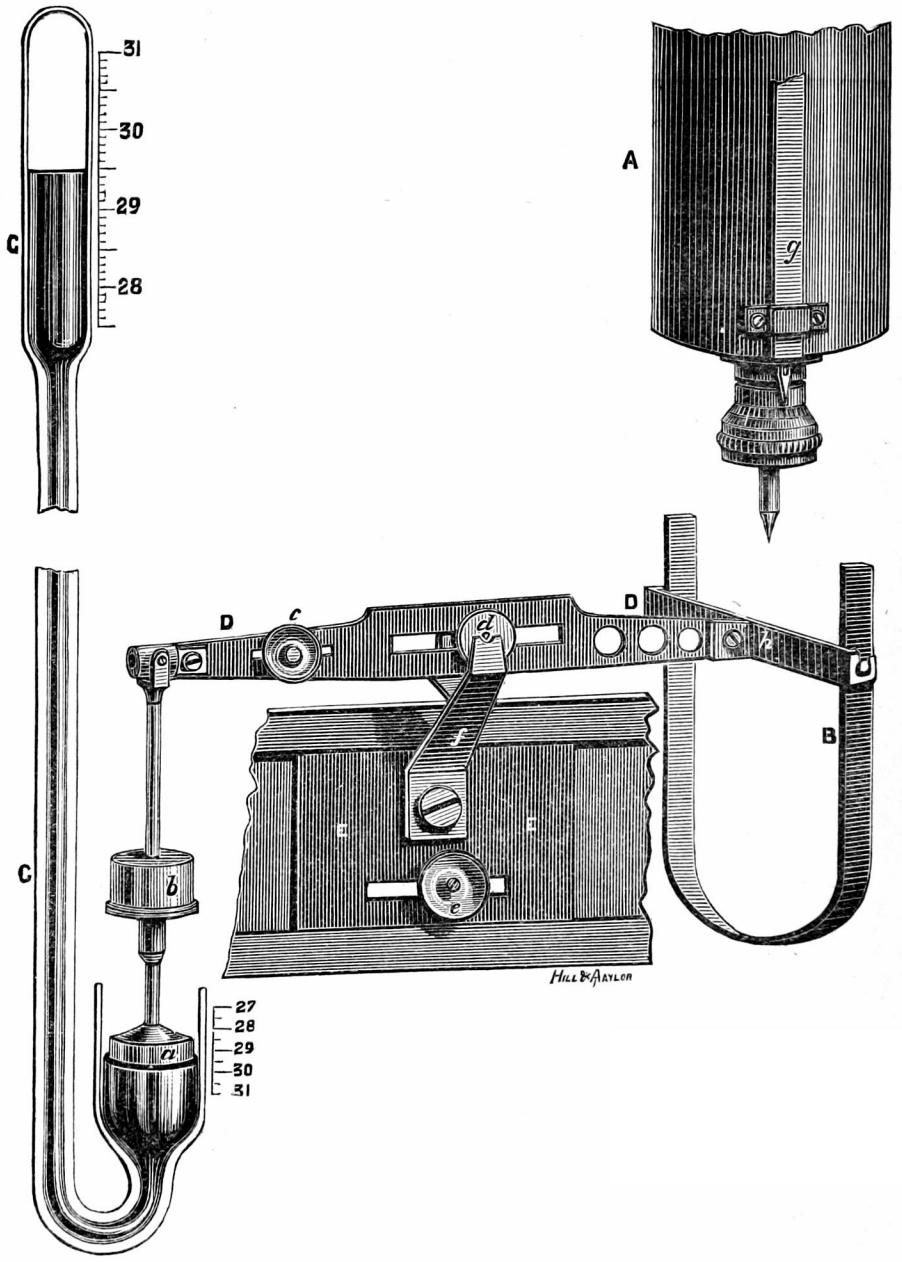

NEW METHOD OF CORRECTING FOR BAROMETRIC ERROR.

SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CVI.] NOVEMBER, 1874. [PRICE FOURPENCE, or 5s. per ann. post free.

THE BAROMETRIC ERROR IN CLOCKS.

WE hold so strongly the necessity of Meteorologists possessing accurate timekeepers, that we willingly travel occasionally slightly beyond our special province, when by so doing it appears likely that we can in any way tend to further that object.

Our present subject is one which, in its detection and removal, is a proof of the extreme degree of accuracy to which clocks of the highest class have been brought.

It will not need a moment's reflection for all our readers to observe that a pendulum vibrating in a vacuum will have less resistance to overcome than one vibrating in the atmosphere, with a barometric pressure of thirty inches. Admitting this, it would still be doubtful whether the slight variations on each side of the mean atmospheric pressure (say $28\frac{1}{2}$ to $30\frac{1}{2}$ inches) would be sufficient perceptibly to affect the rate of a good clock, with a pendulum whose sectional area is perhaps 27 inches, and whose weight is 24 lbs. It has for some years been known in an indefinite and inaccurate manner, that there was a sensible error due to this cause, and a (very troublesome) mode of correcting it was suggested. Recently, however, matters have advanced rapidly.

In August, 1871, Messrs. E. Dent and Co. erected in the Magnetic basement (that position being selected on account of its equable temperature) of the Royal Observatory, a new Standard Sidereal Clock, which the Astronomer Royal described * as "an excellent specimen of horology." Owing, we suppose, to the smallness of all other errors, the Astronomer Royal shortly turned his attention to the possibility of correcting the barometric error. Thereafter several papers were read upon the subject at the Royal Astronomical Society, the general result being to show that with first class astronomical clocks, the error was about $0^{s}\cdot22$ per diem for each inch of the barometric pressure.

* Report to Board of Visitors, June 1, 1872.

We now proceed to describe the arrangement contrived by Sir George Airy, and applied to the above clock by Messrs. E. Dent and Co.

Evidently the desideratum is to make the ratio constant between the gravity of the pendulum and that of the resisting medium. The annexed engraving shows how this has been done: A is the lower part of the pendulum bob; *g* is one of a pair of bar magnets whose poles are opposed to those of the horse-shoe magnet B, over which they oscillate; CC is a large syphon barometer, carrying on its shorter leg the float *a*; the magnet B is counterpoised by the weight *b*; the beam DD, resting on a knife edge at *d*, and supported by the two bearers *f*, carries at one end the float, and at the other (by cross bar *h*) the magnet B; the weight at C, the plate EE, and the screw *e*, are merely for securing accurate adjustment.

The arrangement is so simple that it is almost needless to point out that as the barometer rises (*i.e.*, the density of the air increases) the mercury falls in the shorter leg, the float *a* follows it, and therefore the magnet B is brought nearer the bar magnets at *g*, and hence the ncreased magnetic action, due to this proximity, has the effect of increasing the weight of the pendulum, while it does not increase its area. Of course, with a falling barometer, the result is the reverse.

It would almost appear presumptuous for us to criticize work carried out by Messrs. E. Dent and Co., under the supervision of Sir George Airy, and indeed it appears to us that there is room only for praise. There are, however, two questions which have occurred to us, and which we cannot answer, and which to the best of our knowledge have neither been put nor answered. (1.) When visiting a Magnetic Observatory some years since, we were asked to empty our pockets of knife, keys, &c. for fear of affecting the magnetic indications, and we recollect hearing that when this very clock was being erected, only one screw-driver at a time was admitted into the regions sacred to the Magnetometers. What is to be said respecting the introduction of three magnets into these regions? (2.) Is it not the case that so-called permanent magnets lose their strength by age? and, if so, would it not have been well to have rendered the barometer tube movable, so that it might from year to year be slightly lowered to compensate for this loss of strength? But perhaps sufficient adjustment in this respect might be obtained by shifting the pins which carry the magnet.

As, however, the Astronomer Royal reports, * "The arrangement for correction of the barometric inequality, to which I alluded last year, has been applied to the Sidereal Standard Clock, with satisfactory results," there can, we should think, be little doubt that it is now the most nearly perfect clock yet made.

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* Report to Board of Visitors, June 6, 1874.

SUPPLEMENTARY TABLE OF MONTHLY RAINFALL, OCTOBER, 1874.

Div.	County.	Station.	Total Fall.
			in.
II.	Kent	Margate (Acol)	2·75
,,	Sussex	Hailsham	3·75
,,	Hampshire	Strathfield Turgiss	3·93
III.	Oxford	Oxford (Magdalen College)	3·14
,,	Cambridge	Cambridge (Merton Villa)	1·80
IV.	Essex	Harlow (Sheering Rectory)	4·01
,,	Norfolk	Swaffham	1·84
V.	Devon	Teignmouth (Brookbank)	6·34
,,	,,	Torrington (Langtree)	5·61
,,	Somerset	Taunton (The Castle)	—
VII.	Lincoln	Horncastle (Bucknall)	1·52
VIII.	Lancashire	Liverpool (Walton-on-the-Hill)	4·50
IX.	York	Wakefield (Stanley Vicarage)	1·66
X.	Durham	Gainford	2·37
,,	Westmoreland	Shap	14·82
XVII.	Banff	Keith	3·03
XVIII.	West Ross	Strathconan	9·01
XX.	Cork	Fermoy (Glenville)	5·26
XXI.	Westmeath	Athlone (Twyford)	5·03
XXII.	Galway	Ballinasloe	—

From the above, as well as from the regular table on page 157, the exceptional rainfall of the western coast, and especially in the vicinity of mountain masses, is evident. The fall at Seathwaite (30·18 in.) has only been equalled in the following months :—

1848, February.....30·55	1862, October.....32·13
1852, December .....32·83	1872, January .....32·14
1861, November .....35·41	

The large monthly total is due to frequent heavy rains, but is largely increased by the fall of the 5th-6th (5th 5·14, 6th 2·75 in.), of which we append notes from other stations, and of the 20th, which was very heavy in Wensleydale, and when also Seathwaite had 4·31 in.

EXTRAORDINARY RAINFALL IN THE LAKE DISTRICT.

To the Editor of the Meteorological Magazine.

SIR,—I take the liberty of sending this to say that I registered 1·90 of rain this morning—the largest quantity that has fallen in the same time for the last three years according to my gauge. During that time it has only on two previous occasions exceeded 1 inch.

Yours truly, SAMUEL KING.

Elswick Lodge, Gt. Eccleston, Garstang, Oct, 7, 1874.

SIR,—You will, no doubt, receive reports from other quarters of an extraordinary rainfall which has been experienced in this district. I registered as follows :—

Monday, October 5th		0·76 in.
Tuesday, 6th (11 p.m.)	3·33 in.	=3.51. in.
,, (9 a.m. following morning)	0·18 in.	

The River Kent rose to a height considerably above any flood ever remembered, and great damage has been done to property.

Yours truly,

G. F. BRAITHWAITE, JNR.

Kendal, 10th Oct. 1874.

To the Editor of the Meteorological Magazine.

SIR,—On Tuesday last, in the 21½ hours commencing at 1 o'clock, a.m., and ending at 10.30 p.m., wind S.W., we had rain as below :—

1 o'clock a.m. to 10 a.m.	·790
10 a.m. to 6 p.m.	1·700
6 p.m. to 10.30 p.m.	1·650
Total in 21½ hours ...	4·140

The rain produced the heaviest flood in living memory, being, by well authenticated marks, about 14 or 15 inches higher than the flood in Feb. 1831.

I believe this is the heaviest continuous fall of rain that has been registered here. I am endeavouring to have the papers of the late Mr. Marshall examined to verify this point, and will let you know the result.—Yours sincerely,

JOHN J. WILSON.

Underfell, Kendal, Oct. 15th, 1874.

To the Editor of the Meteorological Magazine.

SIR,—From the 15th February up to end of June we had hardly any rain here. In two days (end of June) we had 2½ in. ; then a fine July, with some very severe rain ; August and September wet. But I write to tell you of the most remarkable rainfall I have ever known. In four days (1st—4th) we had heavy rain, with hours of glorious weather ; the total fall was 1·17 in. The 5th was a glorious day up to about 9 p.m. On the 6th, at 9 a.m., we measured 1·64 ; at 5 p.m. on the 6th I measured myself 2·20,—it never ceased raining for one minute ; at 9 a.m. on the 7th, 1·27 more was measured, making 6·28 in. for 6 days, as follows :—

1st, 9 a.m., to 5th, 9 a.m. ...	1·17 in.
6th, 9 a.m.	1·64 ,,
7th, 9 a.m.	3·47 ,,
Total	6·28 ,,

Total fall in 36 hours, 5·11 inches.

The Lake rose 3 feet in all—a trifle over 2 feet in 36 hours. It kept rising till 1 p.m. on 7th, and then began to fall ; at 5.30 p.m. it had gone down ½ in. ; at 10 o'clock this morning, 9 in. ; and own at 5 p.m., 13 inches.

The height of flood on the Lake was 9 inches higher than has been known for 20 years.

On the morning of the 6th, about 3 a.m., we had rain in such torrents (I cannot prove it) that I think nearly an inch must have fallen in less than an hour, and this I find was purely local.

Yours very truly,

H. W. SCHNEIDER.

Belsfield, Windermere, 8th October, 1874.

REVIEWS.

Report of the Meteorological Committee of the Royal Society, for the year ending 31st December, 1873. 8vo., 66 pages. Spottiswoode.

We are glad to find in this report a promise of a paper on Atlantic weather in August, 1873, by Captain Toynbee, analogous to his excellent one on the "City of Boston" storm.

Another satisfactory feature is the strong way in which the Committee urge the necessity of establishing communication with the North-West Coast of Ireland. In demanding the extension of the Postal Telegraph system in that direction, the Committee might rely on any support which could be needed, and we believe that they have only to speak out strongly in the proper quarter in order to obtain that which is a *necessity*.

With reference to the system of synchronous observations suggested by Brigadier-General Myer, we think that a mistake has been made. The Committee state that they have received more than sixty promises of returns in response to invitations issued by them—whence it is obvious that they sent out *more* than sixty invitations. The original American idea was, we believe, to publish a map of the Northern Hemisphere for each day, plotting upon it the observations collected. Surely this daily map would not be more than 3 ft. by 2 ft., and if not, the area of the British Isles would be about one inch square. The impossibility of plotting sixty sets of observations on a single square inch is sufficiently evident. Unless, therefore, there is some farther object in view than we are aware of, we think that the records of the self-recording instruments at the Committee's own observatories would have afforded all that is necessary.

We object most strongly to unnecessary Sunday work, but we hold with equal steadfastness the desirability of continuing on that day any work that tends to the preservation of human life. Storm-warnings have this object, and achieve this end, or else they are a farce; they are not a farce, and therefore the work should not be interrupted on Sundays or holidays. Moreover, the time occupied would be very trivial, for it appears from page 13, that not only the receipt and discussion of all the telegrams, but also the preparation of the Daily Weather Report is completed by 11 a.m. daily; hence the reception and discussion alone would be completed still earlier. If the difficulty lies with the Postal authorities, the Committee should show their readiness to do their part, and leave the onus of shipwrecks and disasters at the door of the real obstructives.

It is satisfactory to see at last some prospect of obtaining accurate records of the temperature of the sea around our coasts, and we hope that the steps taken will be followed up at every Lightship around the British Isles.

We may, in conclusion, call attention to a good *précis* of the proceedings of the Vienna Congress.

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*Report on Weather Telegraphy and Storm Warnings, presented * * * at Vienna.* [Published by authority of the Met. Com.] 8vo. 60 pages. Stanford.

SINGULARLY enough after penning the remarks on the necessity for Sunday telegrams in the previous review, we find in this the next work which we have to notice, the following recommendation :—

"In order to make the system of warnings as perfect as possible, according to the present state of the Science, the Sub-Committee must indicate that it is desirable that the observations and reports based thereon should be made as complete and continuous (as regards the former) as is possible, *i.e.*, neither Sundays nor holidays should make a difference to them, and there should not be a complete interruption during the night."

This is the recommendation of no less authorities than MM. Buys Ballot, Neumayer, and Scott; and is given after considering the opinions printed at length in the work under notice. The authors of these opinions were—

F. Allison	Halifax, Nova Scotia.	Prof. Mohn	Christiania.
H. F. Blandford	Calcutta.	Dr. A. v. Oettingen	Dorpat.
C. Chambers, F.R.S.	Bombay.	Prof. Prestel	Emden.
G. B. Donati	Florence.	Rev. F. Redford	Silloth.
F. Da Silveira	Lisbon.	Capt. Rikatcheff	St. Petersburg
F. Gaster	London.	Prof. R. Rubenson	Stockholm.
German Commission, presided over by Prof. Dove	Berlin.	W. W. Rundell	Liverpool.
Capt. Hoffmeyer	Denmark.	Dr. Schenzl	Pesth.
G. T. Kingston	Toronto.	Scottish Meteorl. Soc	Edinburgh.
Prof. J. K. Laughton	Greenwich.	R. Strachan	London.
Maj.-Gen. Lefroy, F.R.S.	Bermuda.	G. J. Symons	London.
C. Meldrum	Mauritius.	Capt. H. Toynbee	London.
Meteorological Society	London.	G. V. Vernon	Manchester.
		Prof. Wild	St. Petersburg

With such a series of data to work upon, and such a sub-committee as that we have named, it is not remarkable that this report is of very great value. We agree with almost every sentiment and statement in it, and as it costs only a few pence, refer our readers to it with the assurance that it will well repay careful perusal.

Annuaire Météorologique et Agricole de l'Observatoire de Montsouris pour l'an 1874. By M. MARIE-DAVY, Director. 16mo. xxxvi.—272 pages. Paris, Gauthier-Villars.

THE introduction to this *Annuaire* explains so clearly the aims and

duties of the Montsouris Observatory, that a few extracts will be interesting as well as useful:—

"The study of the atmosphere and its variations, and of the soil and of its waters, considered both in relation to pure science, and in their bearings on health, and agriculture, this the field in which the observatory of Montsouris will labour."

"The regular observations are printed in extenso, in the *Bulletin Mensuel*, which by agreement with the publisher (M. Gauthier-Villars) is sold to the public at a reduced price."

"The *Annuaire* on the other hand should give an abstract of this work, and show plainly their practical results—by its form as well as by the documents which it will contain, it should yearly render useful services to agriculture."

"The harvests which contribute so much to public wealth are subject to all caprices of the weather. The *Annuaire* will contain in its early tables, abstracts of meteorological observations as far back as they have been regularly recorded, and they will also give the daily details for the previous year. These various tables will enable farmers to compare existing weather with that of previous years, both for the guidance of his operations, and to enable him to estimate his future crops. On this last point, however, the means of comparison are still incomplete. In order to follow accurately the influence of atmospheric changes on the ripening of the crops, it is necessary to submit the plants to analysis, at regular intervals from germination to harvest. This is one of the enquiries which can only be undertaken by a special establishment provided with a staff of trained observers, and it is one which we have already commenced."

"The farmer demands that we tell him that his soil contains such and such fertilizers, his harvest will take away so much of this and so much of that; therefore in order to maintain at its maximum the fertility of his fields, he must give to them exactly what they require, but no excess; he must employ such a quantity of such manure, containing such constituents; thus the greatest possible result would be obtained by the simplest arithmetical operations. This is the issue towards which the labours of chemists and physicists are tending, but the problem is still unsolved."

After epitomizing some of the results already obtained, and referring briefly to some of those given in the *Annuaire*, the introduction thus closes:—

"Eminent chemists have devoted themselves to the study of the problems of agricultural science. The Observatory of Montsouris is the only French establishment having a staff appointed for the regular observation of the facts calculated to solve these problems, and it is fully aware of the services which it may render to the country in the path which has been chosen for it."

The work itself is one which well repays perusal; indeed, but for limit of space and time, we should be glad to place translations of several chapters before our readers; as it is, we must content ourselves with noting their contents, and recommending to this pleasantly written volume, those interested in French meteorology and agriculture. Chapter I. gives an epitome of the history and results of thermometric observations at Paris, from 1666 to 1872, and occupies 41 pages. Chapter II., treating of the barometer, is much shorter. The third chapter gives a history of rainfall observations at Paris Observatory, from 1682 to 1872, and not only a history, but also the monthly totals throughout this long period, excepting only when the observations were occasion-

ally interrupted. The mean amounts on the top of the observatory, about 70 ft. above the ground, have been :—

1689 to 1717 (no records for 1697-8)	=	19·76 in.
1748 to 1754	=	19·84 ,,
1773 to 1788	=	21·01 ,,
1788 to 1797	=	16·70 ,,
1804 to 1818 (new gauge)	=	19·76 ,,
1819 to 1848	=	20·12 ,,
1849 to 1872	=	20·50 ,,

Chapter IV. is devoted to magnetic observations, and is, we presume, added for the sake of completeness, for it can hardly be looked upon as connected with agriculture, but no one could object to the few pages it contains, when five of them give the declination for nearly three hundred years, from 1550 to 1873.

This is followed by a series of instructions for observers, by a summary of the Montsouris observations, by a series of numerical tables useful for farmers, and the work closes with two excellent papers, one on the action of water on vegetation, and the other on that of atmospheric air on agriculture.

We have little doubt that copies could be obtained through any of the foreign booksellers for half-a-crown, and we are sure that no meteorologist or farmer would regret investing that amount in a work which does credit to Montsouris Observatory and its able director.

On Mirage. By Prof. J. D. EVERETT, M.A., D.C.L., &c. [From the Proceedings of the Belfast Natural History Society, 1872.] 8vo., 16 pages, 3 plates.

A CAPITAL paper, explaining with precision the physical conditions which are necessary to produce mirage, and the optical principles to which the varied appearances are due—nay more, explaining how a careful manipulator can produce a mirage for the instruction and gratification of himself and his friends. The apparatus required consists of (1) a glass vessel, with plane parallel sides; (2) a pipette; (3) a strong solution of alum; (4) pure water; (5) Scotch whisky, mixed with enough sugar to make its specific gravity intermediate between those of the other two liquids. The last named liquid must be introduced last by means of the pipette. Prof. Everett thus describes the effect of looking through this arrangement when placed in a window :—

"Every object in the landscape was tripled, the middle image being inverted, and the three images seen at once; and the vertical breadth of the strip of landscape thus tripled at one view, extended from the top of the hills down to the houses on the Lisburn road. When the sun was shining on the front of the row of houses represented, which was nearly half a mile distant, I was able to see distinctly the chimneys and windows, and even to see whether the blinds were up, down, or half-way down. It was easy to fancy that the inverted trees and houses were the reflections of the upper ones in water. But a much more striking effect, as of water, was at the junction of the middle and lower image. This had all the

appearance of a calm bay or lake glistening in the sunshine. There are only two natural objects to which this peculiar glistening belong, with brightness far surpassing that of all the dry and solid parts of a landscape. One of these is water, and the other is the sky. A bit of sky has in fact been trapped between two portions of land; and it is a similar trapping of sky in the midst of dry land, that produces the irresistible impression of a lake of water in the mind of the traveller in the dessert."

FINE METEOR ON OCTOBER 11TH.

We are glad to be able to supplement the notes in our last with several other accounts; and we are very glad to find that, with the exception of the Culford Parish Clock, a very fair approach to accuracy in the time is manifested. The times are—

Cambridge	Mr. Nutter	8.50
Camden Square		8.50
Brighton	Mr. G. J. Symons	8.51
March	Mr. Green	8.50
Cambridge	Mr. Talbot	8.52
Keswick	Mr. Chamberlin	9.0 (about)
Beccles		8.55
Culford	Mr. Grieve	9.0
Rainhill, Lancashire	Mr. Higgins	8.55
Wisbeach	Mr. Balding	8.50

CULFORD.—An exceedingly luminous meteor was seen here on the night of the 11th, at the time the Parish Church clock was striking 9. It flashed from N.E. to S.W., and for an instant rendered the dark night as light as day, and left a brilliant trace upon that portion of the sky it appeared to pass over, nearly as bright as the nucleus itself, both gradually disappearing with a tremulous motion, which was visible for at least two minutes; the sky was quite clear, with many stars shining.

SIR,—Perhaps the following description of the wonderful meteor of Sunday night will not prove uninteresting to those of your readers who were not fortunate enough to see it:—At about 8 minutes to 9 o'clock on Sunday night, there appeared suddenly an intensely bright light, something like an enormous flash of lightning and of a bluish-white colour. It lasted for about three seconds, and was of such a brilliancy as to dazzle and almost blind one for the moment, and rendered all the surrounding country as light as at noonday. I have been told that it was accompanied by a slight explosion, followed by a hissing noise, but for my own part, I heard neither the one nor the other. This light seemed to concentrate into a fiery meteor which shot up (or seemed to do so) from near the earth to about the zenith of the sky at the edge of the Milky Way; here it became stationary, and immediately afterwards two streaks of light were thrown out from the nucleus from opposite sides, and formed a straight line, stretching across the Milky Way, and making an angle of about 15 degrees with it. Each streak of light was of about the same length, and had somewhat the appearance of that made by an ordinary meteor in its passage through the air, except that it was broader, brighter, and lasted a considerable time. Meanwhile the meteor itself appeared to be in a state of rapid combustion, and it seemed as if either flames, or smoke, or both, were given off from it, and hung suspended towards the earth, wreathing and twisting about like smoke blown about by the wind. After exhibiting this extraordinary appearance for about 40 seconds, it gradually grew fainter and fainter, or rather it seemed to burn itself out, and the streaks of light

entirely disappeared, but the burning centre might have been easily distinguished from the nebulæ for the space of three minutes afterwards. It was a wonderful, startling, and magnificent spectacle, and such a one as I have never before seen. I should be glad if any of your readers can supply any information about it.

I am, Sir, yours truly,

Cambridge, October 16th, 1874. PERCY W. TALBOT.

Mr. G. M. CHAMBERLIN, of Eaton, vouches for the following phenomenon:—While walking to Keswick, going down the Harford Hill, about nine o'clock on Sunday evening, I heard a slight sharp report in the air. Immediately, and only for a few seconds, the whole heaven was lit up in a most brilliant manner with a peculiar sort of yellow light, and on looking up overhead I saw a huge streak of fire in the sky, similar in appearance to the tail of an enormous comet; this lasted for about a minute, and then slowly faded away. One gentleman writes from Beccles—About 8.55 p.m. what appeared a most vivid flash of lightning illuminated the entire neighbourhood. Hearing, however, some one near exclaim, "Well, I never saw anything like that before," he was induced at once to look upwards, when to his surprise he discovered a line of light in the heavens, just as though a splendid rocket had exploded, and taking out his watch he found that what the Germans would term "fire-mist" remained in view exactly three and a-half minutes before it disappeared. He further states that he made enquiries of several persons whom he met, as to whether they had seen the brilliant light, that they answered in the affirmative, and he then directed their attention to the singular appearance recorded above.

"BRIGHT METEORS.—At 8.55 this evening (October 11th) a party of six observed a meteor in the constellation Aries, or below it, which emitted light sufficient to cast a bright gleam on the neighbouring trees. The body of the meteor shot rapidly along a course extending about 20°. It then seemed to explode suddenly, and its track was luminous for a short time. The granular *débris* of the meteor continued to pursue with very much retarded velocity a path slightly deflected from its former course: it continued to do so for several degrees, and it was, I think, fully a minute after the explosion that several of us almost simultaneously exclaimed, "It is falling." It resembled the expiring light of one globe of a rocket charged with golden rain. The falling motion was very slow. I think it was visible for two minutes after the explosion, but though we tried to consult more than once our watches, the light was insufficient.—HENRY H. HIGGINS."—*Nature*.

"AN exceedingly brilliant meteor was seen here about 8.50 (Wisbech, Oct. 11th) on Sunday evening, which was so bright that it attracted general attention, the light from it being as strong as an unusually bright flash of lightning, but more white. On looking up I saw, near the zenith, a long almost straight and uninterrupted ribbon of light, somewhat pointed at the end towards the north-east. After watching it for some time and noticing that it retained its brilliancy, I began slowly counting, and counted up to twenty before there was any noticable diminution of luminosity. The last portion visible was the end opposite the pointed end, which appeared as a faintly luminous patch as large as the apparent disc of the moon. I consider that, from its appearance, it was visible from 80 to 100 seconds.—A. BALDING."—*Nature*.

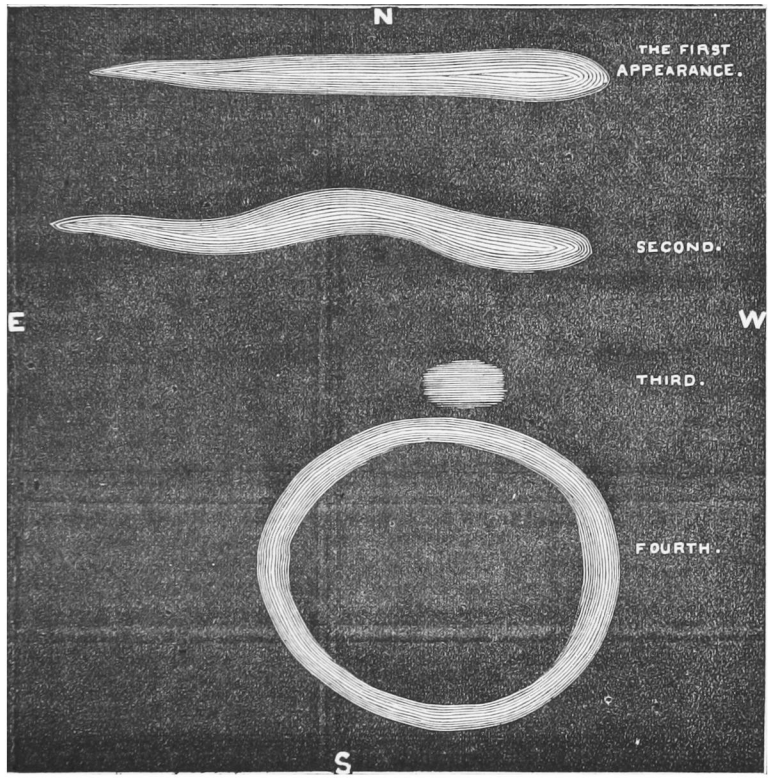
SIR,—While proceeding in a westerly direction at 8.50 on the night of the 11th October, I was surprised by seeing a vivid blueish white light. On looking up to see the cause of this strange phenomenon, I saw, near the zenith (but inclining to the N.E.), the remains of what must have been a beautiful meteor, which consisted of a very bright straight line of light. It was faint and pointed at the N.E., but

brighter at the opposite end. After a few seconds the tail became bent as though blown by the wind. It then began to disappear, beginning at the pointed end, and continued to do so till the head only was left, which was then a square luminous cloud, or patch of smoke. It then opened in the centre, and enlarged into a ring of light, which, when it had attained a considerable size, disappeared. I heard no noise, and most people thought that it was a very bright flash of lightning.

Very truly yours,

JAS. GREEN.

March, November 2nd, 1874.



RAINFALL AND YIELD OF WELLS.

To the Editor of the Meteorological Magazine.

SIR,—In the August number of the *Meteorological Magazine*, you inserted a letter of mine remarking on an article on "The Water Supply of the N.W. of Europe," and I then spoke of October as the ruling month with reference to the transmission of rainfall by percolation to the chalk water level. The late month, taken in connexion with September, verifies that assertion. I tried to show that the amount of rain falling, and the conditions under which it fell, in the Autumn and Winter of 1873-4, easily accounted for the lack of subterranean water up to July last. It was shewn that the January and February rainfall of 1874 gave nearly the whole stock of water to be given out during the rest of the year, until augmented by the Autumn rainfall. In September, 2·775 was registered from the 4th to 12th inclusive—on the latter day the water in the well under observation rose 2 inches,shewing that the rainfall had reached the water level—32 ft. 6 in. from the surface of the ground. From the 25th September to the 10th of October, the water maintained its level. From the 1st to the 11th of October, 1·960 was registered. On the 11th the water again rose gradually, the total rise up to the present date, Oct. 31st, being 7 in. from its lowest point about Sept. 6th.

The prospect of water supply this year, 1874-5, as compared with 1873-4, is better. The water level was rather lower at this period last year, the Autumn rains not having been sufficient so to saturate the soil as to enable the rainfall to reach the water level, though the total rainfall up to the present time is 2·761 less than in 1873; but to set against this, the rainfall of September and October exceed that of 1873 by 2·140. Thus, by the amount of wet concentrated as it has been, the earth is in a better condition to transmit the November rainfall to the water level in 1874, than it was at the same period in 1873, and it is quite possible that the stock of water for the coming year may far exceed the usual average, though at the close of the year the total yearly rainfall may be considerably below the average. It is the conditions under which the rain falls that rule the subterranean supply.

I am, yours faithfully,

J. C. CLUTTERBUCK.

Long Wittenham, Oct. 31st, 1874.

OCTOBER, 1874.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Dpth	Greatest Fall in 24 hours. Date.	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date.	Min. Deg.	Min. Date.	No. of Nights below 32° In shade	No. of Nights below 32° On grass
			inches	inches.	in.								
I.	ENGLAND.	Camden Town	3·34	+ ·75	·59	29	18	68·1	1	34·8	6	0	0
II.		Maidstone (Linton Park)	3·59	+ ·49	1·14	30	16	70·0	1,12	31·0	5,23	4	...
,,		Selborne (The Wakes)	6·28	+ 2·07	1·08	1	22	63·0	1,15	33·5	6	0	1
III.		Hitchen	2·59	+ ·04	·72	1	19	61·0	1,13	34·0	5,22	0	...
,,		Banbury	3·13	+ ·70	·91	29	21	63·0	1	33·0	6	0	...
IV.		Bury St. Edmunds (Culford)	2·08	— ·63	·38	7	15	66·0	13	30·0	23	2	5
V.		Bridport	...	...	...	...	...	...	...	...	...	0	..
,,		Barnstaple	4·44	+ ·32	·95	6	25	64·0	1*	41·5	29	...	...
,,		Bodmin	5·69	+ ·37	1·26	6	25	61·0	10	42·0	20	0	0
VI.		Cirencester	3·81	+ ·32	1·02	6	22	...	...	...	...	...	...
,,		Shifnal (Haughton Hall)	1·65	— ·59	·42	6	22	62·0	15	34·0	6,23	0	3
,,		Tenbury (Orleton)	2·11	— 1·12	·44	6	20	62·7	11†	32·0	20	1	2
VII.		Leicester (Wigston)	...	...	...	...	...	...	...	...	...	0	...
,,		Boston	1·72	— ·40	·38	6	17	65·0	15	35·0	24	0	...
,,		Grimsby (Killingholme)	1·92	...	·50	6	18	63·0	15†	35·0	24	0	...
,,		Derby	1·90	— ·94	·45	6	23	63·0	15	37·0	17§	0	0
VIII.		Manchester	3·76	— ·05	·60	6	22	67·5	15	37·0	20	0	0
IX.		York	2·17	— ·35	·35	6	18	63·0	15	34·0	23	0	...
,,		Skipton (Arncliffe)	8·47	+ 1·81	1·47	20	28	64·0	14	30·0	4	2	...
X.		North Shields	1·66	— 1·62	·35	29	16	61·8	25	34·5	23	0	0
,,		Borrowdale (Seathwaite)	30·18	+13·86	5·14	5	26	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely)	...	+ ...	...	...	..	...	...	...	...	...	...
,,		Haverfordwest	6·16	+ ·97	1·36	6	19	61·0	12	33·0	7	0	1
,,		Rhayader (Cefnfaes)	4·79	— ·81	1·00	6,27	12	61·0	...	36·0	...	0	...
,,		Llandudno	3·42	— ·54	·81	6	21	66·4	15	43·8	17	0	...
XII.		Dumfries	5·13	+ ·21	·75	18	24	62·5	15	33·5	26	0	0
,,		Hawick (Silverbut Hall)	4·83	...	·92	6	19	...	...	...	...	...	...
XIV.		Kilmarnock (Annanhill)	6·18	...	·85	12	21	59·9	16	32·0	31	1	4
XV.		Castle Toward	9·47	+ 3·72	1·12	13	23	59·0	1	...	...	0	...
XVI.		Leven (Nookton)	3·32	— ·43	·94	12	13	61·0	15	27·0	31	5	21
,,		Stirling (Deanston)	...	...	...	...	...	...	...	...	...	...	...
,,		Logierait	4·02	...	·81	12	21	...	...	...	...	...	...
XVII.		Braemar	5·72	+ 2·97	·91	12	23	56·3	11	23·2	31	9	18
,,		Aberdeen	2·29	...	·58	12	18	59·3	7	28·9	31	3	13
XVIII		Loch Broom	11·04	...	2·54	3	27	...	...	...	...	...	...
,,		Portree	15·69	+ 4·91	2·18	20	28	...	...	...	...	...	...
,,		Inverness (Culloden)	2·88	+ ·22	·87	5	20	60·5	15	31·7	30	1	10
XIX.		Helmsdale	4·94	...	1·18	21	22	...	...	...	...	...	...
,,		Sandwick	4·10	— ·82	1·15	20	22	55·0	17	39·0	5	0	0
XX.	IRELAND.	Caherciveen Darrynane Abbey	6·44	...	1·35	14	20	...	...	...	...	...	..
,,		Cork	3·26	...	·60	7	22	...	...	...	...	...	...
,,		Waterford	6·32	+ 1·92	1·09	28	23	60·0	13**	36·0	23	0	...
,,		Killaloe	...	...	...	...	...	...	...	...	...	...	...
XXI.		Portarlington	3·26	— 1·87	·56	7	26	59·0	18	32·0	7	1	...
,,		Monkstown, Dublin	2·75	— 1·17	·58	28	19	...	...	...	...	...	...
XXII.		Galway	6·73	...	1·03	12	22	60·0	3,18	33·0	4	0	...
,,		Ballyshannon	5·08	...	·57	14	24	...	...	...	...	...	...
XXIII		Waringstown	3·66	...	·51	14	19	61·0	18‡	30·0	8	2	7
,,		Edenfels (Omagh)	3·82	...	·65	12	20	56·0	18	28·0	7	4	...

* And 12 & 19. † 25. ‡ 19. § 23. ** 17

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

METEOROLOGICAL NOTES ON OCTOBER.

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

ENGLAND.

Linton Park.—Very high wind on 21st; also on 2nd, 7th, and 25th. Slight frosts on 5th, 6th, 23rd, and 24th, but not severe enough to injure dahlias or other tender plants. T and L on 15th and 30th, with very heavy rain (1·14 in.) on the latter occasion. A mild growing month, with some fine dry weather in the middle of it; the 28th being unusually bright, warm and sunny.

Selborne.—Very wet month, (6·28 in.) 2·23 in. above the average of October for the last 12 years. Violent wind and heavy rain on 7th; wind veered from S. to N.W. Fog on 12th, 14th, and 16th; that on 14th very dense. Vivid L at 5.30 p.m. on 15th. Prevailing winds, S.W. till the last week, then E. and N.E.

Culford.—Swallows last seen on 6th. Gale of wind on 21st. Max. temp. 66° on 13th; min. 30° on 23rd; mean of month 51°·2. Easterly winds prevailed during 9 days, and westerly on 22 days.

Haughton Hall, Shifnal.—The remarkable features of this month have been—first, the total absence of frosts, except on the grass on three nights, 2nd, 20th, and 23rd; the warmth of many of the nights was unusual, especially at the close of the month, the last six averaging 49°·0; while that of the day averaged only 54°. Second, the small amount of R (1·65 in.), compared with the number of days on which it fell, viz., 22, on 6 of which only ·01 in. fell. Dahlias, mignonette, and other tender plants remained unscathed to the end. The wind, with few exceptions, from W. and S.W., changing from thence on the 29th to N.E and E., with R. A severe storm on the 20th and 21st; dense fog on 26th. Potatoes a good crop, and almost free from disease. Great display of gossamer on the 16th.

Orleton.—Upon the whole the weather was warm and pleasant, with many bright days, and frequent slight falls of R till the 24th, when it became very cloudy, dark and damp, with misty R every day, and no sunlight for eight days; mean temp. was about 2°·5 above the average of the month; no L seen or T heard. Aurora visible at 7 p.m. on the 4th. Violent gale on 21st, which did much damage to trees and to roofs of buildings. Only two frosty mornings during the month.

Boston.—A great many wet days, but the total fall 0·58 in. below the average. The want of R is now seriously affecting the rivers; there being no water coming down to scour out the deposit brought up by the tides; the bed of the river has been raised more than 11 ft. above its natural bed by this deposit, and neap tides often do not reach the quays. On the 26th there was a very high tide, the water rising 16·54 ft. above ordnance datum, or 3·25 ft. above high spring tides.

Grimsby, Killingholme.—Many pleasant days; ponds still dry; end of the month dull and cloudy, with E. winds and no frost. High wind on 6th; T at 2.30 p.m. on 7th; lunar corona on 18th; stormy on 20th, and on 21st with heavy squall at 10 a.m.; force about 9 Beaufort scale. High tide in the Humber on 26th.

Arncliffe.—Wild night on 20th; Bar. fell ·75 in. during the night. Dahlias uninjured by frost at the end of the month.

North Shields.—Stormy on 21st.

Seathwaite.—Ten days on which the fall of R was 1 in. or more, six on which it exceeded 2 in., three exceeding 3 in., and one on which the fall in 24 hours exceeded 5·00 in.; the total fall during the month was upwards of 30 in.

WALES.

Haverfordwest.—A mild wet month. Very heavy gales on 2nd, 3rd, 20th, and 21st; no frost; grass lands looking remarkably well. Much sickness among children.

Cefnfaes.—Month damp, with haze on the hills; warm for the season.

LLANDUDNO.—Weather variable, about half of the month fine, the remainder wet and stormy; a very heavy gale on the morning of the 21st; the lime trees devested of their leaves by the 22nd.

SCOTLAND.

DUMFRIES.—This month has been a very wet one, only seven days without R, but the temp. has been very mild; the mean having been 48°·9 or 4°·4 above the corresponding month of last year. On the morning of the 21st the most violent gale experienced for many years; many trees were blown down, and other damage was done, but no injury to life in this neighbourhood. The last two days of the month very fine and spring-like.

SILVERBUT HALL, HAWICK.—A mild month, but violent gales on the 20th and 21st, which tore up by their roots many fine old trees, and made sad havoc with the slates and chimney cans. Though there were frosts on the nights of the 12th and 21st, many of the beauties of the flower garden are blooming as if it were midsummer; I gathered a dish of fine green peas yesterday, and expect to gather another to-morrow.

ANNANHILL.—Prevailing wind S.W. and W.; usually moderate; strong W.S.W. gale on 2nd. Great storm on 20th and 21st, from W.S.W. and W.N.W.; very destructive both on land and on the coast; calculated to have reached a velocity of 78 miles per hour during the height of the gale; rainfall again in excess. Rather frosty towards the end of the month.

CASTLE TOWARD.—A wet disagreeable month, but few dry days, and even when dry but little sunshine. On the 20th we were visited by a dreadful hurricane, commencing about 10 o'clock p.m. and continuing till 6 a.m. on the 21st; it blew in a succession of squalls, the wind at first being nearly due S., but from 4 a.m. it veered about in a most extraordinary way, doing great damage, uprooting trees without number, many snapped across the centre; corn stacks were blown over, roofs blown off, fences blown down, and very great damage done.

NOOKTON.—Storm of wind on night of 20th, and lasting till noon of the following day.

BRAEMAR.—Weather very changeable, but crops well secured; potato disease rather prevalent. S on 13th; hurricane on the morning of 21st, and S in the afternoon. Falling stars on 11th and 13th.

ABERDEEN.—A month of average temperature, with low and very unsettled bar., and frequent very heavy gales; weather rather dry. Bar. pressure and rainfall below the average; temp. very slightly above it. Terrible gale from 3 a.m. to 5 p.m. on 21st. Auroræ on 8 nights; fog on 3 days.

LOCHBROOM.—The 3rd and 4th were the stormiest days ever seen here; from the evening of the 2nd to the morning of the 4th we measured 4·00 in. of R, an unprecedented fact here. On the 21st it blew a perfect hurricane, which caused fearful loss of life and property on the west coast. This (11·04 in.) is the largest fall of R recorded by me, except in the month of February, 1868, when it was 12·72 in.

PORTREE.—The wettest (15·69 in.) and the stormiest October since 1862. Gale from S. on the 8th, and a solar halo; hurricane from midnight of 20th to 9 a.m. on 21st; height of gale from 4.30 to 6.30 a.m. on 21st (and almost equal to the storm on the 3rd October, 1860); many of the corn stooks blown into the sea. Corn not all cut here yet, and most of that which is cut is still out and greatly damaged. The hay crop nearly all lost, having rotted on the fields with the wet. Cattle and sheep doing well on the pastures. Five days on which the R exceeded an inch.

CULLODEN.—Aurora on 4th, 5th and 6th. Bar. at 7 p.m. on the 2nd, 28·33 in. corrected, the lowest this year since January 18th, when it was 28·31 in. Wind S.S.W. veering to W., S.W. & W. Another great depression of the bar. on 21st, min. at 6 a.m., 28·273 in. A heavy storm felt throughout the whole of Scotland, and also in England and Ireland was at this time causing great destruction to trees, houses and other property. Wind S.S.W. to S.W. on night of 20th, veering to W. and W.N.W. and N.W. by the morning of 21st.

SANDWICK.—October is generally our wettest month, but this year its rainfall is less than that of August and September, and less than the average. The storm of the 21st was one of our strongest, breaking out suddenly from the N. at 8 a.m. at the rate of 68 miles an hour, and blowing very strongly for two days; the bar. gave good warning of its approach, falling from 29·32 at 9 p.m. on 20th to 28·50 at 8 a.m. on 21st, and it had probably been lower at an earlier hour. Aurora on 8 nights; pocky clouds seen at Kirkwall at 3 p.m. on the 3rd; aurora coruscating to the zenith and S. sky on the 4th.

IRELAND.

DARRYNANE.—Early part of month changeable, with N. and N.W. winds; the last week fine and bright, with N.E. and E. wind.

MONKSTOWN.—Month unusually mild; frost on one night only; very severe gale on night of 20th.

BALLYSHANNON.—The first part of the month was wet and stormy, and unfavourable for the completion of the harvest; but the latter part has been fine, with easterly winds and slight frosts at night. Gale from W. on 1st, 2nd and 3rd.

EDENFELL, OMAGH.—Weather persistently rainy and damp up to the 20th, causing great difficulty in securing the grain, already kept too long out by a wet September. Fine from 20th to the end of the month.

THE METEOROLOGICAL SOCIETY.

AT the Ordinary Meeting of the Society, to be held by kind permission of the Council of the Institution of Civil Engineers, at 25, Great George Street, Westminster, on Wednesday, the 19th instant, at 7 p.m., the following papers will be read and discussed:—

"Report concerning the Meeting of the Conference on Maritime Meteorology in Loudon, August 31st, 1874." By the PRESIDENT.

"On the Weather of Thirteen Springs." By R. STRACHAN, F.M.S.

"Table for facilitating the determination of the Dew Point from observations of the Dry and Wet Bulb Thermometers." By WILLIAM MARRIOTT.

"On the Heat and Damp which accompany Cyclones." By the Hon. RALPH ABERCROMBY.

The attendance of the Fellows and their Friends is invited.