



ANEMOMETER AT KENSINGTON PARK GARDENS.

# SYMONS'S

## MONTHLY

# METEOROLOGICAL MAGAZINE.

LXII.]

MARCH, 1871.

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

### ANEMOMETRY AT KENSINGTON.

*To the Editor of the Meteorological Magazine.*

SIR,—I send you a small Table, which perhaps you may think of sufficient interest for a place in your Magazine. It gives the mean velocity of the wind in miles, as registered by my anemograph for every hour of the day for 9½ months [during rather more than a month my instrument was being altered, and for a month I was away from home] of last year.

*Table of the Mean Velocity of the Wind in Miles for every hour of the Day from Noon to Noon.*

1870.	1st.	2nd.	3rd.	4th.	5th.	6th.	7th.	8th.	9th.	10th.	11th.	12th.
January .....	9.9	9.5	9.3	8.7	8.1	8.1	7.6	8.2	8.3	8.5	8.2	7.5
February .....	13.0	13.5	13.5	12.9	12.4	11.9	11.5	11.3	11.3	10.8	11.0	11.3
March .....	11.9	11.3	11.6	11.7	11.2	10.1	9.5	9.5	9.1	9.0	8.5	8.3
April 1 to 24.	9.3	9.7	9.8	9.6	9.5	9.4	8.3	7.3	6.9	6.5	6.0	5.4
June 4 to 30.	11.6	11.5	11.8	12.5	11.6	12.3	10.6	10.0	8.7	8.2	7.5	6.5
July .....	10.5	10.9	10.8	11.5	10.8	10.8	10.4	9.1	7.5	7.3	6.5	6.5
Sept. 15 to 30	9.3	8.8	8.9	9.4	7.9	7.9	7.2	7.0	6.7	6.1	5.9	5.5
October .....	14.0	13.2	12.7	12.1	10.7	10.6	10.4	10.3	10.2	9.6	9.8	10.0
November ...	9.6	9.1	9.1	8.9	8.1	8.6	8.2	8.2	7.4	7.5	7.5	7.4
December ..	10.4	10.5	10.2	10.1	9.0	9.1	9.6	9.4	9.5	9.5	9.7	9.7
Means .....	10.9	10.8	10.8	10.7	9.9	9.9	9.3	9.0	8.6	8.3	8.1	7.8

  

1870.	13th.	14th.	15th.	16th.	17th.	18th.	19th.	20th.	21st.	22nd.	23rd.	24th.
January .....	7.2	7.5	7.8	8.4	8.3	8.6	8.2	8.2	8.6	8.8	8.9	9.4
February .....	10.1	10.1	10.1	10.3	10.5	11.0	10.3	10.8	11.4	12.4	12.5	12.4
March .....	8.7	9.0	8.9	8.5	8.8	9.1	9.3	9.7	10.5	10.8	10.8	11.5
April 1 to 24.	4.6	4.6	4.5	4.3	4.0	3.6	3.8	4.8	5.8	7.4	7.3	8.4
June 4 to 30..	6.5	6.7	5.7	5.9	5.8	6.8	7.4	8.7	9.1	10.1	10.9	11.5
July .....	6.2	6.2	5.8	6.0	6.2	6.3	7.1	8.1	8.3	9.1	9.6	9.9
Sept. 15 to 30	4.9	4.5	4.1	4.1	4.7	4.7	4.6	4.8	5.8	6.7	8.3	9.1
October .....	9.2	9.3	9.1	9.2	9.0	9.6	9.2	10.0	11.3	11.7	12.9	13.6
November ...	6.6	6.8	7.0	6.6	6.5	7.2	7.1	6.9	7.5	8.0	8.7	9.2
December ..	9.0	9.1	9.0	9.6	9.2	9.2	9.2	9.0	8.6	8.7	9.6	9.9
Means .....	7.3	7.4	7.2	7.3	7.3	7.6	7.6	8.1	8.7	9.4	9.9	10.5

The hours are reckoned from noon to noon, the first hour being from noon to 1 p.m., and so on ; and the chief point of interest is the decided tendency of the wind to lull from midnight till 5 a.m., and to freshen from 10 or 11 a.m. till 4 or 5 p.m.

This tendency would perhaps show itself more clearly if my anemometer were more freely exposed than it is, for though apparently well placed, the effect of houses in breaking up and checking the velocity of the wind is very marked.

As a caution, it may perhaps be as well to describe the position of my anemometer, and how and when the wind's velocity is checked. My house itself stands high, as the two terraces which form this street are on a narrow ridge about three-eighths of a mile long, running E.N.E. to W.S.W. nearly, the ground sloping down on all sides, rapidly to the S., S.W., W., N.W., N., and N.E., and, excepting to the S. (in which direction lies the high ground of Notting Hill itself, but distant nearly three-fourths of a mile), there is no high ground for miles. My house is on the Northern side of the street and about one-third down from the E.N.E. end of it, and the roofs of all the houses (excepting two, which, however, are not near mine) are on the same level, or nearly so ; and on the Southern side of the opposite terrace is a large open square, and on the Northern side of my terrace is a smaller square, all the houses beyond being much below our level. The cups of my anemometer are 14 feet above the chimney-pots and 22 feet above the walls of the house, and early on a fine summer morning the view from its stand over London and the country to the N., W. and S. is very fine. Notwithstanding, however, this apparently good exposure, nearly always the velocity of the winds from between E.S.E. through S. to W.S.W. is registered below (and considerably so when they are fresh to high) what it is at Kew, as the opposite row of houses, though not continuous but in blocks with spaces between, acts as would a cliff, and throws the wind up, so that it does not reach my cups with its steady full force, but with many lulls. With winds from other quarters my register is generally much the same as at Kew, though even then, when the wind is high, it seems to be much broken by plunging into and again out of the streets and squares, so that I fancy no anemometer within a town, unless raised on some high narrow building, as a church spire, would give the wind's real velocity. Even at Kew, the velocity registered is, I believe, low, and this may, I think, be accounted for by the interference of the many trees near the Observatory, for trees, if close together, would of course have something of the same effect as houses. To give anything like true results as regards velocity, an anemometer should be in a tolerably open country, and well raised above the ground on a narrow building.

I remain, yours faithfully,

R. H. BARNES.

40, Kensington Park Gardens, London, W., Jan. 30, 1871.

[Believing that the influence of *position* on anemometric results is so great that there are scarcely two anemometers in the country, the

indications of which are comparable, we requested Mr. Barnes' permission to have a sketch made, showing the position in which his has been erected ; the result is shown in the frontispiece.—Ed.]

## ERRONEOUS MINIMUM TEMPERATURES.

*To the Editor of the Meteorological Magazine.*

SIR,—In the January number of the *Meteorological Magazine* some observations were made on the discrepancies of minimum readings of thermometers, during the Christmas frost the minimum of the period ranging from  $28^{\circ}$  in Westmoreland to  $-9^{\circ}$  in Norfolk on the night of the 25th.

Now to any one looking down the columns of these minimum readings on the same night, and observing the strange discrepancy between the registries of different observers, there can be no satisfactory explanation of the anomaly, except that it has arisen from the imperfection of the instruments now in use.

For the last seven years I have been registering observations from thermometers, one minimum being suspended 4 ft. above the ground and another on the grass. Both are on Rutherford's principle, one by Negretti and the other by Casella, the best of their kind, and graduated on the stem. My suspicions were lately excited by several very low readings, and, on placing them on the grass alongside of two Kew verified mercurial thermometers, I find, after about thirty observations, that the grass instrument reads about  $8^{\circ}$ , and that, usually suspended in air, about  $4^{\circ}$ , *too low* : consequently all my observations for the last seven years are utterly worthless as regards actual min. temperature, as well as mean temperatures deduced from maximum and minimum readings. I have tried Casella's mercurial minimum, and find it most unsatisfactory. As to the colouring of the spirit, one month's exposure has completely bleached every instrument, and no efforts of restoring these instruments, by swinging and suspension bulb downwards, is of any use. From this discovery I am quite satisfied that *all* minimum observations, as now recorded by spirit thermometers, are valueless, and until our instrument makers can overcome the difficulty of manufacturing a mercurial minimum, observers may cease quoting their minimum temperature.

My lowest temperature of 1870 was  $10^{\circ}$  on the grass, applying the correction as deduced from observation, on the supposition that the variation is the same at all temperatures, it would appear that 18 or 19 was the correct reading. If other observers will compare their minimum with a verified mercurial thermometer, I think they will find similar errors. A minimum by Casella, very little used, is only about a degree low, but a little exposure would soon increase this error. It is hard for an observer to throw into the fire the readings of 2,555 observations.—I am, Sir, your obedient Servant,

CHARLETON MAXWELL.

*Leckpatrick Rectory, Strabane, March 6th, 1871.*

## HOW OUGHT THE TEMPERATURE AND RAINFALL TO BE ENTERED ?

*To the Editor of the Meteorological Magazine.*

SIR,—With regard to rainfall, I believe that all, or nearly all, observers will be prepared to subscribe to the “dictum” quoted with approval in your editorial remarks for January. But, as regards the entry of the temperature, I venture to think that there are some valid objections to the plan there recommended, which should at least be fairly considered before it is sanctioned by authority. Perhaps a few examples of the inconveniences which would result from a rigid observance of that rule will put the matter in a clearer light than any mere general observations.

1. The temperature at 9 a.m. on a given day in winter stands at  $5^{\circ}$ , but, during the day, a rapid rise of temperature takes place, and, the thaw continuing, the temperature remains above the freezing point throughout the following night. Yet, if, according to the stringent rule recommended in your January number, the index of minimum thermometer must not be moved during the day, the minimum of the following day, read at 9 a.m., will of course indicate  $5^{\circ}$ , the temperature of the thermometer at 9 a.m. on the previous day, and there will be nothing to show that the previous night has not been one of intense frost—the effect being, as Dr. Burder well puts it, “to give to an exceptional extreme double its proper value.”

2. In a comparatively mild winter there occurs a short frost of such severity that, though it lasts altogether only three or four days, the temperature on the last day of its continuance shows a maximum of only  $14^{\circ}$ . But in the night following this day of intense cold a sudden change of wind brings about a very rapid thaw, so that at 9 a.m. of the following day the thermometer stands at  $38^{\circ}$ . Now, according to the rule in question, the maximum temperature for the previous day, read and entered at 9 a.m., would of course appear as  $38^{\circ}$ , and thus the interesting fact of the occurrence of a day of almost arctic severity, in the midst of a mild season, passes unrecorded.

3. I will mention one other case, of frequent occurrence in spring and early summer, where the method of entering recommended by your correspondent would be very liable to mislead. After an exceptionally cold period, a wave of heat, coming up from the south, begins to make itself felt early in the morning of a given day, so that the temperature at 9 a.m. of that day is higher than the maximum of the previous day. Here, again, if the rule is to be stringently acted on, the high temperature prevailing at 9 a.m. of this day will be entered as the maximum of the previous day, and the impression will be produced that the warm weather commenced a day sooner than was actually the case.

I may add, that if this rule is to apply, as in consistency it ought, to the case of the Solar Radiation Thermometer, the effect would be to introduce a similar element of confusion on every occasion when a sunless day happens to be followed by a bright sunny morning.

My own conviction is that no system of registration is satisfactory which does not provide for at least two observations during the day. But if this should be found practically unattainable, and the "stringent rule" recommended by your correspondent be generally adopted, there ought, at any rate, to be another "stringent rule" coupled with it, viz., that the actual temperature at 9 a.m. should, in every case, be entered with the extremes read at that time. This would obviate much, if not all, of the confusion which would otherwise result from such a method of entry.—I am, Sir, yours truly,  
*Sutterton Vicarage, March 3rd, 1871.*

GEORGE T. RYVES.

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*To the Editor of the Meteorological Magazine.*

SIR,—I forward a few notes on recent temperatures, illustrative of the acknowledged difficulty in fixing an hour for observation.

February 21st.—Minimum as noted at 9 a.m.,  $38^{\circ}9$ ; minimum before midnight,  $29^{\circ}5$ ; minimum noted at 9 a.m. of Feb. 22nd,  $31^{\circ}0$ .

February 25th.—Minimum noted at 9 a.m.,  $42^{\circ}4$ ; temperature at midnight,  $38^{\circ}1$ , having risen to that point from  $32^{\circ}3$ , the true minimum of the day at 8 p.m.

March 8th.—Minimum noted at 9 a.m.,  $39^{\circ}1$ ; temperature at 9.30 a.m.,  $38^{\circ}5$ .

There is plainly nothing for it but to supplement the usual 9 a.m. observation by one at 9 p.m., or later, if possible. As a rule, however, 9 p.m. would catch most of the abnormal minima, the majority of them occurring before that hour. The maxima are hopeless, except to folks who go to bed at 1 a.m.—Yours faithfully,

T. B. ARMITSTEAD, F.M.S.

*Hutton House, Burton, Westmoreland, March 8th, 1871.*

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*To the Editor of the Meteorological Magazine.*

SIR.—My name has appeared in your columns so often of late, that I must apologise for so soon again intruding on your space. This matter appears to me so very simple and easy of adjustment, that I venture to trouble you with my view of the subject. As you justly remark, "some of us will have to relinquish a pet practice;" but surely this matter should be decided, like most others at the present day, by the opinion or custom of the majority. I take it for granted that by far the greater number of observers read only once a day, at 8 or 9 a.m., mostly at the latter hour. The rainfall difficulty is, I believe, settled by entering the reading at 8 or 9 a.m. to the preceding day, owing, I presume, to the fact of 15 of the 24 hours belonging to that day. The max. temperature is also, I believe, now usually entered to the preceding day; the reason of this no doubt being the fact of the max. temperature occurring on that day at least 350 out of the 365 days of the year. Why, I would ask, should not the same rule apply to the min. temperature? On 350 days at least the min. temperature occurs on the day of reading. Could not the Council of the Meteorological

Society be induced to take the matter up and issue a circular on the subject to the Fellows? This state of "muddle" is neither pleasant nor profitable, and ought to be promptly put an end to.

Yours faithfully,

JOHN THRUSTANS, F.M.S.

Wolverhampton, Feb. 22nd, 1871.

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*To the Editor of the Meteorological Magazine.*

SIR,—The reveille you sounded in your January number seems to have awakened a few observers out of a meteorological dream by the correspondence which has followed. Surely every one is aware of the fact that the rule of registering extremes of temperature at 9 a.m. is not an infallible one, but it has been in use since the invention of self-registering thermometers in the arctic region and torrid zone. It is very easy to find fault, but it is not quite so easy to suggest a remedy. Do not think that I admire individual obstinacy. I can understand a change when it is clearly demonstrated that it is essential, but I certainly deprecate them when they are not necessary. I have looked over the list of Fellows of the Meteorological Society, and, judging from the duties of the generality of them, a more suitable hour could not be adopted, and many of them would not feel disposed to give up a "lucrative appointment" to devote themselves to the subject. For the minimum to occur at 9 a.m., even in the winter months, at this station is of very rare occurrence; it has not exceeded half a dozen times in a period of over thirteen years. However, if you alter the time of reading the minimum, we must alter the time of the maximum also.

I conclude by quoting the following from the *Admiralty Manual of Scientific Enquiry*, page 283 :—

"Both the self-registering thermometers should be read off at the time of the 9 a.m. observation, as it is very improbable that the temperature at that hour should be such as to obliterate either record of the preceding twenty-four hours. Double maxima and minima, when they occur, if remarkable, should be recorded as supernumerary and separately in a diary, and their accompanying circumstances noted."

Yours very truly,

JOHN ARNOLD, F.M.S.

Aldershot, March 2nd, 1871.

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## SUGGESTED AMENDMENTS IN RAINFALL RULES.

*To the Editor of the Meteorological Magazine.*

SIR,—While wishing to comply with your requests, and willing to conform to the practice of a decided majority of observers by waiving my individual opinion, I would enter my humble protest against the general adoption of your proposed Rules XII. and XV.

The discussion, two years ago, in your valuable Magazine on the registration of small quantities of rain, treated only of the respective

merits of different systems of *incorrect* registration, but why should not all observers consent to the very small, if any, additional trouble of registering even small quantities *correctly*, recording 0·001 as 0·001, and 0·009 as 0·009.

The observance of your suggested Rule XII. presents various anomalies, such as two days of 0·005 each being recorded as 0·020, while three days of 0·004 each are recorded as 0·000.

With, if not without, a spirit level there is no more difficulty in reading 0·001 of rain than 0·001 of the barometer scale.

An important object of rainfall observations being to ascertain and record the quantity of moisture reaching the earth, Rule XV., for measuring snow, seems to me a bad one; for, supposing 12 in. to fall and be melted the morning following, it will show the equivalent of 1·000 in. of rain; whereas, if the gauge were left undisturbed, as I would suggest, till a thaw, half the snow might have evaporated, and the remainder, melting into the gauge, would show but 0·500 in., and represent the amount of moisture really reaching the earth.

Yours truly,

PERCY BICKNELL.

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*To the Editor of the Meteorological Magazine.*

SIR,—As you offer to observers to object to, or suggest improvement in, any of your “Suggestions” enclosed, and to forward substitutes with reasons, may I be allowed to offer the following:—

Substitute for last three lines of No. I. If a thoroughly clear site cannot be obtained, shelter is most endurable from N.E. and S.E., less so from N.W. and W., and not at all from S., S.W., or N.E.

In X., line 6, after “decimal point,” add, “but three figures are preferred.”

In XI., at the end, add “particularly when the fall exceeds ·50.”

XII. I object to this, but prefer to measure anything under ·01.

XV. (1) You say “*melt* what is caught, &c.” I think it should be added, which is the best way of *melting* snow, either—

(a). If the quantity is small, by breathing on it; or,

(b). By bringing it into a warm room, and letting it melt slowly; or,

(c). By bringing it near to a fire; or,

(d) By adding to the snow a previously ascertained quantity of hot water, and then deducting this quantity from the total measurement.

Of your divisions, 1, 2, and 3 of XV., I prefer 1; and of *a*, *b*, *c*, and *d*, I prefer *d*.

XVII. I think some instruction is required, in the case of monthly gauges in frosty weather, if the water collected should be frozen, whether to melt it, and how, or how otherwise.

*Reasons for substitute or addition to*

I. Because rain from S. is so frequently accompanied by wind, and sometimes strong wind.



Because rain from S.E. is generally while it is calm, or only very slight wind.

Because although it does not often rain from N.W., yet when it does, it is often after a sudden shift from W. in a squall, and sometimes violent wind.

These reasons are founded on close observation of the anemometer records.

XII. Because any quantity which is large enough or capable of being measured ought to be measured and entered. This is not intended to conflict with your rule that '01 constitutes a 'rainy day.'

XV. There seems not much to choose between 1 and 2, but both are preferred to 3, because snow is not always of the same density, and therefore one-twelfth would not be always the right equivalent.

$d$  is preferred to  $b$  and  $c$ , because in  $b$  and  $c$  there must, it would seem, be always more loss by evaporation;  $a$  not practicable, except when the quantity is very small.

Reasons for additions to the other "Suggestions" referred to are either given or will speak for themselves. C. O. F. CATOR.

## A GUIDE TO THE RAINFALL IN FUTURE.

*To the Editor of the Meteorological Magazine.*

SIR,—I have been drawn to the conclusion that our rainfall season commences not on January 1st, but at sometime in the autumn; and that the wetness or dryness of any summer will be indicated by the wetness or dryness of the preceding winter.

I have been for sometime engaged in investigating this law, and have found that, as far as my observations for this place (Hayward's Heath) go, it is as follows:—

If  $R$  represent the rainfall in any year, and  $n$  be the next whole number not less than the number of inches of rain between Nov. 1st and March 1st immediately preceding, then  $R$  will lie between  $2n$  and  $2(n+1)$ .

Now the rainfall here, during the past four months, has been 9.95 in. I venture, therefore, to predict that the rainfall for this place, for the year 1871, will lie between 20.00 in. and 22.00 in.; in other words, that this year will be at least as dry as last year, in which the rainfall here was 21.80 in.

I hope, when I am in possession of monthly records of rainfall up to the end of last year, to be able to investigate this law for other parts of the country.

I am only in a position now to add, that for Middlesex, as represented by the three stations at Hammersmith, Camden Town, and Hampstead, the law indicated by the data now in my possession seems to be as follows:—

If  $R$  = rainfall for the year in inches,  $n$  = whole number next to the number of inches for November 1st to March 1st, then  $R$  lies between  $3n$  and  $3(n+1)$ .

Perhaps you may be able to procure the value of  $n$  on the average of the three stations I have named for the last four months, and then we shall see, at the end of the year, what difference there may be between the calculated and the actual value of  $R$  for Middlesex for this year.

Of course I am aware that the returns for the last three years and further investigations may lead to a modification of this law, but I am almost convinced that some such law exists. I am prepared to find that occasionally the law, as at present enunciated, seems to fail when the following year is to be wet and the rainfall at the end of the year is large.—Yours truly,

THOMAS E. CRALLAN.

*Hayward's Heath, March 1st, 1871.*

### WINTER PREDICTIONS.

*To the Editor of the Meteorological Magazine.*

SIR,—Your correspondent in December, in his article written to prove that severe winters succeed dry summers, introduced the winter 1864-65 as a hard winter. With us it was quite the reverse, but his theory is indeed strengthened by the appalling winter we are now groaning under. The following little table may interest your readers :—

			1855.		1860-61.		1870-1.
Mean daily temperature .....	28 days	.....	27·0	.....	25·0	.....	24·5
" " " .....	12 "	.. .	21·4	.....	24·3	.....	18·9
" " " .....	7 "	.....	20·4	.. .	20·2	.....	19·0

The winter of 1860-61 followed a very wet summer. These are the three memorable winters since I have been a follower of the fox, which makes one very keenly sensible of a long frost. My record does not go back beyond 1849, but I think we must go back to the time of the first Napoleon for a winter as severe as the present.—Yours obediently,

W. LUCAS.

*Hitchin, Feb. 2nd, 1871.*

*To the Editor of the Meteorological Magazine.*

SIR,—The mean temperature of the three months ending February 28th, 1871 (at the Royal Observatory, Greenwich), was  $36^{\circ}4$ , which is  $2^{\circ}1$  below Mr. Glaisher's adopted average of 50 years, and  $1^{\circ}5$  below the average of 99 years. Except in 1865, when the mean temperature of January to March, inclusive, was  $2^{\circ}04$  below the average of 99 years, so severe a winter period of three months has not occurred at Greenwich since 1855.

The mean temperature of December, 1870, and January, 1871, at Greenwich, was  $33^{\circ}4$ . This is colder than the corresponding period of any other winter since 1830. In 1840-41, however, the mean temperature of December and February was almost as low.—I am, &c.,

GEORGE D. BRUMHAM.

*Barnsbury, March, 1871.*

## STORM AT KILKENNY.

*To the Editor of the Meteorological Magazine.*

SIR,—A rotatory storm of a very violent nature passed across Kilkenny on the morning of the 10th February. I was a guest at the Deanery, at the time, and happened to be lying awake about 3 o'clock a.m. The evening before and the night had been blustering, the wind S., veering to S.S.W. towards dusk, with squalls of rain. About half-past 3 a.m. the house was struck by a sudden squall, which rapidly increased in violence, until it became a perfect hurricane, the wind shifting from S.S.W. to W. and N.W. In about half an hour the storm moderated, and I fell asleep. Next morning Kilkenny presented the appearance of a bombarded town—chimneys down, gables fallen into the street, great chasms in the roofs of nearly every second house, the streets littered with slates in every direction; whilst the ancient trees in the lawn of Kilkenny College, on the Canal Walk, and in the grounds of Lord Ormonde's residence (Kilkenny Castle) were laid prostrate from the various points of the compass above indicated. At one small place, a mile north of Kilkenny, over sixty trees were blown down. At another, about the same distance south, great devastation was apparent amongst the old timber; whilst here, six miles south-west of Kilkenny, very little damage was done.

I append some cuttings from the *Kilkenny Moderator* of the 11th and 15th of February. The barometer did not fall below 29·50, which will account for the destructive effects of the wind.

TERRIFIC STORM.—Yesterday morning we were visited with, by many degrees, the most serious of all the storms of this stormy winter. There was no premonitory symptom or gradual rising of the wind, but just before four o'clock a.m. it suddenly burst over our city like an eastern tornado, shaking every house and building in such a way as to waken up all the sleepers; and for more than an hour the shocks of the wind, coming from the north-west, was repeated momentarily, rocking the buildings, dashing in windows, carrying away slates, tiles, and chimney-pots in showers, and in many places levelling houses to the ground. The scene which our streets presented when day broke was extraordinary. Ruin and devastation was to be seen in various districts, and under several houses the highway bore the aspect of a slate-quarry. There was scarcely a house in the city which was not more or less stripped of slates, and we should say not a single one which did not receive at least some damage to windows, ridge-poles or chimney-pots; however, as regards more serious injury, the entire front gable of the old Elizabethan house, occupied by Miss Birch, corner of Bull-alley, fell out into the street from the second story. Four smaller houses were levelled at Greenshill. The end gable of Miss Dunne's house, in Walkin-street, fell bodily into Mr. Brophy's stone-yard adjoining, and the front now leans into the street in the most threatening and dangerous way. At Newpark House, a stack of chimneys fell through the roof, and narrowly missed falling on the bed in which a member of Colonel Bull's family was sleeping. Some plate-glass windows at Kilkenny Castle were blown in. Seven large stones were knocked off the parapet of the ancient Round Tower at St. Canice's Cathedral. The roof of the south transept of the Roman Catholic Cathedral was much injured. At St. Kyran's College, the pinnacle and carved stone cross which surmounted it were dashed from the great central-gable to the ground, and some of the parapets in other parts of the building sustained injury. The vane surmounting the Tholsel cupola was crooked by the force of the gale. The fine old elms on the Canal-walk were severely dealt with. Sixteen trees on that promenade were blown down, to say nothing of the broken branches;

and amongst them were five of those growing at the narrow part of the walk, a strip of the Castle demesne ground to widen which was given by the Marquis of Ormonde in 1861. Some of those, in falling, broke down the Castle wall. In the College-lawn, seven of the remaining trees of the line of splendid old tall poplars, which formed so striking a feature to the eye of the visitor in search of the picturesque, now measure their length upon the sward. Some trees were also blown down in the Castle grounds; and all along the various roads leading into our city, the traffic from the country was seriously impeded in the morning by the many trees lying across the way. Much damage has been everywhere done, the only consolation being that no life seems to have been lost, nor even any serious personal injury sustained.

**THE STORM OF FRIDAY MORNING.**—We find that although the hurricane of Friday morning last was not as general as we had supposed it might have been, it was very destructive to property in a considerable portion of this county. From Limerick, Ennis, Parsonstown, Carlow and Cork, we have reports of the serious effect of the severe gale; but it was not felt in Dublin, or even Waterford, although on Saturday night the latter district was visited by a storm, when everything here was calm. It is curious that from one place in England, and one only, we have the report of a storm, attended with serious loss of life, on Friday—Bridlington—a seaport in East Yorkshire. In our own city, the damage done to house property is more severe than we had even supposed when announcing the results of the storm in our last issue. Amongst public institutions which we had supposed at the time to have escaped damage, the County Gaol, the Military Barracks, the Lunatic Asylum and the Militia Stores, old House of Correction, suffered considerable injury. Throughout the northern and middle portions of our county the number of trees everywhere blown down is extraordinary. The southern end of the county escaped the blast.

This winter has been a very stormy one, and much rain has fallen with an unusually high barometer, accompanied by an upper stratum of calm cirrus cloud, and a lower stratum of nimbus and cumulo-stratus in rapid motion.—Yours, &c.,

JAMES GRAVES.

*Inisnag, Stoneyford, March 4th, 1871.*

## SOLAR RADIATION.

*To the Editor of the Meteorological Magazine.*

SIR,—So much doubt appears to exist as to the best mode of measuring the amount of solar radiation, that I think the subject ought to be tested in every manner possible.

I would suggest that the outer glass or jacket of the black bulb thermometer in vacuo be also blackened, as well as the bulb itself, and ground or deadened so as to render it opaque. This would prevent all chance of reflection, and it would be highly interesting to see how such a thermometer would work against those of the ordinary description.—I am, Sir, yours very truly,

W. H. E.

## FINE METEOR ON FEBRUARY 13TH.

*To the Editor of the Meteorological Magazine.*

SIR,—About a quarter past nine, on the evening of the 13th inst., happening to be in a room without a light, I was so greatly surprised to find it, all of a sudden, most brilliantly illuminated, that I rushed to the window to ascertain the cause, when I perceived that the whole country round—even to its minutest features—was as clearly visible as at noontide: but irradiated with a bluish tinge, more resembling full-moon light than solar effulgence. Casually casting my eyes

upwards, in search of an explanation, I was just in time to behold (at an elevation of about  $70^{\circ}$ , and in a westerly direction,) the explosion of what appeared to me to have been a splendid meteor—a fact since confirmed by various newspapers. The duration of the whole affair was probably a minute.

I forward you this account simply under the impression that it may tend to verify the extent of country over which the phenomenon was visible. The night was a clear starlit one, with a sky perfectly free from clouds.—I remain, Sir, yours truly,

F. BONNYCASTLE GRITTON.

*West Tytherton, Chappenharn, Wilts, Feb. 22nd, 1871.*

#### A METEOR.

*To the Editor of the Devizes Advertiser.*

SIR,—Last Monday night, about ten minutes past nine, a most brilliant meteor was seen here. It appeared to have begun near the belt of Orion, and proceeded in a southward direction, gradually getting smaller till it finally disappeared near the horizon. It was about the size of a cannon ball, exploded twice inaudibly, and gave off many smaller ones, like a display of fireworks. The light emitted was as bright as that of the sun at noon, and continued more than a minute. A streak of light was visible in its track for five minutes. Hoping to see a fuller account from some of your numerous readers, I am, &c., C.  
*Calne, Feb. 14th, 1871.*

[A correspondent, writing from Bristol, says that he observed the meteor at about five minutes past nine o'clock, and that the whole sky was illuminated by its light. When at its brightest, the light was equal to that of the moon when half full, and it left a train of about two degrees in length, which remained distinctly visible for ten minutes after the meteor was extinguished.]

#### EARTHQUAKE OF MARCH 17TH.

*To the Editor of the Meteorological Magazine.*

SIR,—I felt a decided shock of earthquake on Friday night—a curious noise and shaking of the house. It lasted but a few seconds, not so long as the last one, two or three years ago. Several of my neighbours in the Vale of Clwyd felt it, also the servants at the other end of the house. I was particular in timing it, and had corrected my watch by the railway telegraph that morning and also next day by a reliable time-keeper. I believe it to have been a few seconds before 11.5 p.m. The night was quite still, and I was at an end of the house where nobody slept.—Yours faithfully, WHITEHALL DOD.  
*Llanmerch, St. Asaph, March 19th, 1871.*

*To the Editor of the Meteorological Magazine.*

SIR,—Last night, at 11.15, a decided shock of an earthquake was felt in several parts of this house, accompanied with a rumbling noise.

A picture frame and candlestick were shaken out of their places. The night was very clear, and there was a white aurora in the north. This morning the weather is spring-like, and the snow and cold of the last few days have disappeared.—Yours, &c.,

THOS. DODGSON.

*Thorpe Grange, Greta Bridge, Darlington,  
18th March, 1871.*

# RAINFALL IN NORWAY.

WE are again indebted to Mr. Cator for translating and favouring us with a copy of the observations made at Flekkefjord, in continuation of those which we have published for several years :—

Diameter of Funnel, 12½ in. ; Height above Ground, 8 ft. ; above Sea Level, 18 ft.

Month.	Total Depth.	Greatest Fall in 24 hours.		Days on which .01 or more fell.	Days of Snow.
	English ins.	Depth.	Date.		
January ..	3·384	·480	1 & 8	12	6
February ...	·964	·366	27	7	6
March .. ...	1·356	·299	2	11	7
April .....	3·222	·825	10	12	...
May .....	3·033	·638	1	14	...
June .....	1·343	·765	12	11	1
July .....	2·741	·493	17	11	...
August ...	2·770	1·133	13	15	...
September.	3·677	1·522	6	15	...
October ...	9·254	2·598	24	14	...
November..	4·676	1·059	17	14	...
December ..	1·475	·274	18	10	6
Total .....	37·895	...	...	146	26

On the 11th of June, there fell so much snow that the nearest hills were covered, down to within 50-100 feet of the base, as if it was in winter ; the snow melted very soon again. In about two hours .765 in. of rain fell ; thermometer at 4 p.m., 41°·0 ; at 5 p.m., 39°·2 ; and at 10 p.m., 43°·2, and bright weather. No one can remember it so cold at this time.

On the 13th of August, from 2.30 to 3 p.m., heavy rain, with hail-stones as large as a hazel-nut ; in this half-hour there fell 1·013 in., thunder and lightning in two directions, and a hurricane-like storm. The hail destroyed much corn, and the telegraph was affected. In August there was thunder weather daily for about two weeks or so ; otherwise, of late years, uncommonly little thunder in the summer, but rather more than usual in the winter.

On the 8th of October, 28°·6 in. ; 11th, 23°·0 ; and 14th, 27°·5 in. So early a frost and so hard on October 11th, no one can remember ; there was even ice on the Fjord.

On the 16th of November, hail, snow, rain, and thunder.

On the 17th of October, 1·386 in. fell in ten hours. In October, four days in which upwards of 1 in. fell.

We have had a severe winter, the frost has reached + 0°·5 ; frequently, however, 9°·5, 5°·0, 3°·0, and sometimes only 27°·0. ; but fine weather, such as we can have in Norway. The weather has been generally calm, few storms, and of short duration ; the greatest one lasted two days.

JENS BEER.

January 10th, 1871.

## FEBRUARY, 1871.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which ·01 or more fell.	TEMPERATURE.				No. of Nights below 32°	
		Total Fall.	Differ- ence from average 1860-5	Greatest Fall in 24 hours.		Max.		Min.					
				Dpth	Date.				Deg.	Date.	Deg.		
												inches	inches.
I.	Camden Town .....	1·27	+	·05	·31	7	14	56·2	27	25·8	12	3	7
II.	Maidstone (Linton Park).....	1·07	—	·44	·54	10	13	56·0	8*	23·0	12	6	...
III.	Selborne (The Wakes).....	1·78	+	·07	·28	12	15	53·0	27	23·5	11	5	6
III.	Hitchen .....	1·20	—	·06	·31	7	15	55·0	27	25·0	10††	4	...
IV.	Banbury .....	1·20	—	·23	·28	7	15	55·0	27	27·0	12	7	...
IV.	Bury St. Edmunds (Culford).....	2·07	+	·65	·80	10	12	57·0	27	22·0	11	7	11
V.	Bridport .....	2·26	+	·20	·40	9	18	56·0	6	27·0	22	6	...
"	Barnstaple .....	2·68	+	·60	·53	6	22	57·0	17	31·0	22	...	...
"	Bodmin .....	3·69	+	·90	·52	9	22	57·0	18	31·0	11	1	4
VI.	Cirencester .....	1·72	+	·11	·38	26	8	...	...	...	...	...	...
"	Shiffnal (Haughton Hall) .....	1·62	+	·73	·32	7	12	55·0	27	26·0	1	8	...
"	Tenbury (Orleton) .....	1·93	+	·36	·25	9	19	55·7	23	28·6	22	6	7
VII.	Leicester (Wigston) .....	1·29	—	·05	·31	8	12	56·0	27	26·0	11	6	...
"	Boston .....	1·61	+	·40	·43	10	12	56·0	27	24·2	12	3	9
"	Grimsby (Killingholme) .....	1·78	...	...	·49	10	14	55·0	27	25·0	12	3	...
"	Derby.....	1·51	+	·03	·47	5	14	58·0	23	27·0	12	5	...
VIII.	Manchester .....	2·73	+	·78	·63	5	17	55·0	19	...	...	...	...
IX.	York .....	2·51	+	1·13	·45	10	15	56·0	19	27·5	12	2	...
"	Skipton (Arncliffe) .....	6·64	+	2·97	1·00	20	17	49·0	20	22·0	12	8	...
X.	North Shields .....	1·97	+	·44	·40	4	18	53·1	18	25·6	12	3	8
"	Borrowdale (Seathwaite).....	15·99	+	4·61	2·80	20	22	...	...	...	...	...	...
XI.	Cardiff (Town Hall).....	...	...	...	...	...	...	...	...	...	...	...	...
"	Haverfordwest .....	3·31	+	·45	·50	3, 27	15	53·0	18	29·0	10	3	3
"	Rhayader (Cefnfaes).....	4·88	+	1·90	1·50	4	20	52·0	...	26·0	...	5	...
"	Llandudno .....	2·02	+	·67	·40	5	15	58·5	22	28·7	1§§	3	...
XII.	Dumfries .....	3·93	+	1·38	·53	4	18	52·5	23+	24·5	1	6	...
"	Hawick (Silverbut Hall).....	1·91	...	...	·34	3	17	...	...	...	...	...	...
XIV.	Ayr (Auchendrane House) .....	4·53	+	1·17	·64	5	22	53·0	13+	20·0	1	4	6
XV.	Castle Toward .....	6·51	+	2·77	·91	11	22	52·0	25	29·0	1	6	9
XVI.	Leven (Nookton) .....	3·89	+	2·19	·81	4	20	50·0	18	24·0	13	10	21
"	Stirling (Deanston) .....	5·70	+	2·70	1·14	11	28	52·0	25	22·9	1	9	15
"	Logierait .....	4·08	...	...	1·02	4	16	...	...	...	...	...	...
XVII.	Ballater .....	2·39	...	...	1·40	4	8	53·5	16§	26·0	4	9	...
"	Aberdeen .....	3·99	...	...	·89	4	18	54·8	25	30·9	28	2	16
XVIII.	Inverness (Culloden) .....	·98	...	...	·25	28	17	52·0	25	26·6	3	3	17
"	Portree .....	7·52	—	2·71	1·12	18	24	...	...	...	...	...	...
"	Loch Broom .....	4·67	...	...	·65	8	26	...	...	...	...	...	...
XIX.	Helmsdale .....	4·08	...	...	1·03	6	13	...	...	...	...	...	...
"	Sandwick .....	4·40	+	1·92	·86	7	24	49·8	19	29·7	28	1	7
XX.	Cork .....	4·47	...	...	1·32	2	19	...	...	...	...	...	...
"	Waterford .....	3·93	+	1·90	·83	11	23	53·0	28	33·0	2	...	...
"	Killaloe .....	3·70	+	·79	·63	11	22	57·0	17¶	31·0	11	1	...
XXI.	Portarlinton .....	2·00	—	·03	·42	12	21	55·0	19	31·0	10	2	...
"	Monkstown .....	2·24	+	·60	·50	2	14	...	...	...	...	...	...
XXII.	Galway .....	4·78	...	...	·47	28	23	58·0	21**	30·0	1	2	...
XXIII.	Bunninadden (Doo Castle) .....	3·86	...	...	·80	10	17	52·0	14††	29·0	3	1	...
"	Bawnboy (Owendoon) .....	...	...	...	...	...	...	...	...	...	...	...	...
"	Waringstown .....	2·95	...	...	·73	11	19	56·0	16¶	31·0	2	1	10
"	Strabane (Leckpatrick) .....	2·86	..	...	·61	9	20	...	...	...	...	...	...

\* And 23, 27. † And 26. ‡ And 19, 20. || And 20, 24, 25. § And 18.

¶ And 19. \*\* And 23. †† And 16. ‡‡ And 11. §§ And 2, 11.

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

# METEOROLOGICAL NOTES ON FEBRUARY.

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 mild but dull month; no very high winds; bar. very changeable on the 10th; ther. never rose higher than  $31^{\circ}$  on the 11th; nevertheless the month must be regarded as a mild one, there being only six frosty days in it, a smaller number than on any previous occasion I have on record, excepting 1867 and 1869. The rainfall also is below the average of the last 16 years.

BANBURY.—Fog on the 2nd, snow on 1st and 11th; high winds on 5th, 10th, and 11th.

CULFORD.—High wind on 5th and 27th.

BODMIN.—Average bar.  $30\cdot01$ ; average temp.  $45^{\circ}1$ ; being  $2^{\circ}5$  above the average.

ORLETON.—The month opened with a low temperature and a cloudy sky; on the 3rd a steady thaw set in, the frost having continued 44 days. The weather afterwards changeable, with frequent slight falls of rain. The 11th was very cold and cloudy (max.  $31^{\circ}8$ ), with a rough wind from the N.E. The latter part of the month generally fine and pleasant. The temperature of the whole month was about  $2^{\circ}5$  above the average, and more than  $6^{\circ}$  above that of 1870.

WIGSTON.—Slight S on the 1st; S also on the 10th, and sleet on the 11th.

BOSTON.—Gale with T and L at 9 p.m., and during the night of the 5th; R and S on the 10th.

GRIMSBY, KILLINGHOLME.—Very variable month—stormy and wintry 10th to 12th, but more pleasant days than usual. Many turnips destroyed by frost, and straw and fodder of all kinds scarce; the work of the farm, which was backward, has gone on rapidly. 12th, very cold all day, the max. temp. being only  $38^{\circ}$ . First house-fly in the window on 8th; aconite in flower on the same day; hepatica in flower on 19th, and crocus on 25th.

DERBY.—Less rain falls in February than in any other month, as observed during 21 years; the amount recorded is slightly in excess of the mean, and the temp. is about  $2^{\circ}$  above the average; the weather has been most enjoyable, and garden operations not uncommon.

ARNcliffe.—Snow on 11th.

NORTH SHIELDS.—Snow on 1st, 10th, 11th, and 12th.

SEATHWAITE.— $2\cdot11$  in. on 6th, and  $2\cdot80$  on 20th; S on 3rd, 10th, and 12th.

## WALE S.

HAVERFORDWEST.—A mild damp month, at times very dense fogs, principally at night; prevailing winds southerly and westerly; only three frosty nights; heavy gale from N.N.E. on 21st; month ended spring-like.

CEFNFAES.—The month has been very favourable; wind generally S.E. or N.E. The soil in good order for husbandry; lark heard on the 14th; blackbirds and thrushes early in the month; catkins in full flower.

LLANDUDNO.—Bar. fell during the night of the 9th-10th,  $0\cdot950$ ; 10th, windy; 11th, snow; 12th, stormy; snow on the hills till the 16th. Thrush singing beautifully at 5.30 p.m. on 18th.

## SCOTLAND.

DUMFRIES.—The first half of the month was wet and occasionally stormy; on the night of the 12th, the heaviest fall of snow for some years, but it soon disappeared. The latter half of the month generally fine and mild. The average temp.  $4^{\circ}26$  above the corresponding month; the rainfall is also above the average. Snowdrop in flower on the 8th.

SILVERBUT HALL.—The singularly beautiful aurora on the morning of the 12th, succeeded by 10 days of very squally weather; the month, however, has been very favourable for getting forward all kinds of out-of-door work.



**AUCHENDRANE.**—This February, with a slightly deficient rain and evaporation, has been warm and moist—quite contrary to the February of 1870. The mean temp. of the month, elastic force of vapour, dew point, humidity, and amount of cloud, all more or less exceeded the February means; the bar. pressure, however, accords with the mean, but it was very unsteady within a rather limited range; although the winds were slightly below the mean, there were sharp gales on 11th, 12th, 14th, 18th, 19th, 20th, and 22nd, all from equinoctial points; on 9th the thrush was heard singing, and on the 25th the bees were at work on the snowdrop blossoms, and the daffodils were coming into flower. The rivers were in flood during the whole month.

**CASTLE TOWARD.**—A wet month, with but few frosty nights; 5·02 in. (of the total 6·51 that fell during the month) fell on 10 days from the 3rd to the 13th; it has since the 14th been comparatively mild, and free of frosty nights, so that deciduous trees and shrubs are swelling their buds, while many of the spring plants are now in full flower: snowdrops since the 1st, primulas on the 10th, hepaticas, ericas, and rhododendrons since the 20th.

**DEANSTON.**—Frosty and dry cold for two days, then rain with occasional bright days. Heavy fall of 11 in. of snow on the 12th, but all of it gone in two days from wind and rain. Mild and dry, 22nd and 23rd; blowing a gale thence to the end of the month; more dry and mild, favourable for field operations; spring rapidly appearing.

**LOGIERAIT.**—The month opened with heavy rains; deep snows on the 12th; on 15th a favourable change set in; since that date the weather has been very fine and mild, and all kinds of labour is progressing rapidly.

**BALLATER.**—Dull, with fogs and heavy rain, in the beginning of month; open weather throughout latter half of the month, strong cold winds prevailed, and little R; much L observed on the evening of the 22nd.

**ABERDEEN.**—Aurora on 14 nights; much L on 20th and 21st; the first half of the month remarkably wet, the latter half fine, warm, and dry; mean bar. 29·795, or 0·046 below the mean of 14 years; mean temp. 40°·7, or 2°·9 above mean; rainfall also above the mean; winds from S.E., S.W., and N.W., above the average; estimated pressure of wind rather below it.

**PORTRREE.**—The frost of January continued to the 7th of this month; on the 8th there was distant T the whole day; sleet, H, and S showers every day from the 9th to 15th; very squally from the 10th to the 15th; close fog on 17th, strong gale on 18th, from S., and on 20th from W., 21st N.W., 23rd from W.; 24th and 25th very squally. On the whole, the month was milder than usual in this locality; vegetation is making rapid progress in garden, shrubs, and bushes.

**LOCHBROOM.**—This month has been as wet and unpleasant as January was frosty and exhilarating, though the difference in the rainfall is very small.

**SANDWICK.**—The R, temp., and wind, are all above the mean; the wind, which was bound up during the frost, was let loose in the mild weather of February, and we had gales on 5th and 7th, 40 to 50 miles an hour, from 10 a.m. on to midnight on 5th, and 50 miles an hour from 11 a.m. to 5 p.m. on 7th, with the greatest fall of rain during the month; one continued gale from the earliest hour on the 21st, to 4 a.m. on 25th; 50 miles an hour generally, but during some part, 55 and 60 miles an hour; the winds in the early part of the month S.E. and W., and S.W.; in the latter part, remarkable absence of aurora; much light was seen on the nights of the 11th and 12th, supposed to be aurora behind the clouds.

## I R E L A N D.

**MONKSTOWN.**—The commencement and end of the month were wet, the middle unusually fine and spring-like; a slight frost on the night of the 15th; wind very variable; 1st to 5th, S.E. to W., 6th to 11th, N.W. to N.E., 12th to 20th, S. to S.E.; this was the driest period, which is very unusual with a wind at S. and S.E.; the heaviest rainfall was on the 3rd, with a S.E. wind.

**Doo CASTLE.**—Beginning of month cold and severe, middle fine, and the end wet; gale on the night of the 5th.