

DEANSTON.—Severe TS with much L and heavy R on 20th.

LOGIERAIT.—A genial month. Severe TS on 20th. Harvest not begun.

BALLATER.—From the commencement of the month the weather has been a great improvement on that of July, the temp. being 2° higher; on the 9th there was a remarkable H shower (in the afternoon) pieces of ice  $\frac{1}{2}$  in. in diameter falling in large quantities; a single peal of T occurred in this locality at the same time; a smart TS with much L and heavy R on the afternoon of the 20th.

ABERDEEN.—Heavy TSS on 9th and 20th.

CULLODEN.—Heavy TS on 20th, with 1.33 in. of R in five or six hours.

PORTREE.—Rather a wet month, but drier than August usually is in this locality; the crops have made good progress; there will be a good supply of straw and hay, but fully a month later than usual; there can be no shearing before October.

LOCHBROOM.—This month on the whole has been a grand one, and another such would finish a most bountiful harvest of all kinds. On the morning of the 20th, between 1 and 2 a.m., a severe shock of an earthquake was felt here, it

seemed to have travelled from S.E. to N.W., it shook the houses and broke the crockery therein, and pieces of rock fell from the hills from its effects.

SANDWICK.—August has been fine and dry, the driest since 1856; the latter part of the month was warmer than the mean, and very pleasant. Auroræ on 25th, 26th, and 27th. Lunar halo on 2nd.

#### I R E L A N D.

Doo CASTLE.—First half of month very fine, latter part broken, with very few whole fine days; the atmosphere was close and I should say favorable for the production of caterpillars, which have destroyed the cabbages in this locality; I have employed boys to pick them off, but find them so numerous as to bid fair to destroy all before them.

OWENDOON.—TS on 13th. The potatoe blight made its general appearance early in this month, but the tubers still appear sound; the crops have all much improved; scarcely any apples to be seen; wall fruit scarce. Frost on 2nd and 18th.

WARINGSTOWN.—A fine seasonable month except the last three days; harvest ripening unusually fast, reaping will commence much earlier than was expected.

LECKPATRICK.—A fine month; has ripened the corn in good time; harvest not begun, but promises to be abundant.

### TEMPERATURE IN THE SHADE AND IN THE SUN.

*To the Editor of the Meteorological Magazine.*

STR,—The extraordinary accounts in the papers of the heat in the shade and in the sun having attracted my attention, I was induced to make some experiments, in order to form an opinion of what these terms meant. With this view, I selected four thermometers, by Negretti and Zambra, and compared them to see that they agreed. These I numbered 1, 2, 3, and 4, and thus placed them:—No. 1 outside a window, facing the north, so placed that the direct rays of the sun never fell on it. No. 2 was suspended freely in a verandah, the rays of the sun never falling on it, and subject to a free current of air. No. 3 was placed against a north wall, not part of the house, with high shrubs on the east and west, completely screening the wall from the sun at all times. No. 4 was suspended freely in the dense shade of trees.

The average of a great many observations taken at noon was—No. 1, 68°; No. 2, 69°; No. 3, 64°; No. 4, 61°. Thus it appears that the shade of the trees was cooler by from 3 to 8 degrees than the other three indicated.

I account for the difference thus:—The thermometer No. 1, placed outside a north window, though not exposed to the direct rays of the sun, was affected by heat reflected from an opposite wall, though at some distance. No. 2, though hanging freely in the shade of a verandah, was yet affected, in consequence of the sun shining in the morning on a slate roof, which continued to give out its heat during the rest of the day. In the case of No. 3, though the sun never shone on that part of the wall where the thermometer was hung, yet it did on other parts of the same wall, and heat was thus transmitted.

I conclude, therefore, that the true heat of the atmosphere in the shade is only to be obtained in the complete shade of trees, where the sun never penetrates, and where the air circulates freely.

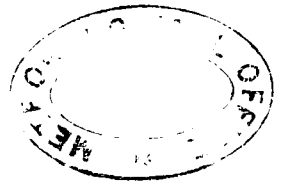
Again, as to the heat in the sun. What does it mean? I suppose in general it means the heat indicated by a thermometer hanging against the south wall of a house. But this surely is deceptive, as the instrument so placed indicates not only the heat of the direct rays of the sun, but also the accumulated heat of the wall.

To determine this, I placed a thermometer against the south wall of my house, and another about 30 yards in front of this, hung to a rail, but fastened so as to face the sun in the same way as the former. The result was that the thermometer against the house stood from 4° to 25° higher than that on the rail, as the day was more or less constantly bright; but the difference always increased as the day advanced, for the reason already mentioned.

If we wish, therefore, to have any comparative returns of the heat in the shade and in the sun, we should come to some agreement as to the method we adopt to procure the information we communicate.—Yours very faithfully,

August 22nd, 1867.

W. E. H.



# SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

XXI.]

OCTOBER, 1867.

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

## METEOROLOGY AT DUNDEE.

THE number of meteorologists and the papers on meteorology at the Dundee meeting of the British Association were quite up to the average. We believe the only foreign meteorologist was Professor Chas. Martens, of Montpellier, for we cannot class the able observer at the Mauritius, Mr. C. Meldrum, as a foreigner. Among our own countrymen may be noted C. Brooke, F.R.S., Sec. Met. Soc.; W. R. Birt, F.R.A.S.; A. Buchan, Sec. Scot. Met. Soc.; Dr. Davy, F.R.S.; Dr. Everett; J. Glaisher, F.R.S., Pres. Met. Soc.; Prof. A. Herschel; D. Milne Home, Pres. Council Scot. Met. Soc.; Col. Sir H. James, F.R.S.; E. J. Lowe, F.R.S.; Dr. Moffat, F.R.A.S.; Prof. Phillips, F.R.S.; Col. Sykes, M.P., F.R.S.; D. Smith, F.R.A.S.; Dr. Balfour Stewart, F.R.S.; G. J. Symons, F.M.S.; F. Vivian.

We cannot find space to give all the Meteorological papers *in extenso*, much less the reports; we therefore propose to give simply condensed notices of the papers and discussions, and in these we shall, to a certain extent, avail ourselves of the reports of the *Dundee Advertiser*, the accuracy of which were the theme of general comment.

### BEHAVIOUR OF THE ANEROID BAROMETER.

Dr. BALFOUR STEWART, Superintendent of Kew Observatory, read an interesting paper on the Behaviour of the Aneroid Barometer at different pressures. Experiments had lately been made with the view of ascertaining to what extent an Aneroid may be considered a reliable instrument when exposed to such considerable changes of pressure as occur in mountain districts. By means of an air pump, the Aneroids, when placed in a receiver, might be subjected to any pressure. A method of tapping the Aneroids had also been devised, and by this means the experiments as to the deviation of the results given by these instruments were conducted with comparative ease, and with the greatest accuracy. The experiments were still going on.

Sir W. THOMSON said the Aneroid had become so popular an instrument that many had satisfaction in learning that it was capable of giving results with scientific precision. Dr. Stewart had shown that in taking a barometer up a mountain of 12,000 feet, the error would only be about 300 feet, and had also shown how to correct this error. By carefully using these instruments, therefore, they had a probability of determining, with much less error, the height of a mountain of 12,000 feet.

Mr. BROOKE entered into some explanations regarding the action of the small Aneroid, one of which he had carried in his pocket for a considerable time.

Mr. GLAISHER corroborated the remarks of Dr. Stewart.

### MAGNETIC DISTURBANCES.

A paper on the results of a comparison of the magnetic curves at the Observatories at Kew and Lisbon during the Disturbance of February 20—25, 1866, by Senor Capello, was also read by Dr. Stewart.

## METEOROLOGICAL OBSERVATIONS AT SEA.

Dr. MOFFAT read a paper on some observations made at sea with regard to the ozoniferous currents of the ocean. The observations referred to had been made by W. F. Moffat, R.N., between lat. 53 deg. N., and 39 S., and long. 83 E., and 25 W. Mr. Moffat had observed that, as the wind veered with increasing readings of the barometer from south points of the compass through W. to N., ozone disappeared, and continued absent while the wind was in points between N. and E., and that it reappeared as the wind veered with decreasing readings of the barometer to S. points. The disappearance and reappearance of ozone with those conditions were so regular, that the changes appeared to be the result of an invariable atmospheric law, and Mr. Moffat was induced to examine the law of rotation of the wind, so clearly developed by Dore, and the results of the examination led him to believe that the Polar current is the non-ozoniferous or that of minimum of ozone, and that the equatorial is the ozoniferous, or that of the maximum of ozone. According to the rotation theory, the N. Polar current forms the N.E. "Trade," and the S. Polar the S.E. Trade, while the equatorials form in the Northern and Southern Hemispheres the upper or returning "Trades." These returning Trades come to the earth's surface in the Northern and Southern Hemispheres about the 53 deg. or 30 degrees of latitude—the latitude varies with the season—N. and S. of the Equator.

## LUMINOSITY OF PHOSPHORUS.

Dr. MOFFAT then read an account of several interesting experiments which he had made on the luminosity of phosphorus. From these experiments it was shown that phosphorus in a luminous state produced phosphorus and phosphoric acids, and ozone also; that it was non-luminous at temperatures below 39° (F), and that it was luminous above 45° (F), but the temperature of luminosity and non-luminosity varied with the pressure of the atmosphere, and also with the direction of the wind. A series of experiments, extending over four years, had been made on the luminosity of phosphorus in connection with atmospheric conditions, and from the results it would appear that the equatorial or sea wind is that of phosphorescence and ozone, and that the polar or land wind is that of non-luminosity and no ozone. As the ocean is the reservoir of ozone, Dr. Moffat asks if it is not probable that its phosphorescence is the chief source of its development—a probability strengthened by the fact that the polar and land winds seem to modify its development, as the land current does. From observations made at sea, between lat. 53 N. and 39 S., Dr. Moffat was led to believe that, were it not for the modifying influence of the polar or trade winds, ozone at sea would be a constant quantity.

Sir W. THOMSON commented on the wonderful character of the results referred to by Dr. Moffat. They were altogether new to him, and certainly he should take the very earliest opportunity of endeavouring to obtain them for himself. He remarked that the phenomenon of luminosity stored up in the ice and produced after the melting of the ice was certainly one of the most startling ever met with in physical science—the luminosity having been induced by the previous presence of non-luminous phosphorus at a low temperature. It was a most beautiful and wonderful result. He was sure the publication of Dr. Moffat's paper would induce persons in all parts of the world to repeat the experiments.

## REPORT OF THE RAINFALL COMMITTEE.

After some remarks from the Chairman of the Committee, Mr. GLAISHER, who commented on the importance of knowledge regarding rainfall in connection with the water supply of large towns, Mr. G. J. SYMONS, read the report, which dealt principally with the following branches of rainfall investigations:—  
1. Extraction and classification of published records, being a collection into one uniform set of tables of all reliable rainfall measurements. 2. Examination of the rain gauges actually in use, by the personal visit of Mr. Symons to each observer, and the careful measurement of each gauge. Upwards of 60 were tested during the past year, and the total now visited is nearly 250. 3. Inclined and tipping-funnelled gauges. These experimental instruments were reported to be acting satisfactorily, and it was stated that Professor Phillips was about to

undertake the reduction of the observations. 4. Experiments on the influence of river mists on the amount of rain collected were reported upon, and it was intimated that any person possessing a lake or large pond in the middle of a large level plain, and clear of trees, might very usefully employ himself in making observations. 5. Reference was made to the establishment of additional gauges in Derbyshire, and in the Lake district of England—the results whereof will be given next year. 6. A preliminary notice was given of some results, as to the relative fall of rain in the various months; and it was pointed out that the monthly per centage is very different at stations having a small fall from what it is at wetter ones—the former having the greatest per centage in the summer, and the latter in the winter. 7. The last subject noticed was the means adopted to determine the altitude of the rain gauges above the sea, explanation being given of the means of obtaining the information from the publications of the Ordnance Survey, and also of some recent arrangements carried out by Mr. Symons for obtaining approximate determinations by means of barometric observations.

Mr. GLAISHER remarked that if there were gentlemen in localities situated near large towns, and where there is a good opportunity for measuring rainfall, who had not yet taken observations, they would, by commencing to do so, and communicating the results to the Committee, aid and assist them in the very important work in which they were engaged.

#### STORM WARNINGS—THEIR IMPORTANCE & PRACTICABILITY.

Colonel SYKES, M.P., then read a very lengthy paper, giving in minute detail a review of the progress of Meteorological Science. He referred to the appointment of Admiral FitzRoy as head of the Meteorological Department of the Board of Trade, and to the long and most valuable and assiduous labours of that gentleman in advancing meteorology, and in applying it to the most practical and useful purposes. The storm signals made by Admiral FitzRoy were very numerous. In the course of three years he gave 405 storm warnings, and of this number 305 were correct, showing that the meteorological observations leading to these warnings were of great utility, for they might safely infer that these 305 correct predictions of storms had saved many a vessel from shipwreck, and many a human life. (Applause.) Again, as to the observations on the wind in the same period, the predictions made were correct to the extent of 38 per cent., and these results were surely sufficient justification of the continuance of the storm warnings. Upon the death of Admiral FitzRoy, however, a Committee of the Royal Society was requested to carry on the work, but this they declined to do, on the ground that Admiral FitzRoy had promulgated these signals on empirical data. This was a determination which was much regretted, not only by scientific men, but by the Mercantile Marine, and by all the fishermen on our coasts. The storm warnings originated in a recommendation by the Mathematical Section of the British Association, which met at Aberdeen in 1859, and when, in conformity with the application of the Association to the Board of Trade, telegraphic meteorology was commenced, and Admiral FitzRoy was appointed to carry it out, that appointment gave great satisfaction to the country; but now all was to be changed. The Committee of the Royal Society had refused to continue these signals, and a long correspondence had taken place on the subject; but the result as yet had only been, that while the Committee of the Royal Society still persevered in their refusal to continue these warnings, they agreed to take steps for procuring certain observations, extending over the next fifteen years, and when these were obtained they would then issue these warnings, if the nature of these observations warranted that course. In order to do this, however, a large number of new Observatories were to be established with self-recording instruments, and this at a very much larger cost to the country than the Meteorological Department of the Board of Trade had cost. He had no hesitation in saying that the argument employed in the refusal of the Committee of the Royal Society was a pedantic affectation of science—literally the coxcombry of science. (Laughter.) What was the position of other countries in regard to this matter? In France meteorological observations were made, and, in the last report on the state of the French Empire, it was stated that the storm warnings given by the Imperial Observatory at Paris were very highly appreciated. In St. Petersburg, the same thing was done, and also

in many continental nations ; and yet here were we, the most maritime nation in the world—having set the example to other countries in this matter of storm warnings—and yet we were now dropping them. (Applause.) We were too scientific for the work. (Laughter.) Colonel Sykes then went on to show, from the memorials that had been sent to the Board of Trade from all parts of the country, that there was a great desire for the restoration of the signals—quoting from those sent by the Edinburgh Chamber of Commerce, from the Dundee Local Marine Board and Harbour Trustees, and many others—and concluded by shewing the practicability of making these observations, if not with absolute accuracy, at least sufficiently so to be of very great practical benefit to the shipping interests of the country. It was compromising the character and affecting the safety of the life and property of the country to discontinue the signals, and he thought he had shown that the restoration of the storm signals was a most urgent necessity. (Applause.) They should not submit to be deprived of the advantage given by these storm signals by the mere crotchet of individuals. (Applause.)

Mr. J. P. GASSIOT, one of the members of the Scientific Committee of the Royal Society, in reply to what Colonel Sykes had said, remarked that there was no doubt Admiral FitzRoy was an able officer, but his own general knowledge as a seaman led him to conclusions without laying down any particular system, and while he had to a certain extent been successful, he had also to some extent been unsuccessful. It would be supposed from what Colonel Sykes had said that the idea of continuing storm warnings was to be suspended for fifteen years ; but the very fact of the Committee having engaged Captain Toynbee showed their desire to carry out these storm warnings in a proper and useful manner. They proposed to have observatories in certain ports, with self-recording instruments—no meteorological observations being worthy of recording, unless the instruments were self-recording. These observatories were in course of being established. They proposed to communicate to certain ports which had the sanction of the Board of Trade, all the facts which they got from the different stations, and that at these particular ports storm signals should be hoisted, and every sailor be able to get the precise information, from which he should make his own deductions to protect his own vessel.

Mr. JOHN DON, President of the Dundee Chamber of Commerce, on behalf of the commercial, manufacturing, and shipping interests of Dundee, thanked the honourable member for Aberdeen for the admirable manner in which he had brought this subject before the British Association. This question had for a considerable number of years constantly occupied the attention of the Chamber of Commerce, the Harbour Trustees, and other public bodies in Dundee. After the discontinuance of the storm warnings, they memorialised the Board of Trade and petitioned the House of Commons in April last, and the Section would therefore see that for some time past they had been urging the resumption of these storm warnings. The honourable member for Aberdeen informed them that these warnings had been discontinued in deference to the pedantic affectation of science. What might be the exact meaning of that term he could not say. All he could say was, that if these warnings had been discontinued in deference to the pedantic affectation of science, the British public would not think that a sufficient reason. (Applause.) If he was told that these warnings had been discontinued on the ground of economy, all he had to say was, that the trifling cost could not for a moment be put in comparison with the saving of valuable life and property. It occurred to him that this was a favourable time for the British Association to urge Her Majesty's Government to resume these signals. All who heard the inaugural address of the noble President—whom he was glad to see present at this discussion—must have been struck with his special and pointed allusion to the benefit of these storm signals ; and his Grace's party being now in power, and knowing his immense influence with the Government, he (Mr. Don) thought that the Association ought to take the opportunity of urging the necessity of at once resuming these storm signals at all the principal ports of the United Kingdom. (Applause.) While, therefore, they were greatly indebted to Colonel Sykes for his valuable paper, he hoped that some practical effect would be given to his suggestions, and that some influential members at this meeting would draw up a formal resolution on the subject.

MR. D. MILNE HOME, of Wedderburn, President of the Meteorological Society of Scotland, quoted the published opinions of various authorities with regard to the notification of storms, and pointed out that, following the example set by the Board of Trade, almost all other civilized countries had adopted these storm warnings as a system which had commended itself to them, after due consideration, as profitable and useful. It appeared to him that, for our country to drop these storm signals, after suggesting them to other countries, was a most disadvantageous position for our country to be placed in, especially as Great Britain, occupying the geographical outpost to Europe, should give the most valuable information. He thought some misapprehension existed with reference to the position taken up by the Royal Society, and he wished to exonerate that Society from a small portion of the blame which had been thrown upon them. Whilst that Society would not themselves undertake the duties, because they considered them incompatible with pure science, they recommended the Board of Trade themselves to appoint an officer as successor to Admiral FitzRoy, and pointed out the proper person for the position; but the Treasury said that, unless a strong case were made out, they were not disposed, with the information before them, to sanction any expense on that account. He thought that a strong case had been made out by Col. Sykes, and as the British Association on a former occasion had been successful with the Government in inducing them to commence these storm signals, he felt sure that the British Association would be equally successful on the present occasion, if they consented to go forward and ask that these storm signals should be resumed. (Applause.) He concluded by proposing the following motion for the adoption of the Section,—“Resolved, that this Section apply to the Council of the British Association, to make a communication to Her Majesty's Board of Trade, urging them to institute arrangements for causing the storm-signals of the late Admiral FitzRoy to be resumed.” (Applause.)

THE DUKE OF BUCCLEUCH said he was quite ready to second that motion, and the more so in that he was one of the deputation that waited upon the President of the Board of Trade, urging this very subject upon him. (Applause.) He did not pretend to enter into the scientific aspects of the question, neither would he enter into the subject of whether the Royal Society was the proper body from which these storm warnings should emanate. What he went upon was the practical benefit that would ensue from some such signals being again resumed. As he remarked the other night, and as he had observed on other occasions, they did not ask the Board of Trade, or any body of men, to undertake the duty of being weather prophets. (Laughter.) All they wanted was to procure information for the public which would enable maritime men and others to judge as to the nature of the weather they were likely to encounter when they left port. He therefore cordially agreed with the resolution that had been proposed, and had great pleasure in seconding it. (Applause.)

SIR JOHN OGILVY remarked that he had listened with much attention to the interesting discussion which had taken place, and it had only confirmed the opinion formerly entertained by him of the value and importance of these storm signals to a large portion of his constituents in Dundee, and he should have the greatest pleasure in co-operating with His Grace in urging this matter upon the attention of the Government. (Applause.)

DR. BALFOUR STEWART said that the Meteorological Committee of the Royal Society had stated that they would have telegraphic stations scattered all over the country, and principally in the west and south-west of Ireland. They would have a telegraphic officer of great intelligence stationed at Valentia, who would be prepared to keep an outlook on the state of the weather, and whenever he found that there was a probability of a storm he would telegraph at once to the Central Office in London; and if he found the meteorological disturbance increasing, and as soon as the Central Office found that a storm was approaching, and that an actual fact had taken place, they would be ready to telegraph this fact to the out-ports without loss of time. So far as he could see, this procedure would not be very different from that of the late Admiral FitzRoy.

MR. GLAISHER, who rose as President of the Meteorological Society, and Meteorological Director of the Greenwich Observatory, said that the Council of the Meteorological Society were very much surprised by the decision of the Royal Society



Committee regarding the discontinuance of the storm signals. Admiral FitzRoy had trained Mr. Babington in the work in which he himself had been engaged, and the storm signals did not cease when the Admiral died, and there was no good reason why these observations should not be resumed. (Applause.) As to the self-recording instruments which it was proposed by the Committee of the Royal Society to establish, and as to what Dr. Balfour Stewart had said, that the mere fact that there was a storm in a certain quarter should be sent down to the different outposts, he would say that self-recording instruments, without eye observations to check and, if need be, correct them, were of no use; and as to sending down the mere results of the meteorological observations to the coasts, he would say, for God's sake, do not do it. They would be read in a dozen different ways, and would only lead to mischief. He concluded by earnestly stating his opinion that the signals should be restored. (Applause.)

ADMIRAL BELCHER said that Admiral FitzRoy had been tried by a civil court-martial, and by a set of men who were not qualified to judge him. They should hear the naval side of the question, for it was really after all a naval question. It had been said that we could not foretell events of the weather, but he could tell them facts to the contrary. (Applause.) As far back as 1812 he recollected that it was the constant habit of the Admiral on the Bordeaux station to give signals every hour when the barometer changed, and the ships struck masts and sent down yards accordingly. On one occasion, when they were chasing the enemy, and just as they were on the point of coming up with them, their captain looked at the barometer, and suddenly gave the order to reef topsails, but before that could be done many spars were lost. On another occasion, he himself had predicted a storm in a certain quarter, and his prediction was fulfilled to the very hour. He knew they could continue the storm signals if those in authority would only be stirred up to do their duty. It was all nonsense to say they could not do so. (Applause.) Why, the cattle, the birds, the fish, and the reptiles, and in fact everything gave indications of coming storms, and, with the assistance of meteorological observations, scientific men should be able to give very precise notice of atmospheric changes. (Applause.)

COL. SYKES regretted that Dr. Balfour Stewart seemed to misapprehend him in a point of some importance. He did not mean to say that the Committee of the Royal Society were pedants, but that the arguments against the data on which Admiral FitzRoy's warnings were based, was a pedantic argument, and of no practical value.

THE REV. C. PRITCHARD remarked that the impression on his mind was that, as usual, the truth in this matter lay between the two extremes. Perhaps too much had been attempted to be done by the late Admiral FitzRoy, but on the other hand he thought that the Committee of the Royal Society, with such a man as General Sabine at their head, might be trusted to do all that could be done in the matter. He thought that a slight alteration in the wording of the resolution might have a good effect. He would propose that, instead of saying that the signals of the late Admiral FitzRoy should be continued, that arrangements should be made for continuing the system of storm signals, and this would prevent them from tying the hands of Government as to the mode in which these should be made. (Applause.)

MR. D. MILNE HOME contended that the value of the signals given by Admiral FitzRoy consisted chiefly in their specific character and intelligibility. He did not merely intimate a meteorological fact, leaving anybody to interpret it, but what he signalled was something like this—"Look out at Dundee for a gale from the S.W." It would be of no use whatever to the people of Dundee or any other port to know that a gale was blowing at Copenhagen, Valentia, or elsewhere, unless they were also told that they might expect to be visited by the same storm. (Applause.)

THE DUKE OF BUCCLEUCH thought, with all deference to Mr. Milne Home, that to insert the words originally proposed would perhaps lead persons to suppose that Admiral FitzRoy's system should be continued. He, however, was not quite sure but that great improvements might be made upon that system. He would be glad to see what had been begun by Admiral FitzRoy taken up and if possible improved, but he should not like to feel himself tied in any way to say that.

Admiral FitzRoy's system should be resumed. Perhaps Mr. Milne Home would allow the resolution to stand in this way, "that arrangements regarding storm signals be continued." (Applause.)

MR. MILNE HOME was understood to consent to this proposal, and on the amended resolution being put to the meeting by Professor Kelland, it was carried unanimously.

#### OBSERVATIONS OF ATMOSPHERIC ELECTRICITY.

DR. EVERETT, formerly Professor of Natural Philosophy in the University of Windsor, Nova Scotia, and now official assistant to the Professor of Mathematics in the University of Glasgow, read a paper on the "Results of Observations of Atmospheric Electricity at Kew Observatory, and at Windsor, Nova Scotia." The Kew observations included in this paper extended from June, 1862, to May, 1864, inclusive, and were taken with Sir Wm. Thomson's self-recording apparatus, specimens of the photographic curves thus taken being exhibited at the meeting. The Windsor observations, taken by Dr. Everett with apparatus of a different kind, also invented by Sir. Wm. Thomson, but not self-recording, extended from October, 1862, to August, 1864. Monthly averages which had been taken showed that at Kew there had in every month been two maxima in the day—one of them between eight and ten a.m., and the other, which was more considerable, between eight and ten p.m. At Windsor, on the contrary, the electricity between eight and ten p.m. had in every month been weaker than either between eight and ten a.m. or between two and three p.m. The annual curve for Kew had its principal maximum in November, and another in February or March. At Windsor the principal maximum was in February or March, and the minima in June and November. The annual curves for the two places agreed pretty well from January to October, but were curved in opposite directions from October to January.

#### ACTION OF LIGHTNING IN FORFARSHIRE.

Professor KELLAND read the following paper of Sir David Brewster's: "In the summer of 1827 a hay stack in the parish of Dun, in Forfar, was struck by lightning. The stack was on fire, but before much of the hay was consumed the fire was extinguished by the farm servants. Upon examining the hay-stack, a circular passage was observed in the middle of it, as if it had been cut out with a sharp instrument. This circular passage extended to the bottom of the stack, and terminated in a hole in the ground. Captain Thomson, of Montrose, who had a farm in the neighbourhood, examined the stack, and found in the hole in the hay-stack, a substance which he described as resembling lava. A portion of this substance was sent by Captain Thomson to my brother, Dr. Brewster of Craig, who forwarded it to me with the preceding statement. The substance found was a mass of silix obviously formed by the fusion of the silix in the hay. It had a highly greenish tinge, and contained burnt portions of the hay. I presented the specimen to the museum of St. Andrews."

(*To be continued.*)

#### TEMPERATURE IN THE SHADE AND IN THE SUN.

*To the Editor of the Meteorological Magazine.*

SIR,—Perhaps if no abler correspondent answers W.E.H.'s letter, you will allow me a few lines.

In the first place, the temperature of the air in the shade is *not* what meteorologists want to know; they want to know the temperature of the air. It is only through necessity that we are obliged to place our instruments in the shade. The air receives increase of heat mainly in two ways:—(1) by absorbing the direct rays of the sun, (2) by contact with the ground still more heated by them. It loses heat (1) by radiating heat into space, (2) by contact with the ground still more cooled by the same process. Now meteorologists place their instruments where these forces act, and not where they do not act; they register the highest temperature to which the air at a certain height (commonly 4 feet) above the ground is heated, and the lowest to which it is cooled by the above causes.

If it were possible to make a thermometer transparent to the sun's heat-rays, such an instrument suspended freely in the air in an open space would show the real temperature of the air. But as this is impossible, meteorologists almost without exception, I believe, place the thermometers as far as possible in an open

space free from trees, and distant from walls upon a stand so arranged that the air has a free passage past and around the bulbs of the instruments, while the sun's rays are completely kept off. If so placed, there will be no substance that can reflect heat to them and no heated surface near, except the ground and the top of the stand, and the air which passes over the latter does not go near the instruments. Mr. Glaisher very properly insists that they shall not be hung against a board unless the bulbs project beneath, for if so placed they are affected by the temperature of the board which is slower than they to receive heat from the air.

Now in the shade, in which W.E.H. puts his thermometers, none of these causes act, and the air would hardly alter in temperature if it were not for the wind. But on calm days the circulation of the air is far from complete, and therefore, the air is cooler in such places by day and warmer by night than in an open space. Moreover, walls and trees do not readily change their temperature if not exposed to the sun, but tend further to cool by day and heat by night the air surrounding them. Trees especially are kept at a very uniform temperature by their vitality, and still further cool the air around by the evaporation from their leaves, so that the air in a wood, as everyone knows, is damp and cold by day, but close—i.e., damp and warm—by night.

It follows, then, that without believing every "extraordinary account in the papers," we must decline to put our thermometers in a thick shade where they will register (as I have found by experiment) from  $6^{\circ}$  to  $12^{\circ}$  too low in summer heat, and as much too high in hard frosts.

About the mode of determining the heat of the sun's rays, there is, I am sorry to say, less agreement; W.E.H.'s criticisms upon the popular notions are very just, and the results of his experiments doubtless correct; still there is much more agreement that he supposes. A thermometer with blackened bulb enclosed in a glass cylinder enlarged at one end and exhausted of air—commonly called the "black bulb in vacuo"—is pretty generally employed, but it is not always similarly placed. I think the Greenwich plan of placing it upon a level piece of short grass, the simplest and the best; once raise it above the ground and there are an infinite number of different heights at which to place it, each giving a different result. Even a few inches elevation lowers the temperature  $5^{\circ}$  or  $6^{\circ}$  in summer, or even more on a bright but windy day. There could surely be no difficulty in all agreeing to adopt the very simple plan of putting it on the grass. Care, however, should be taken to select one in which the bulb is completely covered with lamp-black up to the point at which the tube first begins to widen towards the bulb, and which has also a shield of clear glass without flaws, bubbles, or inequalities, at least on the side exposed to the sun. I have found by experience, that if these points are not attended to, the instrument may read as much as  $6^{\circ}$  or  $8^{\circ}$  too low, but if they are, I believe the results are strictly comparable.—I am, Sir, yours truly,

September 19th, 1867.

F. W. S.

---

*To the Editor of the Meteorological Magazine.*

SIR,—Your correspondent "W. E. H." has come to the conclusion, from his experiments, that the true heat of the atmosphere in the shade is only to be obtained in the complete shade of trees. But I would ask whether such a conclusion can be looked upon as correct, when we call to mind the very great evaporation that takes place from the leaves, and the vast amount of caloric that will so be absorbed, reducing the temperature. I have been lately astonished at the effect produced upon a thermometer by allowing a major convolvulus to clamber over a part of the instrument, in reducing the extent of the daily range. I quite agree in the absurdity of giving temperatures from thermometers suspended just outside windows, as any criterion of the shade temperature of any spot, and was quite startled at the wide discrepancy between my own records and those sent to the *Times*, to surprise the public. Doubtless soil has much influence, and such influences are highly interesting to trace, but we certainly ought to try to get rid of the disturbing effect of reflecting surfaces, and of walls and roofs heated, at some period of the day, by the sun's rays.—Yours very faithfully,

T. L. L.

## YELLOW HAZE AND S.E. WIND.

*To the Editor of the Meteorological Magazine.*

SIR,—There are two subjects which I would lay before your readers for discussion. The first is, the peculiar yellow haze which accompanies an east wind at all seasons of the year, but especially in spring, and which country folk call London smoke, but which I have noticed in Wales and in Germany. The second is the frequency of S.E. winds in this country, in the middle of the months of March and October, especially in October. The S.E. wind being, according to the present theory, a S.W. wind, deflected in its lower portions by a N.E. current, should be colder than the S.W., and so it often is, and we have a pretty positive proof of the truth of this theory, since we often observe with this wind the high clouds moving from the S.W., the low drift from the S., while a thin stream beneath flows languidly from the S.E., and further by the abundant rain (the most copious of all our rains) that falls under these circumstances.

But sometimes this wind is wonderfully warm, not so much from the sun's rays shining without screen, as because the air itself is highly heated, as evidenced by the night and shade temperatures. In Bavaria, men of science hold that the air from the deserts of Africa traverses, sometimes, the Alps, producing the violent breaks which occasionally occur in their somewhat severe winter there. May we not also be justified in assuming that the class of S.E. winds under discussion, come to us from the deserts of Africa giving a mitigated siricco? When they blow, the air is singularly transparent, and the only clouds are largish quantities of cirrus with little motion. This is the class of S.E. winds that we have in October, and I would further suggest that such a bed of heated air from Africa, wandered over Europe at the beginning of May in this year.

I think the S.E. is the most curious and interesting wind that blows in this country, not only because of its somewhat obscure origin, but also because, with it, we have the least atmospheric pressure, which fact has never been satisfactorily explained. I wish we had records, with their heavy rainfalls, in the United States, of the direction of their winds. I am reminded of this by observing that you quote one of these records.—Yours faithfully,

T. L. L.

## LUNAR RAINBOW.

*To the Editor of the Meteorological Magazine.*

SIR,—At 7.30 p.m. September 10th, a beautiful lunar rainbow appeared here in the N.W. quarter, and continued visible for about seven minutes. We had no positive cloud overhead, but a very light vapour, with a scarcely perceptible drizzle for a minute or two. The gibbous moon was rather wan among some moving vapours. The arc itself was about 30° high, and shown upon grey cumulus, below which at the horizon was a long stripe of silver light.

This is the third lunar rainbow I have seen, and it differs from the other two, in possessing colour. The others were merely faint, pale arcs, but in this a fusion of rich colours, as in a fading solar bow, was seen. Moreover, a marginal repetition, just within the main broad stripe, could be descried by careful eyes. The arc was about half the apparent width of a near solar bow. The southernmost spring of the arch was at first the brightest part; then the crown, and then the northern column; and so it died away.

I hope other correspondents will tell you how far it was seen, and what it was like.—Yours very obediently,

R. D. BLACKMORE.

## BOOKS, &c., RECEIVED.

FOURNET, M. J., "Commission Hydrométrique et des Orages de Lyon," 1866, 23<sup>e</sup> Année.

HARRISON, J. P., M. A., "On Radiation and Vapour." [*Phil. Mag.* April, 1867. "On the Relation of Insolation to Atmospheric Humidity." "*Proc. Roy. Soc.* No. 90, 1867.]

HOSKINS, S. E., M. D., F.R.S., "A tabular form of analysis to aid in tracing the possible influence of past and present upon future states of weather." [*Proc. Roy. Soc.*, No. 93, 1867.]

## SEPTEMBER, 1867.

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
		Total Fall,	Difference from average 1860-5	Greatest Fall in 24 hours.		Dpth	Date.		Max.		Min.		
				inches.	in.				Deg.	Date.	Deg.	Date.	
I.	Camden Town .....	2.23	— .03	.55	11	11	79.0	1	36.0	25			
II.	Staplehurst (Linton Park) ...	1.43	— .79	.56	10	12	79.0	2	32.0	25			
III.	Selborne (The Wakes).....	2.65	+ .21	.90	9	12	75.0	3	31.6	25			
III.	Hitchen .....	1.86	— 0.00	.72	10	10	74.0	1	35.0	24			
IV.	Banbury .....	1.79	— .58	.69	2	13	74.3	1	33.5	26			
IV.	Wisbech .....	2.26	— .	1.00	3	6	77.2	1	35.1	25			
V.	Bury St. Edmunds (Culford).	2.63	+ 1.02	.92	9	9	80.0	1	33.0	24			
V.	Calne .....	...	...	...	...	...	...	...	...	...			
V.	Plymouth (Goodamoor) .....	2.88	— 1.77	...	...	...	...	...	...	...			
V.	Barnstaple .....	2.09	— 1.68	.32	15	16	...	...	...	...			
VI.	Taunton (Fulland's School)	1.31	— .35	.64	2	8	87.0	2	38.0	24			
VI.	Shrewsbury (Highfield) .....	1.52	— .68	.39	13	14	...	...	...	...			
VII.	Tenbury (Orleton) .....	1.79	— .90	.39	3	13	74.8	2	35.0	26			
VII.	Leicester (Wigston) .....	1.94	— .27	.93	3	6	81.0	2	34.0	24			
VII.	West Retford .....	...	...	...	...	...	...	...	...	...			
VIII.	Derby .....	2.86	+ .52	1.39	3	15	75.0	2	38.0	26			
VIII.	Manchester .....	2.99	— .71	.62	1	19	76.6	2	38.0	17			
IX.	York .....	1.75	— .59	.41	14	10	69.5	5	42.0	25			
IX.	Skipton (Arncliffe) .....	5.27	+ .31	.84	15	19	68.0	5	43.0	17			
X.	North Shields .....	1.85	+ .15	.56	11	13	68.2	5	41.5	26			
X.	Borrowdale (Seathwaite).....	12.47	— .74	1.73	6	21	...	...	...	...			
XI.	Abercarn .....	3.31	— .	.90	7	14	75.0	1	40.0	25			
XI.	Haverfordwest .....	3.54	— .17	.80	10	11	71.7	2	38.5	17			
XI.	Rhayader (Cefnfaes).....	2.96	— .88	.50	5	20	70.0	...	35.0	...			
XII.	Llanberis (R. Victoria Hotel)	6.75	— .	1.18	4	12	...	...	...	...			
XII.	Dumfries .....	3.87	+ 1.14	.76	5	21	68.5	2	38.0	17			
XII.	Hawick (Silverbut Hall)....	2.12	— .	.44	1	15	...	...	...	...			
XIV.	Ayr (Auchendrane House) ...	4.26	+ .53	.62	28	23	74.0	4	34.0	17			
XV.	Otter House .....	5.67	+ .85	.85	5	19	67.0	2, 4	42.0	18			
XVI.	Leven (Nookton) .....	2.20	— .28	.59	12	14	66.0	4	38.0	17			
XVI.	Stirling (Deanston) .....	4.72	+ 1.57	1.03	3	19	67.3	4	30.8	17			
XVI.	Logierait .....	2.00	— .	.46	6	13	...	...	...	...			
XVII.	Ballater .....	1.94	— .	.52	12	16	66.0	4	30.5	18			
XVII.	Aberdeen .....	1.97	— .	.76	3	19	64.8	29	41.7	18			
XVII.	Inverness (Culloden) .....	1.31	— .	.38	30	8	65.0	4	42.4	18			
XVIII.	Fort William .....	5.79	— .	.92	28	25	...	...	...	...			
XVIII.	Portree .....	7.77	— 3.00	1.82	28	22	66.2	10	36.0	20			
XVIII.	Loch Broom .....	5.40	— .	2.05	28	22	...	...	...	...			
XIX.	Helmsdale .....	3.01	— .	.59	12	22	...	...	...	...			
XIX.	Sandwick .....	5.38	+ 1.72	1.60	10	21	61.8	3	41.8	24			
XX.	Cork .....	3.58	— .	1.32	11	16	...	...	...	...			
XX.	Waterford .....	2.53	— .60	.63	11	17	71.0	15	44.0	22			
XXI.	Killaloe .....	3.14	— 1.02	.69	9	16	74.0	3	36.0	18			
XXI.	Portarlinton .....	1.69	— 1.59	.23	5	22	63.5	1	36.0	17			
XXII.	Monkstown .....	1.31	— .68	.29	2	14	70.0	3, 21	40.5	21			
XXII.	Galway .....	3.52	— .	.49	6	20	68.0	2, 17	43.0	30			
XXII.	Bunninadden (Doo Castle) ...	3.07	— .	.51	4	18	67.0	3	31.0	18			
XXII.	Bawnboy (Owendoon) .....	4.06	— .	.65	6	22	78.5	2	39.0	17			
XXII.	Waringstown .....	1.45	— .	.19	6	16	71.0	2, 3	34.0	16			
XXII.	Strabane (Leckpatrick) .....	2.27	— .	.43	4	20	74.0	3	36.0	18			

\* And 30th. † And 26th. ‡ And 20th. § And 30th.

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



## SEPTEMBER, 1867.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.						Days on which 1/10 or more fell.	TEMPERATURE.				No. of nights below 32°.
		Total Fall.	Difference from average 1860-5	Greatest Fall in 24 hours.		Dpth.	Date.		Max.		Min.		
				in.	Date.				Deg.	Date.	Deg.	Date.	
I.	Camden Town .....	2.23	— .03	.55	11	11	79.0	1	36.0	25	0		
II.	Staplehurst (Linton Park) ...	1.43	— .79	.56	10	12	79.0	2	32.0	25	0		
III.	Selborne (The Wakes) .....	2.65	+ .21	.90	9	12	75.0	3	31.6	25	1		
III.	Hitchen .....	1.86	0.00	.72	10	10	74.0	1	35.0	24	0		
IV.	Banbury .....	1.79	— .58	.69	2	13	74.3	1	33.5	26	0		
IV.	Wisbech .....	2.26	...	1.00	3	6?	77.2	1	35.1	25	0		
V.	Bury St. Edmunds (Culford) ..	2.63	+ 1.02	.92	9	9	80.0	1	33.0	24	0		
V.	Calne .....	...	...	...	...	...	...	...	...	...	...		
VI.	Plymouth (Goodamoor) .....	2.88	— 1.77	...	...	...	...	...	...	...	...		
VI.	Barnstaple .....	2.09	— 1.68	.32	15	16	...	...	...	...	...		
VII.	Taunton (Fulland's School) ..	1.31	— .35	.64	2	8	87.0?	2	38.0	24	0		
VII.	Shrewsbury (Highfield) .....	1.52	— .68	.39	13	14	...	...	...	...	...		
VIII.	Tenbury (Orleton) .....	1.79	— .90	.39	3	13	74.8	2	35.0	26	0		
VIII.	Leicester (Wigston) .....	1.94	— .27	.93	3	6	81.0	2	34.0	24*	0		
IX.	West Retford .....	...	...	...	...	...	...	...	...	...	...		
IX.	Derby .....	2.86	+ .52	1.39	3	15	75.0	2	38.0	26	0		
X.	Manchester .....	2.99	— .71	.62	1	19	76.6	2	38.0	17	0		
X.	York .....	1.75	— .59	.41	14	10	69.5	5	42.0	25+	...		
XI.	Skipton (Arncliffe) .....	5.27	+ .31	.84	15	19	68.0	5	43.0	17	0		
XI.	North Shields .....	1.85	+ .15	.56	11	13	68.2	5	41.5	26	0		
XII.	Borrowdale (Seathwaite) .....	12.47	— .74	1.73	6	21	...	...	...	...	...		
XII.	Abercarn .....	3.31	...	.90	7	14	75.0	1	40.0	25	0		
XIII.	Haverfordwest .....	3.54	— .17	.80	10	11	71.7	2	38.5	17	0		
XIII.	Rhayader (Cefnfaes) .....	2.96	— .88	.50	5	20	70.0	...	35.0	...	0		
XIV.	Llanberis (R. Victoria Hotel) ..	6.75	...	1.18	4	12	...	...	...	...	...		
XIV.	Dumfries .....	3.87	+ 1.14	.76	5	21	68.5	2	38.0	17	0		
XV.	Hawick (Silverbut Hall) .....	2.12	...	.44	1	15	...	...	...	...	...		
XV.	Ayr (Auchendrane House) ...	4.26	+ .53	.62	23	23	74.0	4	34.0	17	0		
XVI.	Otter House .....	5.67	+ .85	.85	5	19	67.0	2, 4	42.0	18+	0		
XVI.	Leven (Nookton) .....	2.20	— .28	.59	12	14	66.0	4	38.0	17	0		
XVII.	Stirling (Deanston) .....	4.72	+ 1.57	1.03	3	19	67.3	4	30.8	17	1		
XVII.	Logierait .....	2.00	...	.46	6	13	...	...	...	...	...		
XVIII.	Ballater .....	1.94	...	.52	12	16	66.0	4	30.5	18	1		
XVIII.	Aberdeen .....	1.97	...	.76	3	19	64.8	29	41.7	18	0		
XVIII.	Inverness (Culloden) .....	1.31	...	.38	30	8	65.0	4	42.4	18	0		
XIX.	Fort William .....	5.79	...	.92	23	25	...	...	...	...	...		
XIX.	Portree .....	7.77	— 3.00	1.82	28	22	66.2	10	36.0	20	0		
XX.	Loch Broom .....	5.40	...	2.05	28	22	...	...	...	...	...		
XX.	Helmsdale .....	3.01	...	.59	12	22	...	...	...	...	...		
XXI.	Sandwick .....	5.38	+ 1.72	1.60	10	21	61.8	3	41.8	24	...		
XXI.	Cork .....	3.58	...	1.32	11	16	...	...	...	...	...		
XXII.	Waterford .....	2.53	— .60	.63	11	17	71.0	15	44.0	22	0		
XXII.	Killaloe .....	3.14	— 1.02	.69	9	16	74.0	3	36.0	18	0		
XXIII.	Portarlinton .....	1.69	— 1.59	.23	5	22	63.5	1	36.0	17	0		
XXIII.	Monkstown .....	1.31	— .68	.29	2	14	70.0	3, 21	40.5	21	0		
XXIII.	Galway .....	3.52	...	.49	6	20	68.0	2, 17	43.0	30	0		
XXIII.	Bunninadden (Doo Castle) ...	3.07	...	.51	4	18	67.0	3	31.0	18	1		
XXIII.	Bawnboy (Owendoon) .....	4.06	...	.65	6	22	78.5	2	39.0	17	0		
XXIII.	Waringstown .....	1.45	...	.19	6	16	71.0	2, 3	34.0	16	0		
XXIII.	Strabane (Leckpatrick) .....	2.27	...	.43	4	20	74.0	3	36.0	18	0		

\* And 30th. † And 26th. ‡ And 20th. § And 30th.

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

# METEOROLOGICAL NOTES ON THE MONTH.

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.

LINTON PARK.—Fog on 14th and 21st; T on 10th, and frost on 25th.

SELBORNE.—TS at 11 p.m. with heavy R on 2nd. Violent TS at 6 a.m. on 3rd, which struck the chimney of a lodge about a mile from here. Another TS on 9th at 9 p.m., during which 90 in. of R fell in two hours. First frost on 25th. Harvest generally completed by the 14th. On the whole a good harvest month, and the hops generally very fine, and in large quantities in this parish.

BANBURY.—TS with heavy R at midnight on the 2nd, and again between seven and eight the following morning. Mean temp. of month slightly above the average.

WISBECH.—Fog on 2nd and 21st. Frost on grass on 25th. TS, with 1 in. of R, on the 3rd. Three sheep killed under a tree near here during this storm.

CULFORD.—T on 3rd. Latter part of the month very fine.

TAUNTON.—The R on the 13th, though only 32 in., was noticeable from its literally coming down in sheets of water. Weather warm and genial. Harvest operations carried on uninterruptedly.

ORLETON.—A fine pleasant month, with moderate rainfall. Temp. nearly 2° above the average. Bar. high and steady. L in S. on evening of 2nd. Frequent TSS all day on 3rd, with L all night. Violent wind on 30th.

DERBY.—An unusually fine month; the mean temp. 2°3 above the average of 21 years, but still 5°3 below the magnificent September of 1865.

MANCHESTER.—TS on 3rd.

NORTH SHIELDS.—Solar halo on 9th.

SEAFHWAITE.—Potatoes much diseased.

## W A L E S.

ABERCARN.—TS to the S. on 1st. A heavy TS at 5 a.m. on the 3rd, with very vivid L to the N. and S.; this was repeated on the 4th, when the atmosphere was very oppressive and unusually warm; thus there were three TSS from the 1st to the 4th. Rather wet to the 15th, afterwards fine and calm.

HAVERFORDWEST.—First fortnight showery, wet, and very trying for harvest operations. Heavy TS, with vivid L, on morning of 3rd, rainfall 45 in. in one hour. T and L again, but less violent, on 6th. After the 15th the weather became settled, fine and clear; nights relatively warmer than the days; harvest well got in. Some three or four nights at the end were cold and foggy.

CEFNFAES.—A heavy TS, or rather three TSS, during the day of the 3rd. Temp. low. Grain crops in this district generally good, and well got in. A small flight of fieldfares seen on 20th.

## S C O T L A N D.

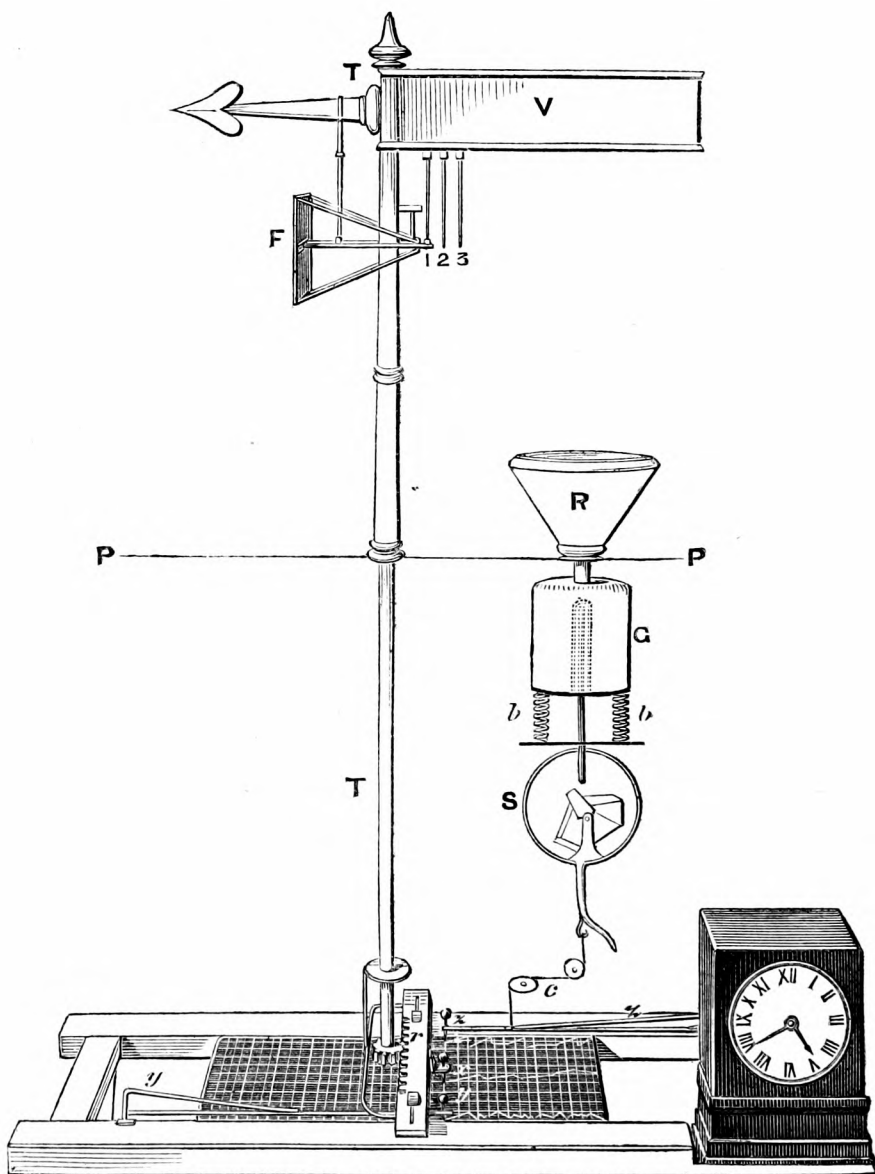
DUMFRIES.—More or less R every day during the first fortnight; the second fine, with occasional showers. TS on 3rd. Harvest very protracted; all the grain cut on many farms before a sheaf was in the barn yard. After the 15th the fields rapidly cleared, the grain, owing to the brisk wind during the rainy period, being in better condition than had been expected. Harvest in the lower districts completed by the end of the month. Potatoes slightly diseased, but the crop good. Pasture fields fresh and green.

HAWICK.—L for two hours on the night of the 2nd. Aurora on the 23rd. Much wind during the last 10 days. Hurricane from the S. on 29th and 30th. Cereal crops in fine order. Potatoe disease very prevalent.

AUCHENDRANE.—September is the principal harvest month in this locality, and with the exception of January and December, it is our wettest month; and this year the weather has been worse than usual. Fortunately, there was a period of nearly dry weather between the 14th and 21st, favourable for harvest operations.

OTTER HOUSE.—Hoar frost on 17th and other days; R mixed with H on 23rd. Harvest nearly completed, under severe and almost continued equinoctial gales. The steam plough is a great boon to the West Highlands.

# OSLER'S PRESSURE ANEMOMETER.





# SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

---

XXII.]

NOVEMBER, 1867.

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

---

## ANEMOMETERS.

(Continued from page 88.)

THE last instruments which we have to notice, are those in which the force of the wind is measured, instead of its velocity. Before describing them it seems expedient to draw attention to an oversight of frequent occurrence. In many meteorological works tables will be found based on experiments made by Smeaton, Hutton, and others, by means of which observers are instructed to convert records of pressure into velocity, and *vice versa*. Without presuming to quote their absence from Guyot's splendid tables, as proof that this cannot safely be done, it certainly is an indication thereof, and supports the caution against the practice which we have previously recorded.\* "We desire, however, in the first place, to lodge a protest against the possibility of obtaining any *simple* rule for the conversion of velocity into pressure, and *vice versa*; because the momentum of a body varies with its density: hence, if the barometer be at, say 28 inches, the pressure of any wind will be less than if the barometer were at 30 inches, the velocity in each case being the same, since each cubic foot of air would weigh about 36 grains more then, than at 28 inches."

Moreover, the pressure plate though at a right angle to the direction of the wind in azimuth, can only be truly perpendicular to horizontal currents, but we all know full well how rarely the motion of the wind is strictly horizontal, therefore it is only rarely that the plate receives the full force to which it is entitled. There can be no doubt, however, that a pressure record is a desirable addition to any observatory, and that the results are extremely interesting. Perhaps the best proof of this is to jot down some of the places where pressure anemometers are at work, Greenwich, Lloyd's, Liverpool, Wrottesley, Wisbech, Birmingham, Osborne, occur to us immediately, also Plymouth, Edinburgh, and Inverness in former years; thus widespread has been their adoption. Until very recently the only instrument in actual use as a pressure recording anemometer, was that shown on the opposite page, and for which, by the bye, we are indebted to Messrs. Negretti and

---

\* *Meteorological Magazine*, Vol. I., p. 19.

Zambra, who on their own account, and as successors to Mr. Newman, have hitherto, we believe, had the manufacture almost exclusively in their hands.

Mr. Follet Osler is the inventor of a self-recording apparatus which registers the direction and pressure of the wind, and the amount and duration of rain, upon the same sheet of paper.

The mechanism may be modified in various ways, but the following is a description of the simplest arrangement.

The instrument, of which the engraving is a diagram rather than a picture, consists, first, of a vane, *V*, of a wedge-shape form, which is found to answer better than a flat vane; for the latter is always in a neutral line, and therefore is not sufficiently sensitive. At the lower end of the tube, *TT*, is a small pinion, working in a rack, *r*, which moves backwards and forwards as the wind presses the vane. To this rack a pencil, *x*, is attached, which marks the direction of the wind on a properly ruled paper, placed horizontally beneath, and so adjusted as to progress at the rate of half an inch per hour, by means of a simple contrivance connecting it with a good clock. The paper is shown in the illustration upon the table of the instrument.

The pressure plate, *F*, for ascertaining the force of the wind, is one foot square, placed immediately beneath, and at right angles with the vane; it is supported by light bars, running horizontally on friction rollers, and communicating with flattened springs, 1, 2, 3, so that the plate, when affected by the pressure of the wind, acts upon them, and they transfer such action to a copper chain passing down the interior of the direction tube, and over a pulley at the bottom. A light copper wire connects this chain with the spring lever, *yy*, carrying a pencil, which records the pressure upon the paper below. Mr. Osler much prefers a spring to any other means for ascertaining the force of the wind, because it is of the highest importance to have as little matter in motion as possible, otherwise the momentum acquired will cause the pressure plate to give very erroneous indications. The pressure plate is as light as is consistent with strength. It is kept before the wind by the vane, and is urged out by three or more springs, so that with light winds one only is compressed, and two, or more, according to the strength of the wind.

The rain gauge is placed on the right in the figure, *PP*, being the plane of the roof of the building. The rain funnel, *R*, exposes an area of about 200 square inches. The water collected in it is conveyed by a tube through the roof of the building into a glass vessel, *G*, so adjusted and graduated as to indicate a quarter of an inch of rain for every 200 square inches of surface—i. e., 50 cubic inches. *G* is sup-

ported by spiral springs, *b b*, which are compressed by the accumulating rain. A glass tube, open at both ends, is cemented into the bottom of *G*, and over it is placed a larger one closed at the top like a bell glass. The smaller tube thus forms the long leg of a syphon, and the larger tube acts as the short leg. The water, having risen to the level of the top of the inner tube, drops over into a little copper tilt, *t*, in the globe, *S*, beneath the reservoir. This tilt is divided into two equal partitions by a slip of copper, and placed upon an axis not exactly balanced, but so that one end or the other preponderates. The water then drops into the end of the tilt which happens to be uppermost, and when quite full it falls over, throwing the water into the globe, *S*, from which it flows away by the waste pipe. In this way an imperfect vacuum is produced in the globe, quite sufficient to produce a draught in the small tube of the syphon, or the long leg; and the whole contents of the reservoir, *G*, immediately run off, and the spiral springs, *b b*, elevate the reservoir to its original position. To produce this action, a quarter of an inch of rain must have fallen. The registration is easily understood. A spring lever, *z*, carrying a pencil, is attached by a cord, *c*, to *S*. This spring always keeps the cord tight, so that as the apparatus descends during the fall of rain, the spring advances the pencil more and more from the zero of the scale upon the paper beneath, until a quarter of an inch has fallen, when the pencil is drawn back to zero by the ascent of the reservoir.

The clock movement carries the registering paper forward by one of the wheels working into a rack attached to the frame.

The adjustment of the instrument should be carefully made at its first erection. The scale for pressure should be established experimentally, by applying weights of 2, 4, 6, &c., lbs., to move the pressure plate.

The registration trace for twenty-four hours is readily understood. The direction is recorded on the centre part; the pressure on one side, and the rain on the other. Lines parallel to the length of the paper show no rain, steady wind, and constant pressure. On the rain trace, a line parallel to the width of the paper shows that the pencil had been drawn back to zero, a quarter of an inch of rain having fallen. The hour lines are in the direction of the width of the paper.

At the International Exhibition 1862, Messrs. Negretti and Zambra exhibited an improved Osler's anemometer, having combined with it Robinson's cups, so that the pressure and velocity appear on the same sheet, on which a line an inch in length is recorded at every ten miles; thus the complete instrument shows continuously the direction, pressure, and velocity of the wind, and the amount of rain.

## METEOROLOGY AT DUNDEE.

*(Continued from page 105.)*

## RAINFALL AT ARBROATH.

Mr. GLAISHER read a communication by Mr. Alexander Brown regarding Observations of the Rainfall at Arbroath. It stated that the want of a proper supply of water for the town of Arbroath had for a considerable time been felt, and along with the recent rapid increase of the town that want had also increased. In the ten years between 1850 and 1860, four reports on the subject of a water supply for Arbroath by three civil engineers had been submitted to the inhabitants by the Town Council, and in two of these reports the question of rainfall in the town and surrounding district had been introduced. In the event of this subject again coming into notice, a table was submitted which it was considered might be of service. It embraced an abstract of Mr. Brown's rain register for a period of nearly twenty-four years from the beginning of March, 1843, to the close of 1866. It contained the amount of rainfall in every month and the total rainfall in each year. It appears that the average annual fall over twenty-four years is 27·013 inches—the highest annual fall being in 1864, 34·020 in., and the lowest in 1854, 20·818 in.; the least monthly fall, March, 1856, 0·121 in., and the greatest, October, 1864, 7·804 in. The rain gauge is 60 feet above the medium sea level, and 2 feet from the ground. The same form and size of gauge has been used throughout, and its position has never been altered. The diameter of the receiving funnel is 7·5 inches. The fall in January and February, 1843, was not observed; assuming that it was equal to the average, it would give a total annual fall for 1843 of 26·984 inches, and throwing the twenty-four years, over which the observations extend, into groups of four years each, the quantities come out as follows:—

## MEAN ANNUAL RAIN.

Average of 1843 to 1846—27·786	}	Mean Annual Rain Average of first twelve years, 26·420.
“ 1847 „ 1850—26·162		
“ 1851 „ 1854—25·311	}	Average of second twelve years 27·603.
“ 1855 „ 1858—25·598		
“ 1859 „ 1862—29·145		
“ 1863 „ 1866—28·066		

A diagram was given, from which it appeared that during the period over which the observations extend, there were three years of great rainfall, namely, 1848, 1856, and 1864, having an interval of eight years between each of greatest rainfall.

Some discussion followed, in which remarks were made on the importance of the subject of rainfall as respects agriculture, commercially, as regards water-power mills, and in a sanitary point of view, as respects our great cities and towns.

## LUMINOUS METEORS.

Mr. GLAISHER was called upon by Sir William Thomson for his report on Luminous Meteors. Last year there were such a vast number of observations, that the Committee had had the greatest difficulty in keeping the report within reasonable compass; at the Royal Observatory alone about 9000 meteors had been observed, and the observations of even that one shower would make a bulky catalogue; for these and other reasons it had been decided that the meteors noted at Greenwich should henceforward form part of the annual volume of Greenwich Observations, and therefore it would be unnecessary to print them in the British Association Report. One large meteor was observed at Cardiff, and the luminosity remained visible for about eighteen minutes. One was also seen above Dundee of extraordinary brilliance, which was ascertained to be about 51 to 57 miles above the earth. A curious detonating fire-ball was then described, which was seen in broad daylight in France and the South of England in June last. Another was seen at Glasgow, which passed over St. Andrews, where it appeared to consist of three parts, each equal to Venus, and it was calculated that this meteor passed at a distance of about fifty miles above the earth. At Aberdeen, a brilliant fire-ball was first seen last November, which it was afterwards found was seen also over the whole of Scotland, and as far south as Nottingham. A remarkable fire-ball, seen near Basle—of which there was a colored diagram on the wall—had been observed in the

Observatory at Basle and also in Paris. A large amount of information was given regarding the reports received from various localities where the meteoric shower of last November was seen—the Cape of Good Hope, and other places, which, combined, cannot fail to yield most valuable accessions to our rapidly increasing knowledge of these once mysterious visitants.

Sir WM. THOMSON then said that Professor Herschel would make a few remarks on the character and quality of the meteoric light, a subject in the investigation of which he had been singularly successful.

Professor ALEXANDER HERSCHEL, Glasgow, said that the spectroscope showed a yellow band, but of what this light was composed it was impossible to say. As, however, observers multiplied, with telescopes armed with spectroscopes, this difficulty would no doubt be resolved. The connection between comets and meteors had this year been established without doubt, and that connection gave wide scope for speculation as to the origin and character of meteoric bodies. Mr. Huggins made an observation on the light of a comet, and although that observation was not perfect, still it was sufficient to identify the light of the nucleus of the comet with that of the meteoric bodies. There were two theories as to these meteors. Le Verrier had shown that their orbit extended from that of Uranus to that of the Earth, while an Italian astronomer believed that they came from the utmost fields of space. Fifty-six showers were well established, and it was by the study of these showers that they hoped to continue, and possibly confirm and extend their researches, aided also by the assistance of those zealous observers who had hitherto been their supporters and constant assistants among the members of the Association. (Applause.)

In answer to a question from Sir Wm. Thomson,

Professor HERSCHEL said it was too bold to say that every shooting star was a comet. They were more likely the dissipated parts of comets—probably comets torn into shreds by the sun's attraction.

#### THE METEOR SHOWERS OF AUGUST, 1867.

A paper on this subject by Mr. George Forbes, was read by Professor SWAN. On its conclusion,

Sir WM. THOMSON remarked that the paper they had just heard was from a very promising young naturalist, and it must be very gratifying indeed to the members of the British Association to have a communication from a son of Principal Forbes, who had been so long connected with the British Association.

#### EVAPORATION FROM RAIN GAUGES.

This paper was by Mr. THRUSTANS, of Wolverhampton, and recounted the results of experiments with six tin cylinders, in each of which a certain quantity of water was placed. Three of these had lids with apertures of different sizes, and three others had apertures of the same diameters as those of the other three vessels, and tubes of the same size, reaching nearly to the bottom. The contents of these vessels had been measured monthly, and it appeared that the total loss was never very considerable, decreasing with the aperture, and being very materially reduced by the pipes, so that with a pipe like that in a 5-inch Howard's gauge, the loss was scarcely appreciable.

#### METEOROLOGY OF THE MAURITIUS.

Mr. MELDRUM, Director of the Mauritius Observatory, read a paper on the meteorology of that island, in which he reviewed the diurnal and annual variations of the meteorological elements as derived from daily observations taken for a period of seven years. The results were contained in forty-two tables, accompanied by diagrams. Mr. Meldrum called special attention to the fact that at Mauritius the pressure of the dry air had a double maximum and minimum, so that Dove's explanation of the double progression of the total atmospheric pressure, which had been adopted by Sabine, Herschel, and others, did not apply at that station. He (Mr. Meldrum) was aware that a similar behaviour of the dry pressure at Bombay had been ascribed to alternate land and sea breezes, but it might be doubted whether such an explanation would account for the double progression of the total pressure at Mauritius. Another point to which he called special attention was the rainfall, illustrating by a map of the island the great influence of local circumstances on the annual fall. Of late years the island had greatly suffered from drought, which was attributed to the extensive clearings which had

been going on ; and it would be gratifying to know the opinion of the Section as to the probable effect, with respect to rainfall, of cutting down trees on an extensive scale. Mr. Meldrum next referred to the hurricanes of Mauritius, and stated that no heavy gale or hurricane occurred within 1500 miles to the north-east or south-west of the island, the existence of which was not made known by the barometer and weather. In conclusion, Mr. Meldrum stated that a new observatory was to be erected and furnished with self-recording instruments, the Governor of the colony, Sir Henry Barkly, who had already done so much for science, being a warm supporter of the measure.

#### THE HURRICANES OF THE INDIAN OCEAN.

Mr. MELDRUM next read a paper on the Hurricanes of the Indian Ocean, in which he dwelt on some points of great interest and importance. After showing how these hurricanes originated between the S.E. trade wind and N.W. monsoon, how the wind in them rotated from left to right, or with the hands of a watch, how they travelled at first to S.W. and then curved to S. and S.E., Mr. Meldrum alluded to their form, showing that the wind blew spirally, and illustrated the subject by interesting quotations from the log-book of the Earl of Dalhousie, a vessel which, he believed, belonged to the port of Dundee, and which in May, 1863, had scudded round and round the centre of a revolving storm three times, at the rate of 10 to 13 knots, nearing the centre each time she went round it. As the S.E. trade wind frequently blew strongly over many degrees of longitude during a hurricane with a falling barometer, it was impossible to know the bearing of the centre when a vessel was in front of a storm, and at some distance from the centre, and Mr. Meldrum could adduce instances of great loss of life and property arising from vessels in those circumstances adopting the recommendation usually given of running to the westward or north-west. It could not also be made too widely known that a large portion, perhaps the largest, of the losses caused by hurricanes in those seas arose from the fact that homeward bound vessels took apparent advantage of increasing N.E. winds between  $10^{\circ}$  and  $16^{\circ}$  S., and, running to the south-west, got in front of the storm, in which they were often dismasted, if they did not founder ; whereas, by lying to for a few hours, or proceeding cautiously to the southward, the storm would have been avoided. Mr. Meldrum illustrated his paper by maps and charts, showing the actual positions of the vessels and the direction of the wind, and stated that the Meteorological Society of the island had collected a large mass of facts and observations bearing on the meteorology of the Indian Ocean.

Mr. BUCHAN, Secretary to the Scottish Meteorological Society, said the point to which Mr. Meldrum had referred—that of the in-moving spiral direction of the wind—was, he believed, true. Mr. Meldrum was returning soon to the Mauritius, intending to give very special attention to the whole subject of storms in the Indian Ocean, of which they practically knew little except what they had been made aware of by the Meteorological Society in Mauritius. Referring to the map which Mr. Meldrum had exhibited, and which he presumed did not represent the direction of the wind at any specific time, he remarked that the value of such a map, which was to a great extent hypothetical, was not to be compared with actual observations ; and the Association should invite Mr. Meldrum when he prosecuted the subject of storms to furnish a succession of charts, in which his actual observations were laid down, and in which they could see the real bearing of the whole question so far as actual observations, unmixed with hypotheses, would show.

Mr. MELDRUM remarked that he had brought with him a great many charts, which were open to inspection, showing the actual observations.

Mr. SYMONS spoke to the value of Mr. Meldrum's papers, and proposed that the former should be printed in extenso in the report of the Association, which was agreed to unanimously.

Sir Wm. THOMSON remarked that owing to the double nature of many of the storms in the Indian Ocean, the rule of keep your nose on the wind and the wind on your left might lead to a vessel passing from one storm right into the heart of another. These double storms were of frequent occurrence in the Indian Ocean, and it was of great importance to the security of the navigation of that sea that rules should be drawn up with special reference to the doubleness of storms. In

Mr. Meldrum's paper they had evidence of great industry and skill, and as the Mauritius was one of the most important meteorological stations, it was to be hoped not only that on his return Mr. Meldrum would continue his observations, but also that when a new meteorological observatory was established at Mauritius, there might be an electrical department in it. (Applause.)

#### NEW TELEGRAPHIC THERMOMETER.

PROFESSOR WHEATSTONE communicated a description of recent improvements in the telegraphic thermometer introduced by him in 1843; he did not state the result of actual trials, but the apparatus, divested of accessories, consists of a metallic thermometer in an air-tight box (*a*) which may be placed anywhere, on the top of Mont Blanc or at the bottom of the sea, provided only that two insular wires lead from it to a similar instrument (*b*) in any convenient position. On turning a handle attached to (*b*), the temperature at (*a*) is marked on the dial of (*b*).

#### PROPERTIES OF VAPOUR IN THE ATMOSPHERE.

PROFESSOR FOSTER then read a paper on the above, by Mr. R. Russell, F.R.S.E., in which the author, after admitting the ingenuity of Professor Tyndall's researches on heat as a mode of motion, took exception to some of his deductions on the influence which the vapour of water exerts in modifying the intensity of solar and terrestrial radiation. He, on the other hand, came to the conclusion that the radiant powers of the vapour of water in the atmosphere were not even capable of forming clouds, though they might be capable of forming mists in valleys. In our atmosphere the vapour of water had little power of transmitting its heat into space when it approaches or reaches the dew point. If any cloud had been caused by the radiation of heat into space, its upper surface would be flat, like the mists in the meadows before sunrise. These and other reasons led him to the conclusion that the radiation of vapours into space has, directly a very slight influence on the production of rain.

Sir Wm. THOMSON observed that the paper that had been read contained some very important arguments on a difficult question of meteorology. He did not doubt that the author was right in the main in maintaining that cold produced by expansion had a very small effect in causing those condensations which gave rise to torrents of rain. But he thought he had undervalued very considerably the influence of radiation in producing that minor condensation by which mists and clouds were constituted. He said minor condensation—meaning condensation from a gaseous condition into small spherical globules, so small that the resistance they met with kept them suspended. The reason why a cloud did not fall down as rain was that every part of the cloud was composed of very minute drops of water. The larger the drops were that constituted a cloud the more rapidly would they fall; but when very small they fell insensibly, as Professor Stokes had shown, only perhaps a few inches in an hour. When somewhat larger, they formed what we called a Scotch mist, which was something between a shower of globules coming down appreciably and a shower of globules in which the descent was insensible; and it appeared to him that Mr. Russell had undervalued the influence of the radiation referred to. He would not pronounce, however, at present upon the vexed question of the radiating power of transparent gaseous vapour. Professor Magnus, of Berlin, and Dr. Tyndall had been investigating that subject; and although up to this time they had not been able to agree on their conclusions, he had no doubt that two such eminent observers would yet arrive at a conclusion, and give the benefit of it to the world. (Applause.) But as to the influence of radiation and the influence of minor condensation to which he had already alluded, as soon as a cloud exists, whether high or low, each particle becomes a radiator. It radiates heat and becomes itself a little cooler than the surrounding air, and so becomes a reservoir of condensation. That takes place at the top of the cloud if there is clear air above it, and so with the mist in the valleys. The observations of Wells, the discoverer of the true theory of dew, demonstrated the accuracy of this assertion. He might now refer to Mr. Russell's remarks upon the temperature at night as influenced by the dew point. The temperature at night was found to be but little different from the dew point which might be observed in the course of the day. The true explanation of that was to be found in Well's theory of dew. A blade of grass could not go to a temperature lower than the dew point of the air touching it, and so was it

with particles of mist. Dew was most plentiful in clear calm nights, when the air was very moist, but quite transparent, and when it fell fine leaves of flowers and grass blades could not sink lower than the dew point. Dew did not form to any great degree, indeed hardly at all, when the sky was cloudy, for then the clouds afforded the protection which was not on such nights afforded by the dew. When there was no clouds, and if there was a high wind, then in that case the wind afforded the protection to the leaves and flowers which was to be obtained from neither dew nor clouds. (Applause.) But by an arrangement which they could not but regard as an admirable and wonderful exemplification of design, there was nothing destitute of protection. The protection was sometimes insufficient, and plants were killed by frost; but some degree of protection was never wanting, and there was enough of that protection always to allow plants to live, as we saw them doing, and to survive during weather when, were it not for one of these three causes, the cold would be so great as to destroy them altogether. (Applause.) Physically, it was interesting to remark how it was that in each instance the protection was obtained. There was first the protection afforded by clouds. These prevented the surface of the earth from radiating and reaching a lower temperature than that of the clouds. The temperature of a blade of grass on a cloudy evening would therefore be very nearly the temperature of the lower surface of the clouds overhead. When there were no clouds and no wind, the office of each blade of grass was to collect the air touching it, condense vapour from that air, and so take heat from part of the heat around it. Thus we had a source of heat taken from the air several feet above the surface. The protection was more complete, however, when dew did not fall, for when there was no dew the wind made up so large a portion of heat from the air that the leaves of plants were never allowed to go down even to the dew point. Thus wind was a more complete protection than dew, and it would have been observed that plants were never injured by frost on windy nights, and that in the morning the grass was found dry. (Applause.) It was sometimes remarked that flowers were frosted in hollows, but that close at hand, and on the summits of little hillocks, they escaped damage. The explanation was clear when they took into account the principles developed by Wells. The air in the hollows remained unchanged, and unless there was moisture enough in the air to provide dew as long as the severe condition of weather lasted, and to keep the dew point from going down too low, injurious effects would follow. The plants, in short, got dry, drying the air around them, and if that air was not changed very much for the better, then they were destroyed by frost. This, however, rarely happened. He agreed with Mr. Russell in what he had said regarding the value of Dr. Tyndall's work on "Heat." The scientific world were much indebted to Dr. Tyndall, not merely for his investigations, but for the manner in which he had attracted interest to the results of science, and for the beautifully clear explanations he had given of scientific principles. Scientific men were extremely dependent on the sympathy of the rest of the world, and this was very largely increased when the illustrations of scientific investigations were made known in a clear and interesting manner, as Dr. Tyndall had made them known, to a very large part of the population in this country, and throughout the civilised world. (Applause.)

## YELLOW HAZE & S.E. WIND.

*To the Editor of the Meteorological Magazine.*

SIR.—As regards your correspondent T.L.L.'s letter relative to the above, it appears to me that the explanation of the peculiar haze which accompanies (as I too have invariably observed) an easterly wind, is to be sought for in a consideration of the characters of that wind; these are—dryness, coldness, and consequent density, with but a small capacity for vapour.

The effect of its dryness—the result of its passage across land, and of its coming from intensely cold regions—is excessive evaporation. But the vapour drawn up in this way is immediately condensed, before it can reach to any height, by the extreme coldness of the air, not in the form of cloud, but as a haze of a most peculiar *bronze* hue.

And this is the more marked in Spring, because at that season the coldness of



the N.E. current is greatest, and the amount of vapour carried up by evaporation reaches a maximum, from the sun, with increasing power, acting on the land drenched by the winter's snow and rain.

With respect to the S.E. wind; in the first place, we must carefully distinguish two distinct forms of the same. The one is nothing more than a *bent polar* or N.E. current, and is accompanied by all its characteristics, namely: a *high* barometer, great cold, the usual bronze hue, dry weather, &c. The other is a deflected S.W. or *equatorial* current, and is attended with a *low* barometer, warmth, moisture, and often heavy rain.

Now the March S.E. wind is the result of an enormous expansion of air due to the commencing increase of temperature over the vast extent of Northern and Eastern Europe, and of Asia.

These easterly winds constitute the spring equinoctial gales, and are generally followed by a reactionary succession of high winds from the west, which give to April its character of "showery."

In October we meet with both forms of S.E. wind, the first, or deflected N.E., occurs as a reactionary equinoctial after the S.W. gales of September, which latter find their origin in the rapid fall of temperature towards the north and east.

This form of S.E. wind is not so often met with in October as is the second, which, again, is noticed under two aspects; first, as forming one side of a cyclone (and this is the more usual), and secondly, as a comparatively steady wind, the result of an equilibrium established by opposite currents from N.E. and S.W. holding each other in check.

If in the second case there is no intermingling of the currents, we have towards the S.W. border of the S.E. wind, the conditions mentioned by your correspondent—viz.: a singularly transparent air and large quantities of cirrus, and towards the N.E. edge of the same the haze and high barometer characteristic of N.E. wind.

Under such circumstances it is possible that air from the deserts of Africa may cross the British Isles.

Should the currents mingle, we have drenching rains with a low S.E. wind, and a high S.W. current, the latter naturally prevailing in the higher regions of the atmosphere by reason of its comparative lightness; this is the state of things during a cyclone too.

And now I would briefly refer to Dr. Moffat's most interesting papers on Ozone, abstracts of which you have kindly given in the *Meteorological Magazine*.

You may remember that in a letter written some 14 months ago, I asked for information concerning a phenomenon I had noticed—the occasional discolouration of paint by rain. In that letter I gave the conditions under which that phenomena always occurred; they were briefly—the prevalence of an under wind from S.E., an upper current from S.W., a very low barometer, and an excessive rainfall. I also suggested that this remarkable fact might be explained by the presence of a large quantity of ozone in the air at the time.

Dr. Moffat has ascertained that the equatorial current, especially when blowing over the sea, is that of most ozone. Is not this confirmatory of the ozone theory of discolouration of paint? That ozone is intimately connected with the electrical state of the air is again borne out by the fact that the equatorial current is at the same time that of maximum ozone, and also the bearer of thunderstorms; to have thunder and lightning with a pure N.E. current is a most unusual phenomenon.

I will only add that on the night of the 11th of July last, the sea off Kingston and Bray was splendidly phosphorescent, while at the same time a violent thunderstorm was raging in the immediate neighbourhood.—Yours very truly,

JOHN WILLIAM MOORE, B.A., Sch. T.C.D.

P.S.—The colour of the east wind haze was for a long time a puzzle to me, until I one day observed that the inner edge of a solar halo was of an exactly similar tint. The bronze is the representative in the halo of the orange in the rainbow. A peculiar arrangement of the vapour particles forming the haze, no doubt gives rise to its colour.

9, Trinity College, Dublin, October 22nd, 1867.

## OCTOBER, 1867.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which 31 or more fell.	TEMPERATURE.				No. of nights below 32°.
		Total Fall.	Differ- ence from average 1860-5	Greatest Fall in 24 hours.		Max.		Min.				
				Dpth	Date.			Deg.	Date.	Deg.	Date.	
		inches	inches.	in.				Deg.	Date.	Deg.	Date.	
I.	Camden Town .....	1·92	— ·68	·42	15	16	66·0	22	31·0	6		2
II.	Staplehurst (Linton Park) ...	2·65	— ·45	·77	16	16	68·0	15	29·0	5, 6		7
III.	Selborne (The Wakes).....	3·68	— ·54	·57	15	19	58·5	17	26·0	11		5
IV.	Hitchen .....	1·78	— ·77	·37	27	17	63·0	22*	30·0	4		3
V.	Banbury .....	2·94	+ ·51	·59	11	24	64·0	22	29·0	11		3
VI.	Wisbech .....	2·31	—	·51	15	20	66·6	22	30·8	6		2
VII.	Bury St. Edmunds (Culford) ..	2·48	— ·24	·44	15	17	65·0	22	27·0	4		5
VIII.	Calne .....	...	...	...	...	...	...	...	...	...		...
IX.	Plymouth (Goodamoor) .....	6·47	— ·20	...	...	...	62·0	...	28·0	...		...
X.	Barnstaple .....	7·12	+ 3·00	1·11	29	26	66·0	23	37·0	11		0
XI.	Taunton (Fulland's School) ..	3·38	— ·16	·52	10	24	...	...	37·0	26		0
XII.	Shrewsbury (Highfield) .....	2·93	+ ·05	·61	9	19	...	...	...	...		...
XIII.	Tenbury (Orleton) .....	3·20	— ·03	·62	9	28	65·4	22	32·2	20		0
XIV.	Leicester (Wigston) .....	2·29	— ·41	·41	12	16	68·0	22	27·0	4		0
XV.	West Retford .....	...	...	...	...	...	...	...	...	...		...
XVI.	Derby .....	3·30	+ ·46	·76	11	21	65·0	22	33·0	4		0
XVII.	Manchester .....	3·98	+ ·17	·75	27	22	69·5	22	30·5	4		0
XVIII.	York .....	1·41	— 1·11	·26	28	18	61·0	16	32·5	6		0
XIX.	Skipton (Arncliffe) .....	4·99	— 1·67	·60	16	24	59·0	23	32·0	9, 28		0
XX.	North Shields .....	1·07	— 2·21	·19	4	16	...	...	...	...		...
XXI.	Borrowdale (Seathwaite) .....	13·67	— 2·65	2·25	29	22	...	...	...	...		...
XXII.	Abercarn .....	5·20	...	·74	18	21	62·0	2	37·0	11		...
XXIII.	Haverfordwest .....	8·54	+ 3·35	1·09	15	23	60·5	22	37·5	3		...
XXIV.	Rhayader (Cefnfaes).....	...	...	...	...	...	...	...	...	...		...
XXV.	Llanberis (R. Victoria Hotel) ..	10·14	...	1·00	5	23	...	...	...	...		...
XXVI.	Dumfries .....	4·01	— ·91	·68	15	23	62·5	22	29·5	28		...
XXVII.	Hawick (Silverbut Hall) ...	1·39	...	·29	26	17	...	...	...	...		...
XXVIII.	Ayr (Auchendrane House) ...	5·10	+ ·15	·77	20	25	64·0	2	27·0	4		...
XXIX.	Otter House .....	10·97	+ 4·49	...	...	26	...	...	27·0	28		...
XXX.	Leven (Nookton) .....	1·99	— 1·76	·46	14	16	64·0	22	31·4	28		...
XXXI.	Stirling (Deanston) .....	4·33	— ·58	·83	26	23	65·0	22	26·0	10		...
XXXII.	Logierait .....	2·89	...	·82	26	18	...	...	...	...		...
XXXIII.	Ballater .....	2·83	...	·66	13	16	68·5	11	24·0	6		...
XXXIV.	Aberdeen .....	2·08	...	·50	14	23	61·0	22	30·9	6		...
XXXV.	Inverness (Culloden) .....	2·76	...	1·11	27	21	62·2	...	34·2	...		...
XXXVI.	Fort William .....	11·83	...	2·57	26	28	...	...	...	...		...
XXXVII.	Portree .....	9·68	— 1·10	2·45	26	25	62·5	11	31·5	5		...
XXXVIII.	Loch Broom .....	8·35	...	2·25	26	25	...	...	...	...		...
XXXIX.	Helmsdale .....	...	...	...	...	...	...	...	...	...		...
XL.	Sandwick .....	6·66	+ 1·74	1·18	26	28	57·0	24	35·1	4		...
XLI.	Cork .....	4·66	...	·57	16	27	...	...	...	...		...
XLII.	Waterford .....	3·88	— ·52	·73	23	24	64·0	10†	37·0	4		...
XLIII.	Killaloe .....	7·63	+ 2·61	1·39	22	26	63·0	12	32·0	28		...
XLIV.	Portarlinton .....	3·51	— 1·62	·60	24	28	60·5	23	34·0	28		...
XLV.	Monkstown .....	2·50	— 1·42	·37	9	20	67·0	22	33·5	4		...
XLVI.	Galway .....	5·29	...	·57	27	28	62·0	2	34·0	14		...
XLVII.	Bunninadden (Doo Castle) ...	7·27	...	·80	13‡	25	59·0	11‡	31·0	26		...
XLVIII.	Bawnboy (Owendoon) .....	6·28	...	·76	13	28	65·0	11‡	31·0	3		...
XLIX.	Waringstown .....	4·15	...	·53	9	25	66·0	22	31·0	27		...
L.	Strabane (Leckpatrick) .....	7·96	...	·97	26	25	66·0	12	30·0	25		...

\* And 24th. † And 12th. ‡ And 22nd.

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

## OCTOBER, 1867.

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 1860-5	Greatest Fall in 24 hours.		Days on which 01 or more fell.	Max.		Min.			
				Dpth.	Date.		Deg.	Date.	Deg.	Date.		
I.	Camden Town .....	1·92	— ·68	·42	15	16	66·0	22	31·0	6	2	
II.	Staplehurst (Linton Park) .....	2·65	— ·45	·77	16	16	68·0	15	29·0	5, 6	7	
III.	Selborne (The Wakes) .....	3·68	— ·54	·57	15	19	58·5	17	26·0	11	5	
III.	Hitchin .....	1·78	— ·77	·37	27	17	63·0	22*	30·0	4	3	
"	Banbury .....	2·94	+ ·51	·59	11	24	64·0	22	29·0	11	3	
"	Wisbech .....	2·31	—	·51	15	20	66·6	22	30·8	6	3	
IV.	Bury St. Edmunds (Culford). ..	2·48	— ·24	·44	15	17	65·0	22	27·0	4	5	
V.	Calne .....	...	...	...	...	...	...	...	...	...	...	
V.	Plymouth (Goodamoor) .....	6·47	— ·20	...	...	...	62·0	...	28·0	...	...	
"	Barnstaple .....	7·12	+ 3·00	1·11	29	26	66·0	23	37·0	11	0	
"	Taunton (Fulland's School) .....	3·38	— ·16	·52	10	24	...	...	37·0	26	0	
VI.	Shrewsbury (Highfield) .....	2·93	+ ·05	·61	9	19	...	...	...	...	...	
VI.	Tenbury (Orleton) .....	3·20	— ·03	·62	9	28	65·4	22	32·2	20	0	
VII.	Leicester (Wigston) .....	2·29	— ·41	·41	12	16	68·0	22	27·0	4	6	
"	West Retford .....	...	...	...	...	...	...	...	...	...	...	
"	Derby .....	3·30	+ ·46	·76	11	21	65·0	22	33·0	4	0	
VIII.	Manchester .....	3·98	+ ·17	·75	27	22	69·5	22	30·5	4	4	
IX.	York .....	1·41	— 1·11	·26	28	18	61·0	16	32·5	6	0	
IX.	Skipton (Arncliffe) .....	4·99	— 1·67	·60	16	24	59·0	23	32·0	9, 28	0	
X.	North Shields .....	1·07	— 2·21	·19	4	16	...	...	...	...	0	
X.	Borrowdale (Seathwaite) .....	13·67	— 2·65	2·25	29	22	...	...	...	...	...	
XI.	Abercarn .....	5·20	—	·74	18	21	62·0	2	37·0	11	0	
XI.	Haverfordwest .....	8·54	+ 3·35	1·09	15	23	60·5	22	37·5	3	0	
"	Rhayader (Cefnfaes) .....	...	...	...	...	...	...	...	...	...	...	
"	Llanberis (R. Victoria Hotel) ..	10·14	...	1·00	5	23	...	...	...	...	...	
XII.	Dumfries .....	4·01	— ·91	·68	15	23	62·5	22	29·5	28	5	
"	Hawick (Silverbut Hall) .....	1·39	...	·29	26	17	...	...	...	...	7	
XIV.	Ayr (Anchendrane House) .....	5·10	+ ·15	·77	20	25	64·0	2	27·0	4	4	
XV.	Otter House .....	10·97	+ 4·49	...	...	26	...	...	27·0	28	2	
XVI.	Leven (Nookton) .....	1·99	— 1·76	·46	14	16	64·0	22	31·4	28	3	
"	Stirling (Deanston) .....	4·33	— ·58	·83	26	23	65·0	22	26·0	10	6	
"	Logierait .....	2·89	...	·82	26	18	...	...	...	...	...	
XVII.	Ballater .....	2·83	...	·66	13	16	68·5	11	24·0	6	8	
"	Aberdeen .....	2·08	...	·50	14	23	61·0	22	30·9	6	1	
XVII.	Inverness (Culloden) .....	2·76	...	1·11	27	21	62·2	...	34·2	...	0	
"	Fort William .....	11·83	...	2·57	26	28	...	...	...	...	...	
"	Portree .....	9·68	— 1·10	2·45	26	25	62·5	11	31·5	5	1	
"	Loch Broom .....	8·35	...	2·25	26	25	...	...	...	...	...	
XIX.	Helmsdale .....	...	...	...	...	...	...	...	...	...	...	
"	Sandwick .....	6·66	+ 1·74	1·18	26	28	57·0	24	35·1	4	0	
XX.	Cork .....	4·66	...	·57	16	27	...	...	...	...	...	
"	Waterford .....	3·88	— ·52	·73	23	24	64·0	10†	37·0	4	0	
"	Killaloe .....	7·63	+ 2·61	1·39	22	26	63·0	12	32·0	28	0	
XXI.	Portarlinton .....	3·51	— 1·62	·60	24	28	60·5	23	34·0	28	0	
"	Monkstown .....	2·50	— 1·42	·37	9	20	67·0	22	33·5	4	0	
XXII.	Galway .....	5·29	...	·57	27	28	62·0	2	34·0	14	0	
"	Bunninadden (Doo Castle) .....	7·27	...	·80	13‡	25	59·0	11‡	31·0	26	1	
XXIII.	Bawnboy (Owendoon) .....	6·28	...	·76	13	23	65·0	11‡	31·0	3	1	
"	Warningtown .....	4·15	...	·53	9	25	66·0	22	31·0	27	1	
"	Strabane (Leckpatrick) .....	7·96	...	·97	26	25	66·0	12	30·0	25	1	

\* And 24th. † And 12th. ‡ And 22nd.

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

# METEOROLOGICAL NOTES ON THE MONTH.

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 TOWN.—Gale with H and heavy R at 1.10 p.m. on 27th.

LINTON PARK.—First ten days cold, with several frosty mornings; T and heavy R on night of 15th. Very dry, mild and fine from 19th to 26th; the last few days moist but mild. Wind mostly S. and W. High wind and heavy R on afternoon of 27th.

SELBORNE.—TS from S. at 6 p.m. on 3rd; TS also on 9th, and at 3 p.m. on 18th; H storm at 12.30 p.m. 8th; distant T at 4 p.m. 14th; dense fog on 25th.

HITCHIN.—Tremendous R on 27th [for a short time], almost like a water-spout.

BANBURY.—H and R on 3rd and 27th.

WISBECH.—Aurora at 11 p.m. on the 2nd. Early part of month cold; from 21st mild and humid. The late swallows departed on the 19th. Solar halo on 9th; fog on 12th and 24th; gale on 27th. Lime trees divested of leaves on 23rd.

TAUNTON.—H storm on 3rd.

ORLETON.—S on the hills on 5th. Month generally cloudy and damp, with frequent fogs and small R almost daily. The beginning of the month very cold; afterwards changeable, but generally warm; great wind on 27th; distant TS at night on 17th, and T on 19th. Temp. nearly 1°·5 below the average; H storm at 10 a.m. 3rd; heavy R and H for twenty minutes at 9 a.m. 27th.

MANCHESTER.—T and L on 7th; H and heavy R on 27th.

ARNcliffe.—Wild, with gale of wind on 2nd; R frequent, though not heavy.

NORTH SHIELDS.—S on 4th and 5th; aurora on 2nd, 3rd, and 8th.

## WALES.

ABERCARN.—A wet month, generally cold, but some close days. Boisterous on 21st and 27th. H shower on 4th.

HAVERFORDWEST.—The first ten days cold, wet and stormy, with heavy H storms, and wind N.N.W.; remainder of month wet; at times very close atmosphere. The wettest October of which I have any record during the last 20 years; only three fine days during the month. Prevailing wind S.W.

## SCOTLAND.

DUMFRIES.—The beginning of the month fine, with some frost. From the 11th to close of month R every day but two. Harvest concluded in higher districts the first week in the month. The potatoe crop in some cases much diseased, in others but little; on the whole the crop is above the average, though the tubers are small.

HAWICK.—A hurricane from the West on the 1st, 2nd, 26th, and 27th; during that of the 26th many trees were torn up. Frost on seven nights at the commencement. Swallows last seen on the 5th; last dish of peas on 26th; cereal crops all safely housed by the middle of the month; turnips looking well. The month on the whole has been dry and mild. H on 4th.

AUCHENDRANE.—Harvesting has been a difficult operation, and the late crops have been damaged, as the weather, even when not raining, has been calm, cloudy, and damp.

OTTER HOUSE.—A rainy month. Crops secured, but much damaged; potatoe disease prevalent, half of them being useless.

NOOKTON.—A fine month; stormy from 12th to 17th, and on 22nd and 26th.

DEANSTON.—Gale from W. on 2nd and 27th, with heavy R. Month generally damp, but good weather during daylight for some part of the month. Leaves fell rapidly towards the end of the month.

LOGIERAIT.—The commencement of the month very favourable, concluding the finest harvest weather experienced for many years. The first S of the season seen on the hill tops on the morning of the 3rd. Severe frost on the night of the 24th. Heavy R, with a severe gale, on the night of the 26th and morning of the 27th.

BALLATER.—Lunar rainbow on 14th; meteor at midnight on 23rd. The weather at the beginning of the month was very stormy, and an unexpected fall

of an inch of  $\S$  occurred on the 4th, but disappeared in the course of the day. Severe frost on the 6th. A remarkable improvement took place in the second week, the temp. on the 11th being  $68^{\circ}5$ . The remainder of the month continued favourable for harvest, and by the end of the month the crops were secured in good condition.

ABERDEEN.—Auroræ on nine nights. Bar., temp., and R below the average; wind force rather above it. The first part of the month was very cold. T  $\S$  with H on morning of 3rd; L on 18th. Bar. 28·885 on 27th.

ROSSE PARSONAGE, FORT WILLIAM.— $\S$  on Ben. Nevis on the 1st, on the lower hills on the following day, and again on 7th. A wet and boisterous month; it began with  $\S$  on the hills and went on with wind and R to the end of the month, there being only three days on which R was *not* registered; the total fall was 11·83, as compared with 6·85 in 1866, and 2·80 in 1865. On Saturday the 26th, a fall of 2·57 was registered, by far the heaviest fall in 24 hours since observations have been taken here, it is said to have been the wettest day known here for 30 years; since the 15th of August only nine days have been without R.

PORTREE.—This month has been wet, stormy, and cold, and not (as usual) favourable for the Highlandman's harvest, on the contrary the greater part of the crops are still unsecured, but the weather being so cold there is no second growth in the stooks; the potatoes are not so plentiful as was at one time expected, they are small in size, not so rich as usual, and a good deal diseased. Fine lunar rainbow on the 11th; first fall of  $\S$  on the 3rd, and frequent H ever since; heavy gale on 1st from W.

LOCHBROOM.—The farmers here have had a trying year—a bad spring, late harvest, and October with only six fine days. Very wild and stormy at the beginning and end of the month. T  $\S$  on 31st.

SANDWICK.—October has been a cold and wet month, indeed the wettest on record except two; high wind on the first 3 and last 5 days; hills white with  $\S$  on 8th and 28th; auroræ on four nights, but particularly brilliant on the 18th at 10 p.m. Gale 50 miles an hour on the 2nd. H on 2nd, 3rd, and 4th. Solar halo on 16th.

#### I R E L A N D.

KILLALOE.—The greatest rainfall in October in 22 years, the other heavy falls being 6·85 in 1846, 7·61 in 1862, and 6·22 in 1863.

MONKSTOWN.—Remarkable variations of temperature; from 3rd to 10th bitterly cold, milder to 22nd, which was very close and heavy; this was followed by heavy gales on 27th at 3 a.m., and 28th at 10 p.m.

DOO CASTLE.—An exceedingly wet rough month; low-lying lands much flooded; hay and oats not harvested before the beginning of the month now present a sad spectacle. The night of Saturday the 26th was tempestuous in the extreme, with showers of H, H also fell on 3rd.

OWENDOON.—More R has fallen than in any month since January, 1866. The 26th was very wet and squally.

WARINGTOWN.—The whole month was showery, and very unfavourable to farming operations; there was scarce any evaporation, and the ground became so wet as entirely to put a stop to the preparing for and sowing of wheat. Heavy gale on the night of the 26th.

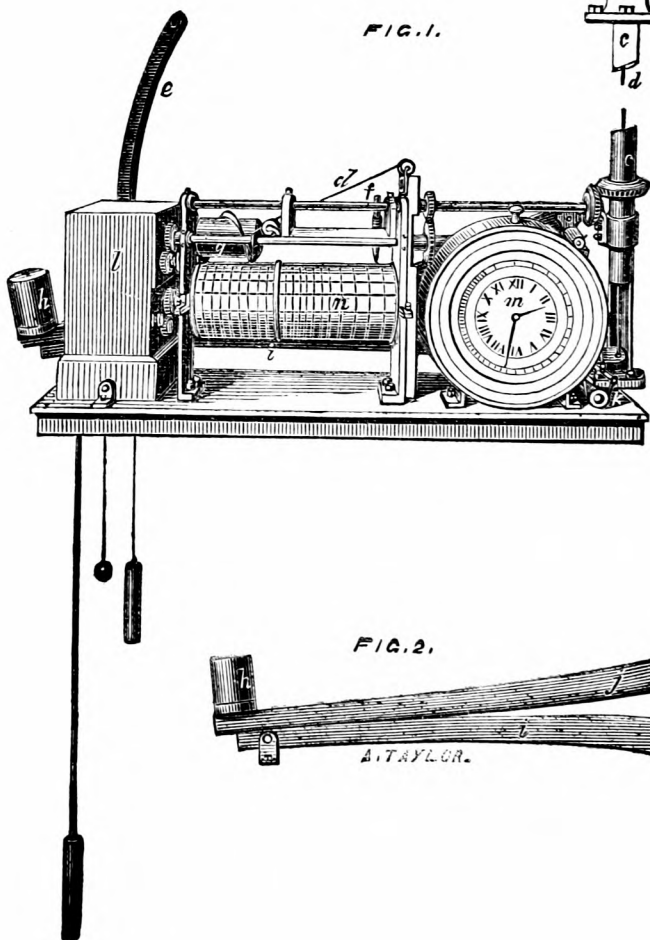
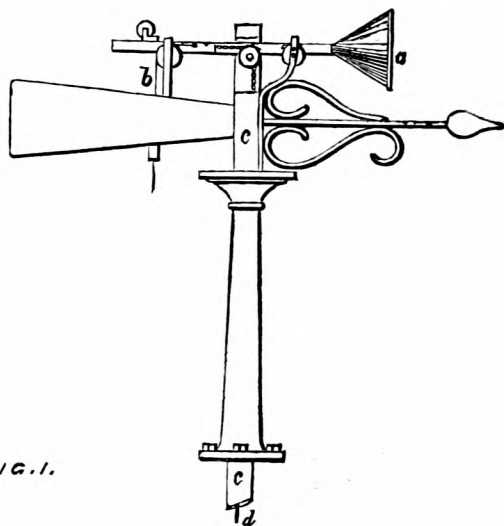
---

#### LATEST INTELLIGENCE.

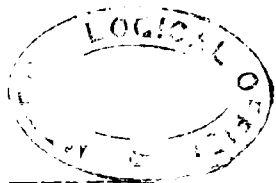
*Meteor Shower of November 14th.*—We have only time to state, that from 2.30 to 8 a.m., the sky was so obscured by mist and cloud that even the moon was quite invisible at Camden Town.



# CATOR'S LEVER ANEMOMETER.



# SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.



XXIII.]

DECEMBER, 1867.

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

## ANEMOMETERS.

*(Continued from page 113.)*

OUR survey of pressure anemometers will terminate with the latest, and in some respects the best—Cator's Lever Anemometer—which will be readily understood from the following description.

The outline sketch (Fig. 1) shows the only portions of the instrument exposed to the weather to consist of, a stout hollow pillar, containing a tube (*c*), which is attached to the vane and conveys its motion to the recording apparatus below ; above the vane a horizontal bar will be noticed, terminating at one end in a cone, whereof the base (*a*) has an area of one square foot, and which is kept constantly face to wind by the vane ; this plate receives the full force of the wind, and by it is driven towards (*b*), but in so doing it draws up the chain, which (part of *c* being cut away) is seen passing inside it, and continuing its downward course at (*d*). A string (*b*) will be noticed passing over a pulley at the back, and dropping through a pipe in the middle of the vane ; this is arranged for affording extreme facility for testing at any time the accuracy and sensibility of the instrument, since it is only necessary to attach various weights to the string (*b*) accurately to imitate force acting on (*a*) ; and it is obvious that 3 lbs. attached to (*b*) should be so recorded on the register below.

We will now, referring to the shaded sketch, fig. 1, consider the arrangements indoors ; these consist of three parts :—the clock (*l*), the sole duty of which is to turn the paper-covered cylinder (*n*) on its axis once in 24 hours. There is the tube (*c*), which as already explained revolves with the vane, and therefore conveys the direction of the wind through the mitred wheels at its base, and one or two cogs, to the drum (*g*), round which a single spiral will be noticed, which is formed of brass and presses gently upon the prepared recording paper (*n*). Therefore every variation in the direction of the wind causes a different part of the spiral to press upon the paper, and as the cylinder (*n*) is continually revolving, the exact time and nature of every change is infallibly recorded.

The special recommendation of this instrument is its record of pressure, which is obtained in the following manner :—It has been



explained that the force of the wind pressing on (*a*) drives it back, and in so doing raises the thin wire (*d*), this brings into play the double levers (*i, j*), shown also separately in fig. 2, the upper lever (*j*), when raised, passing between two guiders (*e*), the special recommendation of these levers being that, owing to their peculiar curvature, the point of contact travels farther and farther from the weight (*h*), the greater the pressure exerted; by this means great sensibility is obtained in light winds, and yet strong ones are recorded accurately and compactly.

Having thus shown how the force is counterpoised, it remains to explain that it is made to record itself by two cords fastened to the end of the lower lever (*i*), near the lower extremity of the wire (*d*)—one of which passes behind the clock (*m*), over two pulleys, and draws the recording pencil (*f*) more or less away from the edge of the paper, according to the amount of the pressure at each instant; the other string passes under the pulley (*k*) and into the clock (*m*)—called the gaining clock—to the regulator of which it is attached. This is a clock of superior quality, arranged to go exactly 24 hours in 24 hours *if the regulator is at zero*, but the string only allows it to be there in a perfect calm, and at all other times it is pulled more or less towards 'fast'; therefore, this clock always gains more or less, and the amount of gain is a direct measure of the mean force. This clock is figured in the usual manner, but of course is *not* an indicator of time. By repeated and varied experiment the exact gain corresponding to various *constant* pressures was determined, and therefrom an outer scale marked on the clock face, which gives therefore by simple inspection the exact mean force of each 24 hours—an element never before truly determined.

The advantages of the instrument are very fairly summed up by the inventor in the *Proceedings of the Meteorological Society*; we therefore quote the paragraph in its entirety:—

*Advantages.*—It remains to consider the peculiar advantages of this instrument. The *advantages* which this instrument has over other anemometers *in general* now in use, are the combination of pressure and velocity, the wind acting on *one* surface only; and over other *pressure*-anemometers, that the only parts out-of-doors and exposed to the weather are the pressure-plate and vane, all the rest of the instrument comprising all the working apparatus, and the levers, which are the resistance to the force of the wind, being inside the building, and protected from the weather; whereas the springs which are the resistance to the force of the wind in other pressure-instruments are out-of-doors behind the pressure-plate, and therefore very much exposed to the action of the weather, liable to rust, &c.; now a lever is preferable to springs for this purpose in *any* position, because springs cannot keep their original strength for ever, but must get weaker from age and constant use, and besides are liable to be too stiff from rust and accumulated dust and dirt; and springs indoors are preferable to springs out-of-doors, therefore, *a fortiori*, a lever indoors is preferable to springs out-of-doors. We now come to one of the peculiar features of this instrument, in that, while it is capable of the greatest susceptibility, it also exhibits, without being impaired, the greatest pressure of wind that has yet been brought to bear upon it. A pressure of wind of

only  $\frac{1}{16}$ th of a pound will cause the pencil to move through an appreciable space (*i.e.* about  $\frac{1}{16}$ th of an inch), while at the same time the instrument will bear a pressure of even 56 lbs. or more if required, and the pencil will show it, the whole scale being comprised in a space of  $5\frac{1}{2}$  inches; a large portion of the scale being devoted to the lower pressures, *i.e.* about 1 inch to the first 2 lbs., which allows space enough for small fractions of a pound to be measured, and the spaces gradually diminishing for each pound as the numbers rise, where indications of integral pounds only are wanted, and fractions not required; whereas springs, which are strong enough to bear a pressure of 20 or 30 lbs., will not show any pressures generally under  $\frac{1}{2}$  lb. In some instruments the spaces allotted throughout the scale are nearly equal for high and low numbers, which makes it impossible to record the small pressures, even if the instrument were sensitive enough otherwise to indicate it. Again, strong gusts of wind will be plainly indicated by this and other pressure-instruments, but are hardly discernible in the velocity-curve of a cup anemometer. Again, a pressure-plate, with a conical back to it, is preferable to one without it, as it will be more easily moved through the air with a very slight pressure of wind, as being pointed, it will cut through the air more easily than the ordinary plate, which, having a flat surface, must take a greater pressure to do so; and the consequence is that in very light pressures the ordinary plate will either not be moved at all, or will not be pushed through far enough, and therefore the pencil will show either no pressure at all or too small a pressure. And when we come to strong winds, a plate with a conical back to it is not subject (or at any rate it is much less subject) to the errors arising from, and false results given by, a partial vacuum being created behind the plate by gusts, which would be so in the case of a plate without a conical back; for when a strong gust comes, a partial vacuum is created behind the plate, and the consequence is that the plate is pushed through too far, and therefore too great a pressure is shown by the pencil. The error arising from this must, it should seem, be considerable. Again, the "gaining-clock," independently of the velocity, is designed to show the *exact* mean pressure, or the mean of an *infinite* number of observations, instead of only an *adopted* mean pressure, or the mean of twenty-four or any other certain or *finite* number of observations, as in other pressure-anemometers. In addition to the above advantages, the combination in this instrument of pressure and velocity dispenses with the necessity of using, at the time of making observations, a book of tables for their conversion; for the "gaining-clock" itself gives the results of the calculations which would have to be made for converting pressure into velocity.

We have only to add, that the instrument was tried at the Royal Observatory, Greenwich, with the most satisfactory results, and that the one represented in the engraving is now working most admirably at Mr. Cator's residence, at Beckenham. The instrument is made by Mr. Adie, but we have no exact knowledge as to cost

---

### THE TORTOLA CYCLONE OF OCTOBER 29TH, 1867.

Not having any correspondent in the district which has lately suffered so severely, we have been obliged, in preparing the following short narrative, to rely upon a series of extracts from the daily and weekly journals. We have, of course, no information as to the quality of the barometers of which the readings have been forwarded, but they appear to have been good, as the indications are very accordant, excepting only the barometer on shore at Tortola, which evidently has the common fault of insufficient cistern space, whereby it ceases to act just when it is most important that it should be correct. Another difficulty is that arising from the effect of the phenomena on those who are in their midst. In the present case there is a singular illustration

of the mental effect of such catastrophes, in that several writers have spoken of so many hours, quarter hours, &c., as to amount in the aggregate to nearly double the real duration of the hurricane even as given by themselves. We all know how "minutes seem like hours" under certain circumstances, and it is no wonder that errors of this kind have occurred. It is deeply to be regretted that there was neither observatory nor anemometer at either of the isles; known as they are to lie in the stereotyped track of West India hurricanes, it seems strange no instruments have ever been provided. However, if they had, they might have shared the fate of the instruments at Calcutta, in the storm of October, 1864, when the native in charge became possessed of the idea that the world was coming to an end, and therefore, that it was superfluous to take any more observations.

We propose to epitomize the history of the storm at Tortola, and at St. Thomas, and to conclude with a few general remarks.

#### TORTOLA.

"Tortola was submerged for eight hours. All living things perished." So said the telegram, but happily it was an outrageous exaggeration. The meteorological details from Tortola are very meagre, and the only shore observations evidently worthless, since the barometer only fell to 29 inches, while two others in the neighbourhood were below 28 inches, and a third in the harbour 28.10 in. The wind freshened from N. by W. soon after 9 a.m. on 29th, at which time the barometer was nearly 30.0 inches. By noon it had fallen to 28.70, and the wind was blowing a hurricane from N. by W. At 12.30 it had fallen to 28.10, and the wind fell calm. In twenty minutes the wind rose again from S. by E., and blew very hard—the barometer rising all the time. At 3 p.m. the wind moderated, and by 5 p.m. the barometer had risen to 29.45. There was very heavy thunder throughout, and intense darkness. In less than three hours, two-thirds of the houses, including the Governor's, Doctor's, and Clergyman's, the gaol, church, hospital, &c., and all the crops, were destroyed.

#### ST. THOMAS.

The season had been wet and very sickly. Seven inches of rain fell at Barbadoes on the night of October 7th, and 5.00 on another night. At St. Thomas there was a fresh wind on the evening of the 28th, and it increased till 1 a.m. on 29th, when it fell calm, remaining so until about 6 a.m. of 29th, when it blew in puffs accompanied by rain. This continued till 9.30 a.m., when it blew very strong. The hurricane began at noon from N.W. A lull of thirteen minutes' duration occurred about 1.30 p.m., then the wind chopped round to S.E., blowing even harder than it had previously done from N.W., and by 3.45 p.m. it passed away, though the sea continued high, and it rained heavily until the morning of the 30th.

The barometer at St. Thomas was about 30 inches until noon, and fell rapidly until about 2.30 p.m., when it was only 27.9. It will therefore be seen, that the minimum reading occurred *after* the centre of the storm had passed. Several shocks of earthquake were felt, and

the atmosphere was so strongly electrical, that the ships' compasses were useless.

### MEASURES OF WIND FORCE.

This element is far too easily supplied. Disasters which in the West Indies are spoken of as unparalleled, and which even English liberality cannot repair, are but too abundant. Harbours strewn with wrecks, houses unroofed, sheds carried away, these are common results—but happily it is rare to find in a lane “tons of broken wood, an anchor. several cart wheels, a pianoforte and slabs of marble, which, when the storm was at its height, had been seen whirling round in the air like sheets of paper;” yet stranger is it to read, that the “dining room of the house belonging to the Royal Mail Company’s superintendent was hurled into a neighbouring garden, where it was discovered with the furniture, lamps, and decanters uninjured.”

### PROBABLE TRACK OF THE STORM.

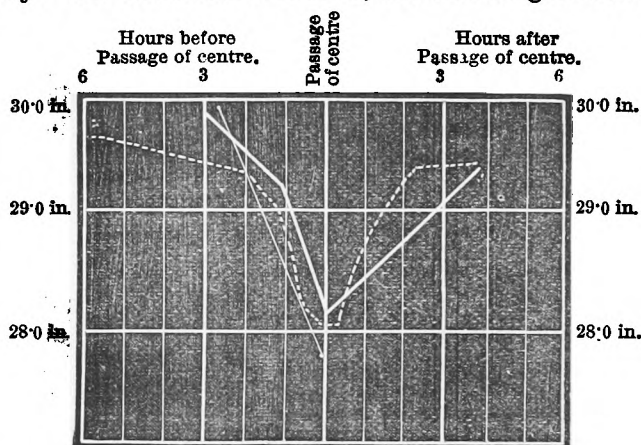
Up to the date of writing, we have only heard of the storm at Anguila, the Virgin Isles, Calebra, and Porto Rico. It did not reach St. Croix, 25 miles South of St. Thomas. When last heard of, it was “going direct for Turk’s Island and the Bahamas.” But another account says that it did much damage at St. Domingo. There is evidence in support of both statements; for the former, in that the mean axial path of hurricanes passing over the Virgin Isles is about W. 25° N, which would take the storm “direct to Turk’s Island.” On the other hand, the entire escape of St. Croix, and the directions of the wind as recorded at Tortola and St. Thomas’, indicate a W.S.W. path rather than the usual W.N.W., and then St. Domingo would suffer.

Collating eleven hurricanes in N. lat 10° to 20°, and W. lon. 60° to 70°, we find that their paths were mostly from E.S.E. to W.N.W., and that the centres of five passed over St. Thomas, four were at a mean distance of 3° S.W. of the island, and two passed about 1½ N.E. of it, thus showing how completely St. Thomas lies in the storm path of the West Atlantic.

### SINGULAR PARALLELISM BETWEEN THE DAMAGE AT ST. THOMAS AND TORTOLA, IN 1837 AND 1867.

“At Tortola the town was destroyed; at St. Thomas the hurricane of August 2nd concentrated all its fury, the state of the harbour and town baffles description. The harbour is so choked with wrecks and sunken vessels, that it is difficult to pick out a berth for a ship to anchor. Some houses were turned regularly bottom up. One large well-built house was carried by the force of the wind from off its foundation, and now stands upright in the middle of the street. In the midst of the hurricane shocks of earthquake were felt. Calm period lasted ten minutes. Every vessel but two, wrecked or ashore. No barometer observations at Tortola or St. Thomas, but at Porto Rico, it began to fall slightly at 4 p.m., at 8 p.m. was 29·6, at 9 p.m. 29·5, 10 p.m. 29·4, 11 p.m. 29·3, midnight 28·0, then turned to rise, and at 4 a.m. next morning was 29·5.”—*Col. Reid’s Law of Storms.*

The foregoing is an abstract of the log of H. M. Packet, *Spey*, giving an account of the effects of the cyclone of August, 1837, which so closely agrees with the present disasters, that it would describe *them* better than any single account yet published. An equally remarkable agreement exists between the barometer depressions, in 1837, at St. Thomas', as given by Piddington, and the readings (correcting an obvious error) transmitted in 1867. The following diagram shows this very clearly. The dotted curve is 1837, from Piddington's Horn Book.



The thick curve from ship observations at Tortola in 1867, and the single faint line shows the fall recorded at St. Thomas in 1867. In each it will be seen the barometer was previously at about 29.8 or 30.0, that it began to fall more than 0.10 per hour, some three hours before the height of the storm, and that during the two hours immediately before the passage of the centre, the fall was at the rate of *three quarters of an inch per hour*; and lastly, all the readings concur in giving the minimum as between 27.9 and 28.1 inches.

It will be noticed that in both 1837 and in 1867, shocks of earthquake are mentioned. We need hardly point out that when the wind force is so furious, it must be very difficult to distinguish between vibrations resulting from it, and from subterranean disturbances. We may notice, moreover, that the West Indian Isles are mostly volcanic, and reference to Mallet's Seismographic Map of the World (British Association Report, 1858) confirms the commonly received opinion that earthquakes are of especial frequency in these islands. In fact another occurred within three weeks after—on 19th of November. A writer in the *Standard* has renewed the suggestion that real earthquakes may be caused by the extremely sudden removal of the consolidating atmospheric pressure—say 2 inches in three hours, which is more than 1,500,000 tons per square mile. We doubt this altogether, and think a slight consideration will render its absurdity obvious.

The specific gravity of mercury is 13.5; that of the surface of the earth may be taken at 2.1; therefore a fall of 2 inches in the barometer equals a removal of a layer of earth 13 inches thick. If such a removal is sufficient to cause a disturbance of the earth's crust, one would

think that there must be great danger at St. Thomas in sinking wells, lest instead of drawing water, they tap a volcano, and draw up melted lava.

---

*Postscript, December 12th.*—In the *Times* of the 10th is a letter from Mr. R. H. Twigg, at present engaged in erecting a lighthouse on the Island of Sombrero, of which the following is an epitome :—

“The hurricane began gently from N.E. about 1 a.m. 29th, and at 5 a.m. it blew hard from N.W., and the barometer had fallen half an inch; by 8 a.m. it had fallen to 28·65 in. (a decrease of  $1\frac{1}{2}$  inches), and the wind veered to N., increasing in force. From 8 to 9 the storm greatly increased, and a large portion of the wooden buildings were carried away. Then there was a lull for half an hour. The barometer by 9 o'clock read 29·95 [*? Ed.*], but the storm continued with even greater than its previous violence from E. till 11 a.m., when it abated sufficiently to allow a few persons to venture out. After that the wind went round to S.E. for about two hours longer. The anemometer had three of its arms broken, and the other twisted.”

In the *Express* of the 11th is the following abstract of the account sent home by “the scientific authorities” at St. Thomas :—

“At 6 a.m. on the 29th the weather was squally, but the aneroid was at its usual height, viz., 29·95. Soon afterwards the barometer fell slightly, the wind freshened into squalls from the N., and much rain fell. At 9 the barometer was at 29·84. It continued to fall after this, and the wind veered to the east. At 10 the aneroid was at 29·80, and it then began to alter rapidly; in fact, the hand could be observed moving. Precisely at noon the wind increased to a hurricane, blowing steadily from N.N.W.  $\frac{1}{2}$  W., and the aneroid was at 27·95 deg., indicating a fall of two inches of the mercurial column in six hours. At 12·15 there was a dead calm, which lasted 25 minutes. At 12·40 it was pitch dark, and there was a rush of wind from S.S.E.  $\frac{1}{2}$  E. After 1 p.m. the barometer rose, and at 1·30 the weather improved. At 2 the barometer rose rapidly, the wind continuing steady at S.S.E.  $\frac{1}{2}$  E. A remarkable peculiarity of the cyclone was that it commenced blowing from an opposite point of the compass from ordinary West India cyclones.

These confirm the views above expressed, and accord with the narratives from other places. We may, therefore, say that so far as present information enables us to judge, the disasters were produced by a true cyclone, revolving in the usual manner (against watch hands), and travelling in a more southerly direction than is usual in the district whence alone we have yet heard of it.

---

#### THE METEOR SHOWER OF NOVEMBER 14TH, 1867.

WE regret to state that our own report of the total eclipse of the meteors, applies to all parts of the British Isles of which we have yet heard, with three exceptions—Greenwich, the North Foreland, and Aberdeen. At Greenwich ten were seen through breaks in the clouds between 5 and 7·30 a.m. At the North Foreland several meteors were seen about 6 a.m.; and at Aberdeen there were a few breaks in the clouds between 5 and 6 a.m., and ten meteors were seen, one of which was so bright as to be visible through a thin cloud.

From Paris, the reports are contradictory. *Galignani* says:—"Between 1 and 3 in the morning the number of aerolites was so great that they could not be counted." On the other hand, the Observatory authorities have not published any observations, and we have been told that "the Paris correspondent of the *Daily Telegraph* reported that he had looked out at all sorts of unearthly hours, seen nothing, and got a cold for his pains." Another *on dit* is, that a party went up from Paris in a balloon (to be nearer the meteors?) but came down crest-fallen, having seen nothing!

At Toronto, Mr. Kingston reports:—"Overcast until 1 a.m. 14th, after which in consecutive hours until 6 a.m. the numbers were—44, 123, 560, 1345, 195—total, 2267—many of which were very bright; maximum frequency at 4.10 a.m., the rate being 2500 per hour."

At New York, most frequent at 4 a.m., at the rate of 1500 per hour.

At Washington Observatory, the display is said to have been the most brilliant in that country since 1833. Maximum frequency at 4 25 a.m., the rate being nearly 6000 per hour. Many of the meteors were remarkable for their brilliancy, and for having a brilliant greenish train, which usually vanished in a few seconds, but in one or two cases lasted several minutes.

### THREE STRANGE STORIES.

**FALL OF AN AEROLITE.**—On Monday afternoon, the attention of the inhabitants was suddenly drawn seaward by what sounded like a signal gun. Those persons who happened to be upon the parades were startled by perceiving an aerolite descend into the sea at some distance. Thunder was subsequently heard, and evidences of strong atmospherical disturbance were plentiful.—*Margate, October 14th, 1867.*

**SHOWER OF SULPHUR.**—The inhabitants of the village of Thames Ditton, Surrey, were, on Friday night, October 18th, 1867, a good deal startled at witnessing a very strange phenomenon, which had the appearance of a shower of fire. The shower lasted about ten minutes, and during its continuance afforded a brilliant light. Next morning it was found that the waterbutts and puddles in the upper part of the village were thickly covered with a deposit of sulphur. Some of the water has been preserved in bottles.

**AN EXTRAORDINARY PHENOMENON.**—(*To the Editor of the Chatham News.*)—SIR,—On the afternoon of Monday the 4th, between the hours of three and four, I witnessed a very extraordinary sight in the heavens. I have not heard of any one hereabout having seen it. The facts are as follow:—At the time above mentioned I was passing the Mill by the Water-works Reservoir. On the gallery I observed the miller uttering exclamations of surprise, and looking earnestly towards the west. On inquiring what took his attention so much, he said, "Look, sir, I never saw such a sight in my life!" On turning in the direction towards which he was looking, the west, I also was astounded—numberless black discs in groups and scattered were passing rapidly through the air. He said his attention was directed to them by his little girl, who called to him in the Mill, saying, "Look, father, here are a lot of balloons coming!" They continued for more than twenty minutes, the time I stayed. In passing in front of the sun they appeared like large cannon shot. Several groups passed over my head, disappearing suddenly, and leaving puffs of greyish brown vapour very much like smoke. I am, Sir, yours truly,

JAMES E. BEVERIDGE, *Darland, Chatham, Nov. 13th, 1867.*

[Concerning the last of this marvellous trio, we are told that several persons saw this extraordinary phenomenon, and concur in Captain Beveridge's letter.]

## REVIEW.

*Results of the Magnetical and Meteorological Observations made at the Royal Observatory, Greenwich, 1865.*—(Extracted from the Greenwich Observations, 1865.) 378 pages, quarto.

THIS volume contains the first set of magnetic observations since the instruments have been fairly at work in their new position in the magnetic basement, the various elements being given as read off from the photographic sheets. We cannot help thinking it is a pity that a somewhat similar course is not adopted with respect to the meteorological records, and we should also be glad to see one set of absolute values daily, in addition to the *means* as now given. There would surely be no difficulty in giving the pressure, temperature, &c, at some one hour daily, and we know that if given it would be highly valued.

The approximate mean declination was  $20^{\circ} 32' 43''$  W., and the mean dip  $68^{\circ} 2' 40''$ .

Some of the most interesting meteorological elements are given in the following table :—

*Meteorological Elements, Greenwich, 1865.*

YEAR.	Barometer at 159ft.			Thermometer.			Humid	Rain.	
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean.	Days.	Amnt.
	in.	in.	in.	°	°	°	Sat: 100		in.
January .....	30·207	28·390	29·404	50·2	19·6	36·3	86	16	3·32
February .....	·432	·718	·722	52·7	15·5	36·6	83	19	1·75
March .....	·204	29·042	·722	58·7	23·7	36·6	79	10	·85
April .....	·170	·680	·954	81·5	31·9	52·3	73	7	·40
May .....	·225	·343	29·769	78·5	31·4	56·1	73	13	4·37
June .....	·358	·120	30·031	87·6	41·2	60·2	70	5	2·45
July .....	·202	·416	29·797	85·0	47·0	63·8	72	11	2·27
August .....	·172	·300	·711	78·0	43·2	59·9	80	17	3·97
September.....	·323	·750	30·071	86·0	40·2	63·9	76	1	·16
October .....	·081	28·824	29·440	71·7	33·5	50·9	87	19	5·90
November .....	·325	·794	·720	56·4	31·0	44·8	88	18	2·39
December .....	30·610	29·005	30·055	52·7	29·2	42·7	88	10	·87
Means .....	...	...	29·783	69·9	32·3	50·3	80	...	...
Extremes ...	30·610	28·390	...	87·6	15·5	...	...	...	...
Totals .....	...	...	...	...	...	...	...	146	28·70

The records of the thermometers sunk in the ground are somewhat incomplete, the spirit occasionally running out of scale, but the usual results are nevertheless manifest in the retardation of the date of maximum temperature, which at 3 ft. occurred on September 13th, at 6 ft. on September 20th, at 12 ft. on October 11th, and at 24 ft. not till December 6th.

Though last, not least important, is the catalogue of luminous meteors observed during the year, giving full particulars of the paths, size, colour, &c., of 300 or 400 meteors.



## NOVEMBER, 1867.

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
		Total Fall.	Difference from average 1860-5	Greatest Fall in 24 hours.			Max.		Min.		
				Dpth.	Date.		Deg.	Date.	Deg.	Date.	
		inches	inches.	in.			Deg.	Date.	Deg.	Date.	
I.	Camden Town .....	.86	— 1.55	.73	30	4	62.6	1	26.4	28	
II.	Staplehurst (Linton Park) ...	1.26	— 1.93	.40	16	8	60.0	1	26.0	29	
	Selborne (The Wakes).....	1.06	— 2.48	.55	30	4	58.0	1	20.0	28	19
III.	Hitchen .....	.61	— 1.53	.39	30	5	55.0	15	26.0	27	
"	Banbury .....	.57	— 1.63	.23	30	9	58.0	1	23.5	28*	15
"	Wisbech .....	.73	...	.24	30	8	58.2	1	24.0	28	
IV.	Bury St. Edmunds (Culford). ..	.95	— 1.44	.45	30	7	60.0	1	22.0	27	
V.	Calne .....	1.15	...	.95	30	3	61.0	15	19.3	28	16
"	Plymouth (Goodamoor) .....	2.16	— 3.44	...	...	...	59.0	...	27.0	...	
"	Barnstaple .....	1.08	— 3.06	.58	30	10	...	...	...	...	
"	Taunton (Fulland's School) ..	.81	— 2.29	.76	15	3	...	...	...	...	
VI.	Shrewsbury (Highfield) .....	1.04	— .94	.47	14	8	...	...	...	...	
"	Tenbury (Orleton) .....	1.19	— 1.28	.45	14	10	57.2	1	21.6	29	16
VII.	Leicester (Wigston) .....	.61	— 1.55	.25	30	5	59.0	15	22.5	27	13
"	West Retford .....	...	...	...	...	...	...	...	...	...	
"	Derby .....	.95	— .68	.47	14	8	55.0	19	25.0	28	7
VIII.	Manchester .....	2.43	— .34	1.50	30	7	53.8	15	24.0	28	12
IX.	York .....	1.16	— .82	.45	14	7	58.0	5, 9	26.5	28	1
"	Skipton (Arncliffe) .....	1.99	— 4.46	.77	16	6	50.0	1	24.0	24	3
X.	North Shields .....	.99	— 1.71	.45	14	6	55.8	8	31.0	27+	2
"	Borrowdale (Seathwaite).....	2.55	— 14.12	.57	27	10	...	...	...	...	
XI.	Abercarn .....	1.12	...	.67	15	4	55.0	1	29.0	29	3
"	Haverfordwest .....	2.21	— 3.46	1.60	30	4	53.0	4, 15	24.5	23	...
"	Rhayader (Cefnfaes).....	1.49	— 3.09	.50	30	9	59.0	...	26.0	...	...
"	Llanberis (R. Victoria Hotel) ..	.39	...	.14	30	5	...	...	...	...	
XII.	Dumfries .....	.71	— 2.51	.39	30	7	59.0	4	26.5	24	12
"	Hawick (Silverbut Hall) ...	.33	...	.13	15	8	...	...	...	...	
XIV.	Ayr (Auchendrane House) ...	1.35	— 2.72	.31	13	10	72.0	4	17.0	21	12
XV.	Otter House .....	...	...	...	...	...	...	...	...	...	
XVI.	Leven (Nookton) .....	.43	— 2.61	.21	30	5	56.0	8	31.0	27	10
"	Stirling (Deanston) .....	1.23	— 2.29	.48	30	7	56.8	4	22.9	18	16
"	Logierait .....	.52	...	.21	30	6	...	...	...	...	
XVII.	Ballater .....	.82	...	.35	1	9	54.0	9	23.0	12	10
"	Aberdeen .....	.94	...	.42	14	10	51.5	4, 9	28.7	13	2
XVIII.	Inverness (Culloden) .....	.91	...	.20	29	7	52.8	9	33.5	17	0
"	Fort William .....	2.06	...	.49	25	13	...	...	...	...	
"	Portree .....	3.57	— 6.91	.75	24	12	58.5	6	29.0	5	2
"	Loch Broom .....	3.27	...	.50	30	20	...	...	...	...	
XIX.	Helmisdale .....	2.28	...	.59	1, 30	15	...	...	...	...	
"	Sandwick .....	2.93	— 1.07	.74	30	22	52.2	7	34.7	27	0
XX.	Cork .....	1.75	...	.63	29	6	...	...	...	...	
"	Waterford .....	2.20	— 1.75	.95	14	9	59.0	4	29.0	28+	2
"	Killaloe .....	1.57	— 3.32	.58	13	6	59.0	1	23.0	28	8
XXI.	Portarlington .....	.86	— 3.06	.40	14	12	49.5	14	23.0	28	13
"	Monkstown .....	1.29	— 1.59	.84	30	8	55.0	14	23.5	29	8
XXII.	Galway .....	.74	...	.23	13	5	59.0	8	31.0	17	3
"	Bunninadden (Doo Castle) ...	.72	...	.31	30	9	54.0	4	23.0	29	11
XXIII.	Bawnboy (Owendoon) .....	.80	...	.28	13	11	55.0	4	25.5	27	6
"	Waringstown .....	1.09	...	.28	13	10	54.0	4	28.0	8, 28	11
"	Strabane (Leckpatrick) .....	1.10	...	.30	13	15	57.0	4	26.0	18	11

\* And 29th. † And 28th. ‡ And 29th. || And 21st &amp; 28th.

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

## NOVEMBER, 1867.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which fall in 41 or more fell.	TEMPERATURE.				No. of nights below 32°.
		Total Fall.	Difference from average 1860-5	Greatest Fall in 24 hours.		Max.		Min.				
				Dpth.	Date.				Deg.	Date.		
											Deg.	
		inches.	inches.	in.								
I.	Camden Town .....	.86	— 1.55	.73	30	4	62.6	1	26.4	28	6	
II.	Staplehurst (Linton Park) ...	1.26	— 1.93	.40	16	8	60.0	1	26.0	29	10	
	Selborne (The Wakes).....	1.06	— 2.48	.55	30	4	53.0	1	20.0	28	19	
III.	Hitchin .....	.61	— 1.63	.39	30	5	55.0	15	26.0	27	9	
"	Banbury .....	.57	— 1.63	.23	30	9	58.0	1	23.5	28*	15	
"	Wisbech.....	.73	...	.24	30	8	58.2	1	24.0	28	5	
IV.	Bury St. Edmunds (Culford) ..	.95	— 1.44	.45	30	7	60.0	1	22.0	27	7	
V.	Calne .....	1.15	...	.95	30	3	61.0	15	19.3	28	16	
"	Plymouth (Goodamoor) .....	2.16	— 3.44	...	...	...	59.0	...	27.0	...	...	
"	Barnstaple .....	1.08	— 3.06	.58	30	10	...	...	...	...	...	
"	Taunton (Fulland's School) ..	.81	— 2.29	.76	15	3	...	...	...	...	...	
VI.	Shrewsbury (Highfield) .....	1.04	— .94	.47	14	8	...	...	...	...	...	
"	Tenbury (Orleton) .....	1.19	— 1.23	.45	14	10	57.2	1	21.6	29	16	
VII.	Leicester (Wigston) .....	.61	— 1.55	.25	30	5	59.0	15	22.5	27	13	
"	West Retford .....	...	...	...	...	...	...	...	...	...	...	
"	Derby .....	.95	— .68	.47	14	8	55.0	19	25.0	28	7	
VIII.	Manchester .....	2.43	— .34	1.50	30	7	53.8	15	24.0	28	12	
IX.	York .....	1.16	— .82	.45	14	7	58.0	5, 9	26.5	28	1	
"	Skipton (Arncliffe) .....	1.99	— 4.46	.77	16	6	50.0	1	24.0	24	3	
X.	North Shields .....	.99	— 1.71	.45	14	6	55.8	8	31.0	27†	2	
"	Borrowdale (Seathwaite) .....	2.55	— 14.12	.57	27	10	...	...	...	...	...	
XI.	Abercarn .....	1.12	...	.67	15	4	55.0	1	29.0	29	3	
"	Haverfordwest .....	2.21	— 3.46	1.60	30	4	53.0	4, 15	24.5	23	...	
"	Rhayader (Cefnfaes) .....	1.49	— 3.09	.50	30	9	59.0	...	26.0	...	...	
"	Llanberis (R. Victoria Hotel) ..	.39	...	.14	30	5	...	...	...	...	...	
XII.	Dumfries .....	.71	— 2.51	.39	30	7	59.0	4	26.5	24	12	
"	Hawick (Silverbut Hall) .....	.33	...	.13	15	8	...	...	...	...	...	
XIV.	Ayr (Auchendrane House) ...	1.35	— 2.72	.31	13	10	72.0	4	17.0	21	12	
XV.	Otter House .....	...	...	...	...	...	...	...	...	...	...	
XVI.	Leven (Nookton) .....	.43	— 2.61	.21	30	5	56.0	8	31.0	27	10	
"	Stirling (Deanston) .....	1.23	— 2.29	.48	30	7	56.8	4	22.9	18	16	
"	Logierait .....	.52	...	.21	30	6	...	...	...	...	...	
XVII.	Ballater .....	.82	...	.35	1	9	54.0	9	23.0	12	10	
"	Aberdeen .....	.94	...	.42	14	10	51.5	4, 9	23.7	13	2	
XVIII.	Inverness (Culloden) .....	.91	...	.20	29	7	52.8	9	33.5	17	0	
"	Fort William .....	2.06	...	.49	25	13	...	...	...	...	...	
"	Portree .....	3.57	— 6.91	.73	24	12	58.5	6	29.0	5	2	
"	Loch Broom .....	3.27	...	.50	30	20	...	...	...	...	...	
XIX.	Helmsdale .....	2.28	...	.59	1, 30	15	...	...	...	...	...	
"	Sandwick .....	2.93	— 1.07	.74	30	22	52.2	7	34.7	27	0	
XX.	Cork .....	1.75	...	.63	29	6	...	...	...	...	...	
"	Waterford .....	2.20	— 1.75	.95	14	9	59.0	4	29.0	28†	2	
"	Killaloe .....	1.57	— 3.32	.58	13	6	59.0	1	23.0	28	8	
XXI.	Portarlinton .....	.86	— 3.06	.40	14	12	49.5	14	23.0	28	13	
"	Monkstown .....	1.29	— 1.59	.84	30	8	55.0	14	23.5	29	8	
XXII.	Galway .....	.74	...	.23	13	5	59.0	8	31.0	17	3	
"	Bunninadden (Doo Castle) .....	.72	...	.31	30	9	54.0	4	23.0	29	11	
XXIII.	Bawnboy (Owendoon) .....	.80	...	.28	13	11	55.0	4	25.5	27	6	
"	Waringstown .....	1.09	...	.28	13	10	54.0	4	23.0	8, 28	11	
"	Strabane (Leckpatrick) .....	1.10	...	.30	13	15	57.0	4	26.0	18	11	

\*And 29th. †And 28th. ‡And 29th. ||And 21st &amp; 28th.

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

# METEOROLOGICAL NOTES ON THE MONTH.

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.

LINTON PARK.—Northerly winds, high bar. and less R than for many years. Dense fog on morning of 9th.

SELBORNE.—Bar. fell an inch in the four days preceding the 14th, and high winds blew throughout 15th, 16th, and 17th. Fog daily from 3rd to 11th, and on 24th and 25th; it was dense on 9th.

HITCHIN.—The driest November for 20 years.

BANBURY.—A cold dry month; mean temp.  $2^{\circ}0$  below the average. Fog on 8th, 28th, and 29th, and thick fog on 9th and 11th.

WISBECH.—Bar. high throughout, the mean being  $30\cdot261$  in. Sycamore divested of leaves on 23rd, common poplar on 25th, and walnut on 17th. Constant fog from 9th to 12th.

CULFORD.—A very mild month. High wind on 16th; slight S on 20th.

CALNE.—Very high bar.; northerly winds, and remarkably dry month. Very high wind on 16th, gale on 17th.

ORLETON.—A dry month with an even temp., about  $3^{\circ}$  below the average, and a high bar. throughout. Max.  $30\cdot43$  at 9 a.m. 9th. Wind generally from the N. and the air dry. Frequent frosts. Much fog 9th to 15th, followed on 16th and 17th by rough wind from N. and N.E.

WIGSTON.—Temp. below the average. An unusually dry fine month, which has proved most favourable for agricultural purposes. The rainfall, as far as my record serves, is unprecedentedly small, not being one-third of the average fall during the last 12 years.

DERBY.—A month of remarkable beauty, more resembling October than November. No fogs and only two days of decided R. Seed time all that agriculturalists could desire. It was unfortunately cloudy on the night of the 14th, but enough shooting stars were seen to verify the prediction.

MANCHESTER.—This month has been unusually dry here, more especially looking at the very small number of days upon which R fell.

ARNcliffe.—R only on 6 days, the smallest number I have ever registered; a very fine month.

NORTH SHIELDS.—Fog on 14th; H on 16th.

SEATHWAITE.—A singularly fine and dry month. R remarkably small, only one-seventh of the average. So fine a month never remembered.

## W A L E S.

ABERCARN.—A very fine month, generally calm and cold. Fog on 13th and 14th. Windy on 16th.

HAVERFORDWEST.—Finest November for 20 years, chiefly characterised by bright frosts and cloudless sky. Bar. very high throughout, max.  $30\cdot615$  on 9th. Had it not been for the storm of R and wind, which was very severe from S.E. on the last day, it would have been the driest month of this year, as it was certainly the finest.

RHAYADER.—A remarkably fine month.

## S C O T L A N D.

DUMFRIES.—Unusually fine for November. On 26th, at 5.44 or 5.45 p.m. a large and very luminous meteor passed from E. to W; it was pear-shaped, and appeared about one-eighth the size of the moon.

HAWICK.—The driest, mildest, and pleasantest November recollected. Windy on 15th.

AYR.—Most seasonable weather throughout; high bar., small rainfall.

NOOKTON.—A month of singularly fine weather, with a minimum of rain; quite unlike November weather.

DEANSTON.—Some S on the hills at the beginning of the month, and frequent frosts at night during it; generally very dry and bright, and very favourable for agriculture. Very little wind. The 14th very cloudy, and no meteors seen.

LOGIERAIT.—Finest November recorded; cloudy on 14th, and no meteors seen.

BALLATER.—An unusually fine month; bar. on 21st,  $30\cdot706$  in.

**ABERDEEN.**—Auroræ on 1st, 2nd, 6th, 21st to 24th, 26th and 27th. A month of remarkably fine, mild, dry weather. H on 2nd, L on 6th, lunar halo on 7th, dense fog on 12th and 29th. On 14th a few meteors were seen between 5 and 6 a.m., but the sky was generally cloudy all night. Very fine meteors were seen on 20th at 7 p.m., and 26th at 6 p.m.—[See also Dumfries.]

**CULLODEN.**—H on 1st; aurora on 27th; fog on 29th.

**FORT WILLIAM.**—Very fine in the middle of the month, and the total rainfall only a quarter of the corresponding month of 1866. Cloudy at night on 13th; no meteors to be seen.

**PORTREE.**—Although October this year did not favour the Highlander's harvest, November has been very fine, and all is stacked in excellent condition. December is setting in very wild.

**LOCHBROOM.**—Beginning and end of month rainy; the middle very favourable for the herring fishery, which has been more successful than for 17 years. TS on 1st.

**HELMSDALE.**—Harvest was late in this quarter, but finally secured in good condition during the beginning of this month, when the weather was all that could be wished. Dec. 1, violent storm of wind and S.

**SANDWICK.**—Rain on 22 days, but not heavy; in fact, the amount is an inch below the average; very high bar. which, even when above 30·5 was accompanied by E and scud. H on 1st, auroræ on 20th, 23rd, and 28th; lunar halos on 12th and 13th.

#### I R E L A N D.

**KILLALOE.**—The driest Nov. in 22 years, except 1856, 1·51 in., and 1858, 1·22.

**MONKSTOWN.**—Colder and more foggy than usual; temp. on grass below 32° on 19 nights; min. 16° on 29th. Gale on 16th, and severe storm on night of 29th.

**DOO CASTLE.**—One of the finest Novembers on record. Potatoe digging, which was prevented by the weather in October, was pushed on in November with fair results.

**OWENDOWN.**—Very fine and dry. H on 1st; fog on 5th, 6th, 8th, 9th, 10th, and 14th. Night of 13th rainy and overcast, could not see meteors.

**WARINGSTOWN.**—Very fine month; small rainfall; favourable to farming operations; large breadth of wheat sown in consequence. Tremendous H shower at 2 p.m. on 1st. Dahlias, &c., killed on 5th.

**LECKPATRICK.**—Very fine month; high bar., light winds, and warm sun for the time of year. Rapid fall of bar. on 30th, preparatory to gale and S of December 1st.

#### HEIGHT ABOVE SEA LEVEL.

In a former number\* we submitted a proposal relative to the determination of the heights of any number of localities above the mean sea level by means of the publications of the Ordnance Survey, and also by simultaneous barometric observations, which we undertook to reduce, and also to "publish the results" as soon as the discussion was completed. This promise, we think, the majority of our readers would rather see unfulfilled, since it seems to us rather a matter for settlement between ourselves and the observers than for publication, especially as the corrected values will be adopted in *British Rainfall, 1867*. The results will therefore be communicated to the observers very shortly. It may be well to add that the period selected, proved well suited for the purpose, the barometer being steady, and the results generally singularly accordant. In conclusion, we can only say that any of our readers who are uncertain of their altitude, and will send us the position of their house, in the following form—

"The Limes, Johnstone, Derbyshire,

Quarter of a mile South of Johnstone Church,"

shall be assisted to the best of our power.

---

\* *Meteorological Magazine*, No. XVI., May, 1867.

# SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

XXIV.]

JANUARY, 1868.

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

## CYCLONE IN BENGAL.

ALTHOUGH there is certainly no present proof of community of origin, it is at least a singular coincidence, that almost at the very same moment that Tortola was being laid low by a cyclone unequalled in destructive power for thirty years, "Calcutta was astonished at a return of wet weather," followed in a few days by a violent Cyclone.

The disasters in Bengal were far heavier than in the West Indies, but as only three years have elapsed since the former district suffered from one of the most destructive storms on record, the present catastrophe has been deemed less important than it otherwise would have been. The cyclone of October 5th, 1864, swept over Calcutta in the day-time, yet 50,000 lives were lost, and property worth upwards of two millions was destroyed. In 1867 the lives lost are computed at 3000.

The following extracts from the *Calcutta Englishman* give a vivid description of what is often deficient—namely, the premonitions of the storm.

"For weeks past the weather has been a foremost topic of conversation. The rains had apparently ceased, when Calcutta was astonished, on 26th October at a return of wet weather. During all last week rain seemed threatening, and on Thursday the threat began to be fulfilled. The sky on Friday was overcast and lowering, the pall of cloud was unusually low, and masses of scud were whirled swiftly away to leeward all day long. The gloom of the day was added to by frequent rain-squalls; the day, in fact, was just one of those for which November in England has acquired so unpleasant a reputation. As the day wore on the signs of bad weather increased. About three o'clock the barometer began to show signs of falling, and the wind came down in fiercer gusts. Matters remained in this state till dusk, when it was evident to the most careless that Calcutta was about to be visited by a storm, which would rival the now famous Cyclone of 5th October, 1864. Men went home from office to hurry through dinner and prepare for the struggle, and although some daring spirits went to the Opera, they were the exception. At ten o'clock, the fastenings of doors and windows began to be severely tasked, and the storm rushed over the city with a heavy murmurous roar, like a fierce surf beating on a shingle beach. This roar never lulled until daylight, but every few minutes it swelled up into a thunder of wind and rain, marking the approach of heavier squalls. Up to half-past one the storm was content with rattling doors and windows furiously, but now it forced its way into the well-guarded dwellings of the European portion of the city, and tore off here a sash, here a venetian, here a door. The houses shook under the force of the blows dealt them, and often and anxiously were the time-pieces consulted to see how the night wore away. Soon after two, however, there was a sensible

abatement of the storm, the gusts were as fierce as ever, but the intervals between them were longer. By half-past three the strength of the gale had greatly abated, and by four the hurricane had become a strong westerly gale, and people began to count up the damage they had sustained, and to hope for daylight, to enable them to ascertain the losses of their neighbours. Few slept last night, and there are few who could wish to pass such another night, or to battle again with a gale which has wrought the city, as much, if not more, injury than even the great cyclone."

"The following is the official report from Mr. Blandford, the Meteorological Reporter, on the storm of Friday night :—On the night of 1st and 2nd November, Calcutta was visited by a severe cyclone, the centre of which passed to the east of Saugor Point and Calcutta, in a northerly direction. Threatening indications were noticed in the telegrams, received on the morning of the 1st, from Saugor Point and Cuttack, and the probability of an approaching storm was strengthened by a report sent from the former place at 12 h. 30 m. These, with the subsequent reports from Saugor Point at 16 h., 17 h. 30 m., and 19 h. were communicated at once to the Master Attendant of the Port, but up to 19 h., the wind at Saugor Point shewed no sign of veering, and it was uncertain whether the cyclone had actually formed. At 20 h. no distinct telegraphic report could be received from Saugor, and the 19 h. telegram is the latest information received thence up to present date. At Calcutta the wind was from N.E., and shortly after dusk became fitful and threatening, the gusts gaining gradually in strength until they reached their maximum between 2 and 3 a.m. of 2nd (?). The wind was at first from the N.E. veering gradually to N. and to N.W., which was its average direction when most severe. The lowest barometric reading at the Surveyor General's office was taken at 3 a.m., *viz.*, 28.6 inches.

"The maximum force could not be recorded, owing to the destruction of the anemometer at 2 a.m. The storm abated, and the barometer rose rapidly after 3 a.m."

"A native correspondent at Jessore, writing on the 3rd November, sends us the following :—

"'Jessore has been swept by the terrible cyclone, unprecedented in the history of this little station. From the evening of the 29th October to 11 p.m. of 1st November, it rained heavily. At half-past eleven, a burning brilliant cloud was first observed in the north-east corner of the station. All thought at first that it was a fire, but it was not so ; for the storm soon began, and changed its direction as the sky-flame changed its position, *i.e.*, from north to east, to south, to west—to north-west, whence in the morning it disappeared. It was not a cloud, for clouds were distinctly seen running fast below it. When it was in the north-east several houses at Jhoonjhoonpoor (a small village north-east of the station) were burnt ; when it was in the north-west fire set into some of the houses at Poorono Kuslea (a village north-west of this station) ; similarly to some houses in another village in the east. I have yet received no news from south and west. The fires may have been accidental, but the brilliant flame, which guided the course and direction of the great cyclone, deserves enquiry. The spiritualists here attribute it to supernatural agency, but let the materialists, or the so-called scientific world explain the phenomenon ! It was not a delusion, for it was observed by the majority of the residents. I write you to know this, for you have many literary and scientific readers, who, I hope, will kindly come forward and explain to us (ignorant men) the mystery of this mysterious flame ! ! !

"'Except a few *pucca* houses, all gone down ! Rice crop at once ruined, prospect of winter crop very gloomy, and the people know not what to do. They attribute all these to the sins of their rulers. I am glad, however, to inform you that our magistrates are doing all that humanity could wish, or energy act.'

"This letter mentions a phenomenon preceding the storm which we do not remember to have heard of before, in connection with cyclones. Several correspondents have, however, spoken of a peculiar luminous appearance in the atmosphere at the height of the storm. The subject is one well worthy of investigation."

The following barometric returns show that the rate and amount of depression was much less in the Calcutta than in the Tortola Cyclone—

and (though the anemometer broke down) there is no doubt that the wind force was proportional to the depression, and far greater at Tortola than at Calcutta; yet the loss of life was greatest at Calcutta, the reason being perhaps that the houses in the West Indies are better adapted to resist the hurricanes which are there of such frequent occurrence.

*Reading of Marine Barometer at Calcutta, October 29th to Nov. 2nd.*

	Inches.	Fall per hour.	Rise per hour.	Wind.
Oct. 29th— 6 a.m.	30·08	...	...	...
noon.	·08	·000	·000	...
8 p.m.	·06	·003	...	...
30th— 6 a.m.	·04	·002	...	...
noon.	·02	·003	...	...
8 p.m.	30·00	·003	...	...
31st— 3 a.m.	29·99	·001	...	...
7 a.m.	·98	·003	...	...
noon.	·97	·002	...	...
4 p.m.	·97	·000	·000	..
8 p.m.*	·98	...	·003	..
midnight	·96	·005	...	N.E.
Nov. 1st— 4 a.m.	·96	·000	·000	...
6 a.m.	·97	...	·005	...
9 a.m.	·97	·000	·000	...
noon.	·90	·023	...	...
2 p.m.	·84	·030	...	...
4	·82	·010	...	...
6	·78	·020	...	...
7	·74	·040	...	...
9	·70	·020	...	N.E.
10	·58	·120	...	N.E.
11	·38	·200	...	N.N.E.
12 p.m.	29·16	·220	...	N.
2nd— 1 a.m.	28·96	·200	...	N.W.
2	28·90	·060	...	W.N.W.
3	29·10	...	·200	W.
4	29·26	...	·160	W.
5 a.m.	29·50	...	·240	W.S.W.

\* At sunset remarked an unusual lurid red haze.

*Reading of Barometer at Different Stations.*

Stations.	November 1st.				November 2nd		Min. of Barometer.	
	3 p.m.	6 p.m.	9 p.m.	Midngt	3 a.m.	6 a.m.	Reading.	Hour.
Contai, Hidgelle .....	...	...	29·25	29·25	29·50	29·65	29·18	11.15
Fort Gloucester (Aner.)	29·90	29·86	·72	·30	·40	·76	29·14	1.15
"  "  (Symp.)	·60	·57	·48	·20	·28	·51	28·90	1.15
"  "  (Marine)	·68	·63	·51	·08	29·16	·51	·91	1.15
Calcutta (Aner.) .....	...	...	·54	·00	28·96	...	·70	1.30
"  St. Xavier's Coll.	29·68	29·64	·52	·00	29·00	29·62	·69	1.30
"  "  (Aner.)	...	·72	·62	·17	·13	·65	·85	1.35
"  Durham .....	...	·75	·45	·00	·00	·60	·70	1.40
"  "  (Marine)	29·83	·78	·70	·16	·10	·60	·90	2.0
Cossipore.....	...	·86	·73	·38	·07	·58	·95	2.0
Dum Dum .....	...	...	·78	·42	·07	·63	·94	2.15
Ooterparah .....	29·84	29·82	·68	·24	·01	...	·85	2.30



From the above it will be seen that the maximum rate of depression was about .25 in. per hour, and that only for a short time; this is about double the rate of fall in this country, but it is only one-third the rate in the West India Cyclones, where the barometer falls *three-quarters of an inch per hour*.

### IS THE ROYAL CHARTER GALE PERIODIC?

WE anticipate an immediate negative reply to the above query, but that will not deter us from examining the facts, at least such as are readily within our reach.

#### NOTES ON WEATHER IN OCTOBER.

- 1820. *London*.—Lowest barometer in the year on the 25th.
- 1845. *Birmingham*.—Greatest wind force 9 lbs. on 20th at 11.15 a.m.
- 1846. *Nottingham*.—Greatest rainfall in the year on 19th.
- 1847. *Uckfield*.—Gale from S.W. on 23rd; showers of rain and hail on 24th.
- „ *Cambridge*.—Only once has the bar. fallen suddenly—on 22nd.
- 1848. *Uckfield*.—Strong gale on 9th; none mentioned afterwards.
- 1849. „ Dull month, no gales.
- 1850. „ Gale on 6th; on 23rd continuous rain and heavy S.W. gale.
- 1851. „ Mostly fair and mild; no gales.
- 1852. *Helston*.—Barometer lowest on 26th.
- 1853. *Uckfield*.—Severe thunderstorm, with heavy rain and hail, on 27th.
- 1854. *Hull*.—Lowest barometer in month on 22nd.
- 1855. *Uckfield*.—Barometer very low during the last week. Very stormy 4th to 6th, and about 26th.
- 1856. „ Remarkably fine throughout.
- 1857. No particulars at hand.
- 1858. *Norwich*.—High wind on 7th and 19th; stormy on 29th.
- „ *Nottingham*.—Gale on 18th and 19th; barometer high at the end of the month.
- 1859. Royal Charter Gale on 25th.
- 1860. *St. Kilda*.—Hurricane on 3rd.
- „ *Dublin, Sheffield, Glasgow*.—Lowest barometer on 18th.
- „ *Helston*.—Lowest barometer on 11th.
- „ *Manchester*.—Lowest barometer on 13th.
- 1861. *All Stations*.—Lowest barometer on 11th; no gales, and high barometer at the end of the month.
- 1862. *Bedford, Retford, Sandwich, &c.*—Very stormy from 19th to 27th.
- „ *Silloth*.—On 19th barometer fell an inch in 8½ hours.
- „ *Birmingham*.—On 19th barometer “lower than since Royal Charter storm.”
- 1863. *Penzance*.—Gale on 13th.



1863. *Haverfordwest*.—From 24th to 31st very stormy, with hail.  
 „ *Markree*.—Gales from 28th to 30th.  
 „ *Calne, Leckpatrick, Killaloe, Dumfries, &c.*—A series of gales, with hail and thunder, on 29th, 30th, and 31st.  
 „ *Sandwick*.—Gale blowing 74 miles per hour on 30th.  
 1864. *Truro*.—Minimum barometer on 22nd.  
 „ *Boston*.— „ „ „ 23rd.  
 „ *Retford*.— „ „ of the year on 23rd.  
 „ *Penzance*.—Gales from 21st to 27th.  
 „ *Aldershot*.—Gales from 1st to 5th, and 19th to 24th.  
 „ *Dumfries*.—Violent gale on 20th.  
 „ *Scotland and Ireland*.—Excessive, if not unprecedented, rains from 19th to 24th.  
 1865. *London*.—Lightning on 29th.  
 „ *Selborne*.—Splendid aurora on 19th ; thunder on 29th.  
 „ *Banbury*.—Lightning on 7th, 26th and 29th.  
 „ *Wisbech*.—Gale (12lbs.) on 25th ; squally at end of month ; auroræ on 19th and 26th.  
 „ *Culford*.—High wind on 25th.  
 „ *Taunton*.—Thunderstorm at 4.30 a.m. 25th.  
 „ *Arnccliffe*.—Violent storm on 24th, with snow and hail.  
 „ *Haverfordwest*.—Heavy gale 29th to 31st ; much damage to shipping.  
 „ *Portree*.—Gale on 24th from S.W. ; 25th, N.W. and N. ; 27th, heavy gale from N.  
 [For further details see *British Rainfall*, 1865, pages xxxiii.-iv.]  
 1866. *Linton*.—No high winds.  
 „ *Wisbech*.—Strong wind only on one day, 30th.  
 „ *Seathwaite*.—Tremendous rain on 29th.  
 „ *Haverfordwest*.—First fortnight calm, afterwards stormy, especially 28th and 29th, when it blew a heavy gale.  
 „ *Deanston*.—Little or no wind except on 29th.  
 „ *Ballater*.—Blew hard on 29th.  
 1867. [See meteorological notes, *Meteorological Magazine*, pp. 121 and 122.]

So much for the evidence ; to what does it amount ? Apparently to this—that in two Octobers out of three, there will be a gale on or about the 25th, and that it is frequently accompanied by electrical phenomena, thunder, lightning, and hail, also by snow. It would seem that gales in the middle of October are rare, and that they generally occur in the first or the last week. We have thrown out the suggestion, and, so far as time permits, attempted to test it ; we leave it with the hope that some one will find leisure to confirm it or to contradict it.

---

[The above article was in type before we had heard of the cyclones of Tortola and Bengal ; far be it from us to suggest that in their dates and almost simultaneous occurrence there is either proof of common origin, or confirmation of the *possibility* shadowed forth above.]—ED.

## REVIEWS.

*The Life Boat*, No. 66, October, 1867.—Published at the Office of the National Life Boat Institution. 24 pages and map.

THIS ably conducted quarterly is as interesting as usual. It begins with a very impartial article on "The salvors of property on the English coasts," discussing the questionable demands on foreigners often made by the 'long shore men of the Suffolk coast, and which is most appropriately introduced by the lines of Burns—

"Oh ! wad some power the giftie gie us,  
To see oursel's as others see us,  
It wad frae mony a blunder free us."

Then follow notices of additional life boat stations, and a capital map, showing the localities and number of wrecks in 1866, and various tables. One of these raises a question which merits examination ; it is this : during the six years 1859-64, the average number of casualties with the wind blowing a strong gale was 15, and the greatest, 16 per cent. of the wrecks in all weathers. In 1865 the number was doubled, being 33 per cent., and in 1866, 32 per cent. Does this bear any connection with the stoppage of the FitzRoy storm signals ?

---

*Report of the Sanitary Committee of the Town of Nottingham.*—Nottingham : J. N. Dunn, 1867 ; 25 pages.

Shows that they look sharply after their business, and are conscious of the important bearings of meteorology on sanitary matters.

---

*Proceedings of the Manchester Literary and Philosophical Society*  
Vol. VII. No. 4.

THIS is meteorologically a most interesting and important number, almost every article bearing on radiation in one or other of its many branches. The first communication is by Dr. J. P. Joule, F.R.S., "On a Thermometer unaffected by Radiation," which consists of a double cylinder, in the inner of which hangs a spiral of fine wire suspended by a filament of silk, and carrying a mirror ; this instrument is so delicate that 1° Fahrenheit produces an entire revolution of the mirror. The second paper is an elaborate discussion of the Oxford solar radiation observations, by Mr. Baxendell, F.R.A.S. ; the conclusions arrived at being—

1st. That the calorific intensity of the sun's light is subject to periodical changes, the maxima and minima of which correspond respectively with those of solar spot frequency.

2nd. That the intensity of a ray of direct sunlight on its arrival at the earth's surface, in the latitude of Oxford, is greater in April and September than in June, when the sun's meridian altitude is greatest.

3rd. That the curve representing the mean monthly values of solar radiation on cloudless days has its times of maxima and minima corres

ponding with those of the curve representing the mean monthly diurnal ranges of the magnetometer.

4th. It seems probable that the heating rays of the sun consist of two kinds, differing considerably in intensity, and being subject to periodical changes, the times of maximum of one kind and those of minimum of the other corresponding respectively to the maximum frequency of solar spots.

5th. That the oscillations of mean daily temperature are intimately connected with the changes which take place in the earth's horizontal magnetic intensity.

In these deductions Mr. Baxendell has opened new paths of investigation, which we hope will soon be well trodden. But we trust he and his followers therein will look well to the data they employ, and if they elect to proceed upon black bulb thermometers without jackets, we would advise them to clear away as far as may be the uncertainties inseparable from those instruments. We press this point strongly, because Mr. Baxendell terms the Greenwich observations "anomalous and unsatisfactory," which may be the case, but is not to our mind at all proved by the evidence quoted.

"Take, for instance, any winter month—say, December, 1857. The mean difference for the month between the maximum in sun and the maximum in shade was only  $1^{\circ}7$ ; at Oxford it was  $6^{\circ}1$ . The highest value during the month was  $4^{\circ}5$  at Greenwich: at Oxford it was  $19^{\circ}0$ . At Greenwich there were only seven days on which the difference exceeded  $3^{\circ}0$ : at Oxford there were seventeen. And yet at Greenwich the month was unusually fine and dry, only  $0.36$  of an inch of rain fell, and several days appear to have been nearly if not quite cloudless. Under these circumstances, it is difficult to understand why the black bulb thermometer, if properly exposed, did not register much greater differences."

Surely the smoke of the millions of London chimneys is ample reason for diminished intensity of solar action, was our first impression on reading this; but surely a Manchester man would never forget *smoke*. We have therefore investigated the question, and although not so thoroughly as we hope to do on a future occasion, believe the results are sufficiently interesting to merit notice.

In order that *all* may be able clearly to understand the points at issue, we must premise a few definitions.

*Max. in air* = Highest temperature of air in perfect shade.

*Max. in sun* = Indifferently applied to black bulb thermometer, whether in a vacuum jacket or not.

*Amount of solar radiation* = Excess of reading of either form of black bulb thermometer above temperature in shade.

*Black bulb max.* = A maximum thermometer with the bulb blackened so as to retain the heat which falls upon it.

*Vacuum black bulb* = Similar to the above, but enclosed in a glass jacket, and with the bulb in the centre of a glass sphere about 2 inches in diameter, whereby the wind is prevented from carrying off the heat imparted to the bulb.

Let us first see how the Greenwich returns agree with the other metropolitan stations; and as there were in 1857 only two others pro-

vided with black bulb max. thermometers, and as moreover January, 1857, is recorded at Greenwich to have had the same solar radiation as December, 1857, we will take both cases :—

STATIONS.	Amount of Solar Radiation. Ordinary Black Bulb.	
	Jan. 1857.	Dec. 1857.
Whitehall .....	1°3	2°9
Paddington.....	1·8	1·1
Mean .....	1·55	2·0
Observed at Greenwich...	1·7	1·7
Difference .....	+ 0·15	— 0·3

From this it is abundantly clear that if Greenwich was wrong, so were the other metropolitan stations.

We will now adopt another mode of examination—viz., by tabulating a few results from other stations :—

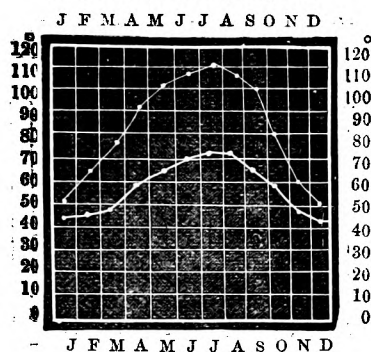
	OXFORD (6 years).		CAMDEN TOWN (7 years).	
	Amount of Solar Radiation, Ordinary Black Bulb.		Amount of Solar Radiation, Vacuum Black Bulb.	
	Degrees.	Per Cent. of Monthly Mean.	Degrees.	Per Cent. of Monthly Mean.
January ..	5·51	52	9·4	38
February..	9·16	86	17·2	68
March .....	10·08	95	25·9	103
April .....	13·23	124	33·1	131
May .....	12·90	121	35·9	142
June.....	12·93	122	37·5	149
July.....	13·81	130	37·8	150
August ...	14·03	132	35·9	143
September.	13·71	129	31·8	126
October ...	9·66	92	20·1	79
November..	8·00	75	11·8	47
December..	4·50	42	6·0	24
Mean ...	10·6		25·2	

From this it appears that the amount of radiation indicated by vacuum thermometers is twice that by unprotected ones, and if so, we at once establish the necessity of clearly discriminating between the two classes of instruments. We also see that even in the mean of seven years, and with a thermometer in vacuo, the radiation in December in London is not one-sixth of what it is in the summer; hence again we see that it is no proof of the Greenwich observations being wrong to quote a month wherein the solar radiation was 1°7; why one-sixth of the *mean* Oxford summer value is 2°·2.

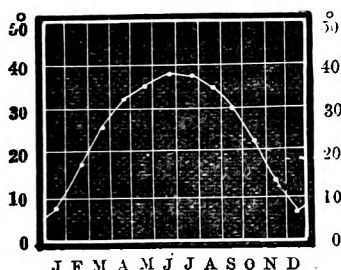
The subject is further elucidated by the following diagrams. Fig. 1 shows the monthly march of the sun and shade temperature during

seven years as observed with a Vacuum Black Bulb Thermometer at Camden Town. Fig. 2 shows on a more open scale the curve of solar radiation from the same observations, and fig. 3 shows the remarkably flat Oxford curve.

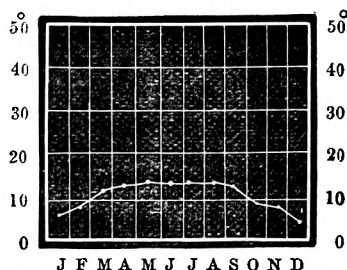
*Mean monthly max. temp. in shade and in sun (Vacuum Max.) at Camden Town, 7 years.*



*Mean Monthly Amount of Solar Radiation at Camden Town, 7 years Vacuum Max.*



*Mean Monthly Amount of Solar Radiation at Oxford, 6 years Ordinary Black Bulb.*



The third paper is by Mr. Vernon, on the results of Solar Radiation Observations made at Old Trafford, Manchester, during eleven years. They were made with an ordinary black bulb thermometer, but the results accord better with the vacuum Camden Town observations than with the Oxford ones, which seem remarkably uniform (flattened) in the summer months.

The last paper is by Mr. Mackereth, of Eccles, on "A Comparison of Solar Radiation on the Grass and at Six Feet from the Ground." They only extend through October, 1867, but show that the means were—

Black bulb on grass.....	59.0
"      "      6 ft. above.....	62.9
Vacuum      "      on grass.....	64.6

Mr. Mackereth wisely concludes in the following words :—

"These results show how important it is that some definite principle should be adopted in the placing of solar thermometers, as certainly no comparison can be made between the amount of solar radiation at any two or more places, unless some common plan of placing the instruments be adopted."

## DECEMBER, 1867.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.						Days on which 1/16 or more fell.	TEMPERATURE.				No. of nights.
		Total Fall.	Difference from average 1860-5	Greatest Fall in 24 hours.		Deg.	Date.		Max.		Min.		
				Dpth.	Date.				Deg.	Date.	Deg.	Date.	
		inches.	inches.	in.					Deg.	Date.	Deg.	Date.	
I.	Camden Town .....	1.59	+ .10	.52	1	13		54.9	1	22.5	10		
II.	Staplehurst (Linton Park) ...	2.42	+ .59	.62	1	18		53.0	1	19.0	10		
	Selborne (The Wakes).....	1.49	+ 1.26	.79	1	9		50.0	1	12.0	10		
III.	Hitchen .....	1.56	+ .25	.49	1	16		54.0	1	13.0	8		
"	Banbury .....	1.56	+ .11	.63	1	19		54.0	1	23.0	4		
"	Wisbech .....	2.43	...	.67	1	14		56.8	16	20.1	10		
IV.	Bury St. Edmunds (Culford).	2.66	+ 1.17	.70	1	12		55.0	1	14.0	9		
V.	Calne .....	1.65	...	.69	1	12		56.5	1	18.4	4		
"	Plymouth (Goodamoor) .....	4.02	+ 1.91	...	...	...		45.0	...	28.0	...		
"	Barnstaple .....	3.16	+ .05	.58	6	21		...	...	...	...		
"	Taunton (Fulland's School)	1.48	+ 1.04	.46	2	8		...	...	22.5	4		
VI.	Shrewsbury (Highfield) .....	1.89	+ .21	.65	2	12		...	...	...	...		
"	Tenbury (Orleton) .....	1.60	+ .86	.44	20	19		56.8	15	20.0	4		
VII.	Leicester (Wigston) .....	2.09	+ .57	.42	21	10		56.0	1	18.0	8		
"	West Retford .....	...	...	...	...	...		...	...	...	...		
"	Derby .....	1.65	+ .10	.50	2	15		55.0	1	22.0	20		
VIII.	Manchester .....	3.98	+ 1.64	.80	15	20		55.0	16	22.0	4		
IX.	York .....	1.72	+ .08	.38	1	13		52.0	1, 16	22.5	3		
"	Skipton (Arncliffe) ...	2.94	+ 1.61	1.00	14	13		...	...	...	...		
X.	North Shields .....	2.34	+ .14	.39	7	19		55.0	16	26.0	3, 4		
"	Borrowdale (Seathwaite).....	13.04	+ 3.91	1.60	15	16		...	...	...	...		
XI.	Abercarn .....	2.76	...	.91	1	7		54.0	16	25.0	29		
"	Haverfordwest .....	3.73	+ 1.10	.75	21	13		55.0	1	22.0	28+		
"	Rhayader (Cefnfaes).....	2.95	+ .34	.50	14	18		52.0	...	19.0	...		
"	Llanberis (R. Victoria Hotel)	...	...	...	...	...		...	...	...	...		
XII.	Dumfries .....	2.05	+ 1.41	.48	20	16		52.0	11	22.5	31		
"	Hawick (Silverbut Hall)....	1.48	...	.28	21	16		...	...	...	...		
XIV.	Ayr (Auchendrane House) ...	3.80	+ .22	.94	4	12		56.0	9	20.0	20		
XV.	Otter House .....	...	...	...	...	...		...	...	...	...		
XVI.	Leven (Nookton) .....	1.44	+ 1.34	.33	23	13		54.0	16	24.0	2		
"	Stirling (Deanston) .....	3.25	+ .95	.64	14	18		53.8	16	22.0	19		
"	Logierait .....	1.76	...	.38	14	13		...	...	...	...		
XVII.	Ballater .....	2.21	...	.38	6	16		53.8	16	18.0	3		
"	Aberdeen .....	2.52	...	.34	2	20		52.3	11	25.2	2		
XVIII.	Inverness (Culloden) .....	1.88	...	.54	16	...		51.4	11	22.5	2		
"	Fort William .....	7.03	...	.97	16	21		...	...	...	...		
"	Portree .....	10.36	+ 5.27	2.20	4	21		35.0	6	25.0	2, 3		
"	Loch Broom .....	7.91	...	1.07	16	27		...	...	...	...		
XIX.	Helmsdale .....	4.21	...	.61	5	18		...	...	...	...		
"	Sandwick .....	3.87	+ .10	.59	21	27		49.5	26	23.5	2		
XX.	Cork .....	1.50	...	1.04	24	9		...	...	...	...		
"	Waterford .....	1.33	+ 3.09	.44	23	18		59.0	15	23.0	8		
XXI.	Killaloe .....	1.90	+ 1.59	.28	4	14		53.0	23	20.5	7		
"	Portarlinton .....	1.98	+ 1.21	.72	1	23		53.0	14	21.5	7		
"	Monkstown .....	1.06	+ 1.56	.26	14	13		55.3	15	26.0	7		
XXII.	Galway .....	2.23	...	.37	4	18		52.0	13	25.0	31		
"	Bunninadden (Doo Castle) ...	2.97	...	.38	1, 14	18		53.0	16	19.0	7		
XXIII.	Bawnboy (Owendoon) .....	2.74	...	.60	4	20		54.0	15	26.5	6		
"	Waringstown .....	1.98	...	.33	18*	18		53.0	15+	24.0	6, 30		
"	Strabane (Leckpatrick) .....	2.51	...	.47	4	18		54.0	17	24.0	7		

\* And 20th. † And 16th, &amp; 22nd. ‡ And 31st. || And 19th &amp; 31st.

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

# METEOROLOGICAL NOTES ON THE MONTH.

**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.

**LINTON PARK.**—The first 11 days wintry, afterwards chiefly dull, raw, and cold. High winds on 1st, with bar. 28·65. Dark nights and dirty roads the prevailing features of the latter part of the month.

**SELBORNE.**—Fog on 25th and 30th, and on the 27th a very dense one; diffused aurora on night of 22nd. Bar. 28·48 on 1st; the fluctuations both of the thermometer and barometer, as well as the wind, have been most remarkable.

**BANBURY.**—Dense fog on 26th and 27th.

**WISBECH.**—Gale on morning of 2nd, 14 lbs.; lunar halo on 9th and 10th; fog on 25th and 26th.

**CULFORD.**—High wind on 1st; S on 2nd, 3rd, 6th, 7th, 8th, 18th, and 20th; dense fog on 26th.

**ORLETON.**—Very warm on the 1st, then cold and frosty till the 11th, warm and pleasant till the 18th; the remainder of the month cold and frosty, with much fog, especially on 26th and 27th; frequent falls of fine R with S occasionally, but not remaining on the ground. Temp. more than 2° below the average of the month; very cloudy, violent winds, &c.; low bar. on 1st and 2nd.

**WIGSTON.**—Great and sudden changes in the weather during this month; frequent S showers, and more than the usual number of frosty nights.

**MANCHESTER.**—Fine lunar halo on 10th in evening.

**ARNcliffe.**—A very fine month, dry and clear.

**NORTH SHIELDS.**—Lunar halos on 6th, 8th, 9th, and 14th; fog on 1st & 27th.

**SEATHWAITE.**—Nearly 4 inches below the average, though having eight days on which the fall exceeded an inch. A moist, damp month, with but little frost; last week remarkably fine.

## W A L E S.

**ABERCARN.**—Heavy rain storm on 1st, bar. 28·6; on the 2nd a great and sudden change of temperature, the max. being 51° in the day and 31° at night. A dry, calm month, generally fine and genial weather, but cold.

**Haverfordwest.**—December commenced cold, wet, and stormy; heavy fall of S, with severe gale from N.N.W., followed by sharp frosts; the month generally was about the average of cold, wet, and frost, there having been eleven frosty nights; the year ended with intense frost, clear sky, and N.E. wind.

**CEFNFAES.**—A month of variable weather; nights frosty, rain in the afternoons; prevailing winds, N.W. and N.E.

## S C O T L A N D.

**DUMFRIES.**—The weather has been variable, but on the whole favourable for the season; a few days' keen frost in the first week; the second week fine and mild; in the third week some frost, followed by several foggy days; the month closed fine and frosty. Temp. 3°·5 below that of corresponding months; S on 2nd, 5th, 18th, and 20th.

**HAWICK.**—December, except at the beginning of the month, has been mild, moist, and misty. All kinds of farm out-door works have been prosecuted with vigour, and ploughing is much farther advanced than it usually is at this season of the year; fortunately, also, for out-door labourers, the openness of the weather has allowed all sorts of work to go on without interruption.

**AUCHENDRANE.**—The amount of cloud and the temperature are below the average (for December) of 11 years; as is also the velocity of the wind, but there was a very severe storm of the rotating kind on the 1st and 2nd. The rainfall, though considerable, is below the average; the temperatures have been variable, indicating the alternating influence of the Polar and Equatorial currents. The weather throughout December may be stated as very fine for the season of the year, and very superior to that of December, 1866.

**NOOKTON.**—Month variable—mild and fine, again cold and stormy.

**DEANSTON.**—Gale on evening and night of 1st from N.N.E. ; also on the night of 6th from N.W. ; weather very dry till the 14th ; no S during the month, except about three-quarters of an inch on the evening of the 20th, and no severe frosts, 22° being the lowest temp.

**LOGIERAIT.**—A continuance of strong easterly gales from 1st to 8th ; considerable rainfall on 14th and two following days. On the whole a very fine month, many of the days quite spring-like.

**BALLATER.**—Sharp S storms in early part of the month ; latter part fine for the season, with a steady high bar. Bat seen flying on the evening of the 26th. Fresh S storm commenced on the 31st ; it has come on about the same time for the last four years.

**ABERDEEN.**—Bar. and Ther. a little above the average, and rainfall a little below it. N.W. and S.W. winds rather more frequent than usual ; but the pressure rather less. The month, with the exception of the short sharp storm at the commencement, was mild, quiet and dry for the season. Auroræ on 3rd, 18th, 24th, and 27th. L on evening of 7th, 12th, 13th, 14th, 16th, 17th, 19th, 25th, and 27th ! H on 2nd and 20th ; fog on 21st ; lunar halo on 9th.

**CULLODEN.**—S on the 1st, 2nd, 3rd, 5th, and 6th ; H on 13th ; and L on 14th. **ROSSE PARSONAGE.**—Nothing special to say of the month of December, and the year ended seasonably with hard frost. Much S with N.E. wind on the 1st ; S low on the hills on 17th ; L on 16th.

**PORTREE.**—A tremendous gale from 2 a.m. on the 1st till 4 p.m. on the 2nd with H and S showers ; afterwards the month was very mild and open, but, as usual, very wet. T L on the evening of 16th, and bar. only 28.955 corrected ; falling stars on the evening of the 17th.

**LOCHBROOM.**—As November ended so December began, very stormy, and continued of the same unchangeable character, only varying in form and intensity, until the 20th, when it began to abate, by the 23rd it had become beautiful weather, which continued to the end of the month. During the month we had an inch of R on three days, two in succession, and R on every day except the last three.

**SANDWICK.**—December has been rather drier and colder than the mean ; the first part of the month was cold and stormy, while the last nine days were dry, mild, and moderate, and the last three unprecedentedly calm. Ground covered with S on the 1st ; gale from 6.45 a.m. on 1st to 7 p.m. on 2nd, wind from 50 to 60 miles an hour. It will be noticed that the gale of the 1st commenced much earlier than in England, as is generally the case with a gale from the N. ; it was also very sudden. Auroræ on the 1st and 31st. Large lunar halo on 4th. Gale on 22nd from noon till 8 p.m., 45 miles an hour.

#### I R E L A N D.

**MONKSTOWN.**—Severe gale commenced suddenly at 1 p.m. on the 1st. Very dense fog on the 27th. Commencement of month cold, but the latter half was at times mild and warm, accompanied by a good deal of fog and damp. Lunar halo 8 p.m. on 3rd.

**DOO CASTLE.**—1st and 2nd were most tempestuous, H showers very fierce ; from 7th to 25th mild and open, from which time to close of the month we have had pretty severe frosts.

**OWENDOON.**—More than an inch of S fell on the 1st, some of which remained for three or four days.

**WARINGSTOWN.**—Heavy squalls and S showers on the 1st and 2nd ; a fine month on the whole, very favourable to winter work ; rainfall under the average ; very little frost.

**LECKPATRICK.**—First week S with northerly winds ; on 1st bar. 29.165, wind N., S all day ; on 2nd, bar. 29.969 ; latter part of month mild and fine. Laurels throwing out their flower buds, wild primrose and Christmas rose in flower.