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MONTHLY

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ANOTHER METEOROLOGICAL CONFERENCE.

WE fear that this title will lead some of our readers to exclaim :—
“ We did not know that a Meteorological Conference had ever been proposed much less carried into effect.” As information respecting the former one is not generally accessible, we commence that which we think will prove a long series of articles, by particulars respecting the Brussels Conference of August, 1853.

Maritime Conference held at Brussels, for Devising a Uniform System of Meteorological Observations at Sea ; August and September, 1853.

The Governments represented at the Conference, and the names of the officers who attended, were :—

BELGIUM—by A. Quetelet, directeur de l'Observatoire royal, secrétaire perpétuel de l'Académie royale des sciences, des lettres, et des beaux-arts de Belgique ; and Victor Lahure, capitaine de vaisseau, directeur général de la marine ;

DENMARK—by P. Rothe, Captain-Lieutenant Royal Navy, Director of the Depot of Marine Charts ;

FRANCE—by A. Delamarche, Ingénieur hydrographe de la marine impériale ;

GREAT BRITAIN—by F. W. Beechey, Captain, R.N., F.R.S., &c., Member of the Naval Department of the Board of Trade ; and Henry James, Captain, R.E., F.R.S., M.R.I.A., F.G.S., &c. ;

NETHERLANDS—by M. H. Jansen, Lieutenant Royal Navy ;

NORWAY—by Nils Ihlen, Lieutenant Royal Navy ;

PORTUGAL—by J. de Mattos Corrêa, Captain-Lieutenant Royal Navy ;

RUSSIA—by Alexis Gorkovenko, Captain-Lieutenant Imperial Navy ;

SWEDEN—by Carl Anton Petersson, First Lieutenant Royal Navy ;

UNITED STATES—by M. F. Maury, LL.D., Lieutenant United States Navy.

THE CONFERENCE.

The proceedings of the first meeting commenced at the residence of the Minister of the Interior, on the 23rd of August, 1853, at half-past eleven in the morning.

The attention of the meeting was first directed to the choice of a president. Lieutenant Maury was requested to direct the proceedings, but he declined the honour ; and, at his suggestion, in which other members of the meeting concurred, Mr. Quetelet took the chair.

The President submitted to the meeting the propriety of publishing the discussions of the Conference ; expressing, as his opinion, that publicity was one of the best methods of insuring the success of their undertaking ; remarking, at the same time, that, independently of the information which would be conveyed to the public through the medium of the press, the minutes of each sitting and the scientific report of the Conference would thus be preserved.

Lieutenants Jansen and Maury seconded the motion.

The President next called upon Lieutenant Maury to explain to the meeting the object of his mission.

Mr. Maury spoke as follows :—

"Gentlemen,—The proposal which induced the American Government to invite the present meeting originated with the English Government, and arose from the communication of a project prepared by Captain Henry James, of the corps of Royal Engineers, by order of General Sir John Burgoyne, Inspector-General of Fortifications, in which the United States Government was invited to co-operate.

"Nineteen stations have been formed by the English authorities upon a uniform system, and the direction of the observations confided to the immediate supervision of the officers in command of the respective stations.

"In the United States meteorological observations had been made since the year 1816.

"The American Government sympathized with the proposal of the English Government, but said : Include the sea, and make the plan universal, and we will go for it. I was then directed to place myself in communication with the ship-owners and commanders of the navy and mercantile marine, in furtherance of the plan.

"It is from the information extracted from more than a thousand logs that I have been able to prepare the Charts which have been published up to this time, showing the sailing routes and the direction of the winds and currents.

"With a view, however, of extending still further these nautical observations, the Government of the United States decided upon bringing the subject under the consideration of every maritime nation, with the hope of inducing all to adopt a uniform model log book.

"In order to place the captains navigating under a foreign flag in a position to co-operate in this undertaking, Mr. Dobbin, Secretary of the Marine Department at Washington, has instructed me to make known that the mercantile marine of all friendly powers may, with respect to the Charts of the Winds and Currents, be placed on the same footing as those of the American Marine ; that is to say, that every captain, without distinction of flag, who will engage to keep his log during the voyage upon a plan laid down, and afterwards communicate the same to the American Government, shall receive, gratis, the Sailing Directions and the Charts published.

"It has consequently been suggested to the captains, that they should provide themselves with *at least* one good chronometer, one good sextant, two good compasses, one marine barometer, and three thermometers for air and water. I make use of the expression *at least*, because the above is the smallest number of instruments with which a captain can fulfil the engagement he contracts upon receiving the Charts.

"Foreign flags will thus enjoy the advantage of profiting at once by all the information collected up to this time.

"You will not fail to observe, gentlemen, that the observations made on board of merchant vessels, with instruments frequently inexact, are not to be relied upon in the same degree as those made where the instruments are more numerous and more delicate, and the observers more in the habit of observing.

"The former, however, from the fact of their being more numerous, give an average result, which may be consulted with advantage ; but the observations made on board the ships of the navy, although fewer in number, are evidently superior in point of precision.

"The object of our meeting, then, gentlemen, is to agree upon a uniform mode of making nautical and meteorological observations on board vessels of war. I am already indebted to the kindness of one of the members present, Lieutenant Jansen, of the Dutch Navy, for the extract of a log kept on board a Dutch ship of war, and which may be quoted as an example of what may be expected from skilful and carefully conducted observations. In order to regulate the distribution of the Charts, which the American Government offers gratuitously to captains, it would in my opinion be desirable that, in each country, a person should be appointed by the government to collect and classify the abstracts of the logs of

which I have spoken, through whom also the Charts should be supplied to the parties desirous of obtaining them."

A unanimous vote of thanks was passed to Mr. Maury.

The Conference lasted until September 8th, and brought forward a mass of suggestions and good ideas, which rendered the year 1853 a memorable date in meteorology. But twenty years have nearly elapsed and we must not devote to the past, however interesting, that detailed notice which belongs to the present.

The necessity for another conference has been for some time recognized by leading meteorologists, but the first to give expression and definition to the proposal, is no less a man than Dr. Buijs Ballot, in his remarkable pamphlet, "Suggestions on a Uniform System of Meteorological Observations," which, on receipt, we felt to be one so emphatically deserving of notice by British meteorologists, that we immediately telegraphed to Utrecht, to ask the Doctor to send over a supply of copies, that we might place them in the hands of our publisher, and thus render them accessible to any person in the British Isles, on the very economical terms stated on our cover, which sufficiently indicate the generosity of the author. On the present occasion, and for probably the only time, we quote from it, viz., the preface, but in future numbers we shall assume that our readers have secured copies for themselves.

"In the following pages I have endeavoured to review some of the questions that may be discussed at a meeting of the General Congress of Meteorologists to be held, probably at Vienna, in the course of the present year.

"The want of such a Congress is deeply felt, and whenever it meet, it will be of great utility. Nor can it be but a saving of much time, if attention be previously directed, however imperfectly, to such subjects as are likely to be submitted to consideration.

"In this paper I have adverted only incidentally to foreign inquiries, the great scientific value of which I am eager to acknowledge.

"An apology is perhaps due for this apparent neglect.

"M. Mühry's inquiry into the local influence of mountains, of rain and wind, and the investigations of the progress of storms by Messrs. Buchan, Dove, Clement Ley, Loomis, Moon, Le Verrier, and especially of the origin of depression systems, the great problem to be solved, have engaged my most serious attention. I should have dwelt at some length on Mr. Clement Ley's work, "The Laws of the Winds prevailing in Europe," in which the writer agrees on many important points with Prof. Mohn, but unfortunately his publication did not reach me until the following pages had been printed.

"My principal aim, however, has been to draw attention to the general method of observing, and of printing the facts observed at the least expense and so as to facilitate particular investigations.

"I entreat the reader's indulgence if I appear to insist too much on such instructions as I have observed myself, or dwell too long on researches made by the Dutch Meteorological Institute. I should be sorry if this were imputed to my not sufficiently appreciating the investigations and labours of others.

"Zealously as I have advocated my opinion, I am most anxious to do ample justice to those distinguished philosophers, my fellow-labourers, and shall pay due deference to their opinions by eagerly complying with such of their wishes as may be generally accepted by the Congress.

"The Dutch language is seldom known beyond the confines of our own country, and this circumstance, joined to the imperfect character of our researches, has caused them to be taken little notice of.

"Hence I have deemed it advisable to have recourse to another medium.

"While in German more general questions have been discussed, the English language is perhaps more widely known, I have therefore selected it for this communication. This will sufficiently account for the many imperfections in the style of this paper. Yet sensible as I am of never having attained that clearness and propriety of diction, so characteristic of English writers, I hope I have succeeded everywhere in making myself intelligible to those to whom these pages are more specially addressed.

"*Utrecht, 10 January, 1872.*

BUIJS BALLOT."

WEATHER MAPS.

IN these pages we have always announced our honest and unbiassed opinion without fear or favour, hence last year the strong way in which we argued as to the incumbent duty which lay upon the Meteorological Committee, as the only national body solely devoted to Meteorology, to take up the matter of Weather Maps, and place us abreast of other nations, who, copying our system, had carried it on to such perfection that we were being left disgracefully in the rear. We do not for a moment claim that our article has quickened their proceedings, but we have infinite pleasure in laying the following circular before our readers:—

*Meteorological Office, 116, Victoria Street, S.W.,
11th March, 1872.*

SIR,—I am instructed to inform you that the Meteorological Committee propose to issue Lithographed Charts illustrative of the Daily Weather Report.

Such charts can be delivered in London, within a reasonable distance from the office of the printer (in Lincoln's Inn Fields), between one and two o'clock p.m., or posted in time for the evening despatch to the country.

(The charts for Sundays cannot be delivered before Tuesday morning, as the Office is closed on Sunday.)

The cost of delivery of the charts by hand, and of postage, will entail some outlay, which it will be necessary for the recipients of the charts to defray.

These charges it is proposed to meet by a subscription, payable in advance, of—

Ten shillings per quarter for a copy to be delivered by hand before two o'clock p.m.

Five shillings per quarter for a copy sent by book post.

The charts will be sent gratuitously until the 31st of March.

If you should wish to receive them after that date, you will please to let me know, stating the number of copies you will require. The subscription will cover any reasonable number of copies.

The Committee reserve to themselves the right of declining to supply copies by hand on the ground of distance.

Your obedient servant,

ROBERT H. SCOTT,

DIRECTOR.

We regret that we cannot also reproduce the table and charts which accompanied it, but we have no doubt whatever that Mr. Scott will gladly send a few specimens to all who will address to him an intimation of their desire to judge for themselves. We think that it would be unfair to look upon the first few numbers as indicative of the delicacy of manipulation of which the plan adopted is capable, but we are certainly at present favourably impressed with its clearness; at the same time we may throw out a few hints for consideration:—1st. General: would it not be well to mark on the outline sketch of Europe by small white discs the approximate sites of the Committee's stations; this, if once done, would occasion neither further trouble nor cost, and those not in the office are seldom acquainted with the position of, say Greencastle and Farö. 2nd. As to Barometer—we are glad to see the isobars so plainly figured, but we hope that occasionally a few more of the actual readings may be inserted. 3rd. As to temperature—we would make the same remarks, supplemented by expression of our hope that if it is even suspected that any of the stations report temperatures normally either too high or too low, some intimation of that fact should be made to the subscribers; for instance, we do not know precisely where the thermometers are placed at Plymouth. But is it not evident that, leaving out of question altogether different forms of thermometer-stand, a very different temperature must prevail in the lower part of the town and on Mount Wise, and which is the fairer representative of the temperature sweeping over the sea cliffs of South East Devon, or the weather-beaten tors of Dartmoor; which the more suitable for comparison with their station in the storm-beaten Scilly Isles? We are fully aware that nothing approaching to accuracy is in this respect obtainable, but it would be of great use to know that normally the temperature recorded at Plymouth was, say 3 degrees higher than on Mount Wise, 4 degrees higher than on the Breakwater, and $4\frac{1}{2}$ degrees than at the Eddystone. As to wind and sea cloud, fog, rain, thunder, &c., we also think the arrangements are very good.

And now there is only one point to consider,—the price. We do not see how this could possibly have been less than it is, and we shall be very much surprised if in a few years' time there is a club-house, country news-room, large shipper's office, or large farmer's breakfast-table without a map of the previous day's weather, and which will lie punctually on the table for considerably less than one penny a day.

MINOR UNDULATIONS IN BAROMETRIC DEPRESSIONS.

To the Editor of the Meteorological Magazine.

SIR,—A fact is mentioned in Mr. Maxwell's letter in your last number which I have often noticed, but which does not appear to have attracted the attention of meteorologists. I allude to the minor oscillations exhibited by the barometer during an extended fall.

These oscillations are well exhibited in the curves from the continuously self-recording instruments, and in almost every instance of

a long steady fall the trace exhibits a sinuous appearance, as though a series of minor undulations was superimposed upon the great wave of diminishing atmospheric pressure.

Of course I am not now alluding to the well-known "pumping" or "heaving" the ordinary barometer so frequently exhibits during a gale of wind, and which being due to the gusts, can be seen by the eye when the instrument is closely watched; but the fluctuations in question have a much longer period than the "hevings."

May we not suppose them to be due in some measure to inertia in the atmosphere, for if they are registered, or observations are plotted down in a curve, we get a striking similarity to the trace produced by a magnetic needle undergoing deflection either in the presence of another magnet or under the action of varying terrestrial magnetic forces.

It will be found by experiment with delicate magnets, that a suspended needle when acted upon by another magnet will not be deflected at once to the greatest extent, but will proceed to make a series of vibrations, each alternate swing being extended farther in the direction in which the needle is being deflected, until the position of equilibrium is reached.

I do not say the two phenomena are in any way analogous, but only to remark upon the similarity exhibited in this respect between barograph and magnetograph curves during periods of disturbance.

Yours truly,

G. MATHUS WHIPPLE, B.Sc. (Lond.)

Kew Observatory.

THE BAROMETRIC DEPRESSION OF JANUARY 24, 1872.

To the Editor of the Meteorological Magazine.

SIR,—In your enumeration of recorded cases of barometric depression approaching or equal to the great depression of last January, you appear to have overlooked the depression of 1814, which occurred at the breaking up of the great frost.

You may, of course, have reasons for omitting it as untrustworthy, but I find it given by the late J. H. Belville, of the Greenwich Observatory, whose reputation for accuracy, I believe, stood very high, in his "Manual of the Mercurial and Aneroid Barometers," without any expression of doubt as to its correctness, as 28·21. It will be found in "A Table of the greatest and least observed heights of the barometer for the last thirty-eight years, taken at Greenwich, and reduced to 32° of Fahrenheit," at page 19. I should add that the "Manual" was published in 1849, by Taylor, of Red Lion-court, Fleet-street, and the thirty-eight years referred to comprise the period from 1811 to 1848.—Yours truly,

GEORGE T. RYVES.

Buildwas, Iron Bridge, Salop, March 5th, 1872.

[No, we did not overlook the depression of 1814, and though the letter to which Mr. Ryves refers was compiled and written after a

night spent by the side of the barometer, we are not yet convinced that it contains a single error. Did Mr. Ryves notice the governing clause in the second paragraph on page 10, "the only instances which I can convince myself have exceeded the present are, &c." Now the question is, did the depression of 1814 exceed that of 1872? on the evidence before us we thought *not*, but we have not had time to investigate further, and cannot speak positively. The reading quoted by Mr. Ryves is from a table which does not state whether or not the values are corrected for altitude, nor what the altitude was—if at the Royal Observatory, 28·21 would be nearly 28·40 at sea level, or far above our limit, but if taken, as is more probable, in the town of Greenwich, then it might not be more than 28·26 or 28·30, and so be below it. As to the very high reputation for accuracy of the late Mr. Belville we know nothing, but if the frontispiece to his work represents his idea of a standard barometer, and the one he employed we should certainly be very careful in using his results.—Ed.]

To the Editor of the Meteorological Magazine.

SIR,—As requested, I send you my notes of the above (irregular from illness). The readings are all corrected and reduced to sea level; barometer, a standard, 65 ft. above mean sea level.

1872.	in.	
Jan. 22nd, 10 p.m.	29·206 f.	
23rd, 11 a.m.	28·826 f.	
2 p.m.	28·776 f.	} Two readings of a slight rise, marked at the time on the diagram, but not exactly taken.
5 p.m.	28·820 r.	
10 p.m.	28·758 f.	
24th, 4 a.m.	28·432 s.	} This minimum reading is <i>estimated</i> by comparison with readings of a small Aneroid taken at 10 p.m. 23rd, 4 a.m. and 10.15 a.m. 24th. Being less sensitive than the standard, probably the actual min. of the latter was lower.
10.15 a.m.	28·709 r.	
9 p.m.	28·895 r.	
(N.B. Rise of Barometer checked in this interval.)		
25th, 10.30 a.m.	28·931 r.	
10 p.m.	29·022 r.	

I watched the Aneroid by my bedside from 3.50 to 4.30, and again at 5 a.m. on the 24th, and am certain that the minimum pressure did not occur later than 4 a.m. At that time it was very unsteady, the index frequently oscillating ·02 in. as each long-drawn blast blew over. The rainfall here of January has been enormous, viz., in 24 rainy days 7·43 inches, of which there fell 0·56 on 22nd, 1·13 on 23rd, and 0·13 on 24th, just half an-inch more in the three days than fell on the other side of the hills at Worthing.

N.B.—Approximate correct altitude above sea level of rain gauge, is 60 feet.—Yours faithfully,

HUGH INGRAM.

Steving, 22nd February, 1872.

[We have been favoured by several gentlemen with tracings of their

self-recording barographs, and we have received a few notes of readings from ordinary observers, but up to the present time their response to the request at the foot of page 12 is unusually slight. We hope they will notice this, and kindly save us the trouble and cost of individual application.—Ed.]

BAD WEATHER, JANUARY 1ST TO 14TH.

SIR,—The following extracts from my register for the last ten years seem to point to something like periodicity in the storms of the early part of January :—

- 1862, Jan. 11.—High wind and heavy rain.
- 1863, „ 1.—Much rain and high wind in night.
- „ 5.—Barometer at 9 p.m., 28·55 in. (at 32°).
- 1864, „ 7.—(Minimum temp. of year.)
- 1865, „ 12.—High wind ; barometer at 3 p.m., 28·594 in.
- „ 13.—High wind ; rain and snow = 0·46 in.
- „ 14.—Barometer at 9 a.m., 28·106 in.
- 1866, „ 3.—High wind.
- „ 6.—High wind.
- „ 8.—Hail and snow.
- „ 11.—High wind and snow. Barometer very low for several days past.
- 1867, „ 5.—High wind and snow.
- „ 7.—High wind and heavy rain.
- „ 8.—Barometer at 9 a.m., 28·266 in.
- „ 9.—Barometer at 9 a.m., 28·428 in.
- 1868, „ 5.—Snow and sleet.
- „ 6.—Snow and sleet.
- 1869, „ 1.—High wind in night.
- „ 2.—High wind in night.
- „ 4.—High wind in night.
- „ 5.—High wind.
- 1870, „ 6.—High wind in night.
- „ 7.—Very high wind.
- „ 8.—Barometer 28·558 in.
- „ 9.—Barometer 28·85 in.
- 1872, „ 3.—Very high wind in night.
- „ 5.—Barometer at 9 a.m., 28·564 in. ; thunder, lightning, and hail at 7,30 p.m.
- „ 7.—Barometer at 10 p.m., 28·805 in.

Barometer corrected for temperature, but not for height above sea level = 345 feet.—Truly yours,

THOMAS BEESLEY.

5, High-street, Banbury, February 10, 1872.

THE WINTER AND COMING SUMMER.

To the Editor of the Meteorological Magazine.

SIR,—The table that accompanied my letter which appeared in your magazine for December last, showed that the mean temperature of the winter of 1871-72 should, at the very least, be in excess of the average by nearly 1 degree. The table further showed that the mean of the winter would probably be very much more than 1 deg. in excess ; for in six out of ten instances there given, the winter was more than

3 deg. above the average, and in four instances as much as 4 or 5 deg. above the Greenwich average of 100 years. Now the mean temperature of the past winter (reckoning from December to February inclusive), has been $41^{\circ}5$, which is $2^{\circ}9$ above Mr. Glaisher's adopted average of 50 years, and $3^{\circ}5$ above the Greenwich average of 100 years. So the law has again been strikingly verified.

In the letter and table above referred to, I showed that the coming summer would be warmer than the average, and according to another law, which, as far as I can ascertain, has never failed, the coming summer must be hot. In fact the mean temperature of the summer must, on the lowest computation, be considerably in excess of the average.—I am, &c.,

GEORGE D. BRUMHAM.

P.S. The following *errata* occurred in the above-mentioned letter :—At line 11 from the top of page 193, for 1868 read 1867 (Nov. 1867), and at line 8 from the end of the letter (when speaking of extremely hot summers since 1829) for 100 years, read 42 years. The summers of maximum heat in the 68 years preceding 1829 were those of 1826, 1818, and 1778.

[It is only justice to ourselves to remark, that a proof of every letter is sent to the author, and that the above and several similar *errata* pointed out in our pages, are neither our fault nor the printer's. We hope our contributors will take the hint in good part.]—Ed.

TRUE TIME.

The receipt of the following letter reminds us that it may be expedient to explain that though the above heading has not recently appeared in our pages, the subject is just as important as ever, and our silence has been caused by the knowledge that the question had been fairly taken up, and was in excellent hands. We may mention that some of our articles having been honoured by transference to the pages of the *Horological Journal*, the discussion has been continued there with considerable ability. The subject has also been discussed in the *English Mechanic*. We understand that Mr. Evans is by no means alone in the race, or in his determination to uphold the honour of his profession, we cannot hope that *all* will win, but are thankful to all who try. As to deciding on respective merits *that* appertains more to our esteemed contemporary, the *Horological Journal*. But so soon as a thoroughly good pattern, at a moderate price, is obtainable, we shall rely upon those of our observers who have not such a time-keeper procuring one as soon as possible. True time gives regularity to observations, and in some cases increases their value at least a thousandfold.—Ed.

CHEAP ASTRONOMICAL CLOCKS PRODUCED.

To the Editor of the Meteorological Magazine.

SIR,—In reply to the various articles which have appeared in your journal on cheap astronomical clocks, and being desirous of removing

any slur from our profession, and also willing to render any assistance which may lie in my power to our valuable friends, the astronomers, I have devoted my leisure to drawing the designs, and working out the dimensions, of the various parts of the above clock, have made the different patterns, and put three in hand at once, which I can produce for £12 each. Those who have named £5, cannot have had much experience in constructing such a timekeeper as I consider is required.

I have used the favourite escapement, the double three-legged gravity; considering astronomers desire a sonorous tick also, they have the cheapest kind of compensation pendulum, vibrating seconds, as a matter of course; the rods are of straight-grained deal wood, which I know to be thoroughly free from moisture and well seasoned, happening to have had a gross of them made for me some six years ago; after being well seasoned they have had no less than four coats of good varnish on them. I fit a piece of brass tube outside the diameter of rod for the crutch-pins, to act against; the bob is a turned cylinder of lead and fourteen inches high, resting on its divided regulation nut, and capable of adjustment for mean or sidereal time. Its weight is 15 lbs. The train of wheels for keeping the foregoing pendulum in motion, is pivoted into an ordinary pair of brass plates, firmly fixed to a cast iron platform, screwed to the base and sides of case, having its escapement carried to the back, and as near the pendulum as possible, which of course is hung on a cast iron cock attached to the stout back of case.

The movement carries a 12-inch painted dial plate, with separate circles for the seconds, minutes, and hours; to simplify and reduce friction as much as possible, the hour hand is carried round once in every twelve hours, by a wheel driven by the main wheel, which is larger than usual, in order to carry the weight as far from the pendulum as possible and close to the side of case. I make use of the ordinary maintaining power to keep going whilst winding, and seven and a half turns on the barrel serve for the eight days; the whole is fitted into a plain solid mahogany case, made just long enough to take the pendulum, with full length glass door in front, and door at back to inspect the escapement.

I purpose constructing some zinc and iron compensation pendulums, suited also for these clocks.

JOHN EVANS.

89, Mount-street, Grosvenor-square, W.

FEBRUARY, 1872.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.						Days on which .01 or more fell.	TEMPERATURE.				No. of Nights below 32°	
		Total Fall.	Difference from average 1860-5	Greatest Fall in 24 hours.		Max.	Min.		In shade	On grass.				
				Dpth.	Date.						Deg.	Date.	Deg.	Date.
I.	Camden Town .....	.96	— .26	.19	22	14	57.0	10	31.4	28	1	7	
II.	Maidstone (Linton Park)	1.33	— .18	.31	19	18	57.0	9	30.0	21	...	...
„	Selborne (The Wakes)	3.10	+ 1.39	.38	1	21	52.5	10	31.5	9	2	4		
III.	Hitchin	1.25	— .01	.26	7	23	53.0	24†	29.0	27	3	...		
„	Banbury	1.88	+ .45	.43	18	17	54.5	10	31.0	17	1	...		
IV.	Bury St. Edmunds (Culford) .....	.90	— .52	.32	7	10	55.0	10	24.0	19	6	12	
V.	Bridport	2.53	+ .47	.36	5	24	55.0	23	29.0	21	2	...		
„	Barnstaple	4.64	+ 2.56	.84	22	24	56.5	25	38.0	21||	...	...
„	Bodmin	9.59	+ 6.80	1.29	12	25	58.0	29	35.0	16	0	2		
VI.	Cirencester	2.87	+ 1.26	1.08	17*	18	...	...	...	...	...	...
„	Shiffnal (Haughton Hall)	2.89	+ 2.00	.60	6	22	53.0	29	29.0	17	6	...		
„	Tenbury (Orleton)	4.14	+ 2.57	.65	6	24	57.0	10	30.5	3	2	7		
VII.	Leicester (Wigston)	2.05	+ .71	.64	19	20	56.0	10	32.0	16¶	...	...
„	Boston	1.78	+ .57	.37	18	20	...	...	...	...	...	...
„	Grimby (Killingholme)	2.38	...	.49	29	21	55.0	10†	33.0	10	0	...
„	Derby	2.87	+ 1.39	.51	17	22	55.0	10	33.0	17	?	...		
VIII.	Manchester	3.02	+ 1.07	1.08	29	18	56.0	10	33.0	17	0	8		
IX.	York	2.50	+ 1.12	.58	24	21	50.0	1	33.5	22	0	...		
„	Skipton (Arncliffe)	7.91	+ 4.24	1.68	29	27	...	...	...	...	...	...
X.	North Shields	2.39	+ .86	.77	24	23	54.0	1	33.0	8	0	2		
„	Borrowdale (Seathwaite)	17.53	+ 6.15	2.00	28	21	...	...	...	...	...	...
XI.	Cardiff (Ely)	4.65	+ 2.58	1.09	23	23	...	...	...	...	...	...
„	Haverfordwest	6.62	+ 3.76	.84	9	19	52.6	24	30.4	26	2	4		
„	Rhayader (Cefnfaes)	5.85	+ 2.87	.90	29	19	53.0	...	32.0	...	...	...
„	Llandudno	3.04	+ 1.69	.24	17	17	57.7	5	34.2	28	...	...
XII.	Dumfries	5.26	+ 2.71	1.03	24	25	53.0	1, 13	32.0	8, 17	2	...		
„	Hawick (Silverbut Hall)	3.32	...	.73	24	22	...	...	...	...	...	...
XIV.	Ayr (Auchendrane House)	2.38	— .98	.49	5	20	53.0	29	27.0	27	5	15		
XV.	Castle Toward	5.37	+ 1.63	.82	25	20	51.0	7	29.0	...	...	...
XVI.	Leven (Nookton)	4.06	+ 2.36	1.20	24	18	50.0	1, 23	26.0	8	8	18		
„	Stirling (Deanston)	4.12	+ 1.12	.82	24	22	52.1	1	24.5	27	8	13		
„	Logierait	6.08	...	1.27	26	18	...	...	...	...	...	...
XVII.	Ballater	8.74	...	2.80	25	13	53.0	29	24.5	8	14	...		
„	Aberdeen	5.08	...	.96	25	24	53.6	29	31.1	8	2	13
XVIII.	Inverness (Culloden) .....	.52	...	.12	1	10	51.4	1	31.9	8	1	19
„	Portree	5.57	— 4.66	.93	19	22	...	...	...	...	...	...
„	Loch Broom	2.12	...	.36	26	13	...	...	...	...	...	...
XIX.	Helmsdale	1.76	...	.33	25	15	...	...	...	...	...	...
„	Sandwick	2.16	— .32	.47	17	23	49.6	1	32.1	21	0	11		
XX.	Cork	5.32	...	.81	23	20	...	...	...	...	...	...
„	Waterford	5.52	+ 3.49	.77	8	21	52.0	25‡	32.0	19	1	...		
„	Killaloe	4.60	+ 1.69	.60	28	23	58.0	13	30.0	19	7	15		
XXI.	Portarlington	3.12	+ 1.09	.56	1	28	54.0	24	32.5	18	...	...
„	Monkstown	3.49	+ 1.85	.58	4	18	61.5	24	29.5	7	1	1		
XXII.	Galway	3.93	...	.48	15	21	53.0	10§	32.0	19	0	...
„	Bunninadden (Doo Castle)	3.60	...	.60	23	18	50.0	9	29.0	8	2	...
XXIII.	Bawnboy (Owendoon) .....	...	...	...	...	...	...	...	...	...	...	...
„	Waringstown	3.07	...	.46	12	20	54.0	9, 25	28.0	26	3	15
„	Strabane (Leckpatrick)	3.79	...	.40	24	25	...	...	...	...	...	...

* And 18. † And 29. ‡ And 26. § And 13, 24, 28. || And 27. ¶ And 18.

+ 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 and dirty, but not wet month. Aurora on the evening of the 4th; fogs on 2nd, 9th, 16th, and 22nd; slight frosts on five mornings only; bar. generally steady until the last week; wind S., S.W., and S.E. on 25 days; vegetation advancing, but not so forward as might be expected from the long period of mild weather we have had, which contrasts strongly with February of 1855, when we had 26 frosty days, and the average temp. of the whole month was only $28^{\circ}\cdot66$ against $43^{\circ}\cdot96$ of the past month, a difference of 15° ; max. bar. $29\cdot81$ on 27th; min. $29^{\circ}\cdot23$ on 24th.

SELBORNE.—An unprecedentedly mild and damp February; catarrh almost universal; prevailing winds S.W., with scarcely an exception, till the 26th; birds pairing, and progress of vegetation unusually early. In the last fortnight of December, and the months of January and February (73 days), there were only 19 days without measured R; fogs on eight days; violent wind, S.W. on 4th; fine aurora on 4th and 6th; T with much L on evening of 14th, at 9 p.m.

CULFORD.—Magnificent aurora on the evening of the 4th; easterly winds during 15 days, and westerly during 14 days, altogether a month of exceedingly mild weather for February, the mean temp. being $43^{\circ}\cdot5$, and as a consequent result, vegetation is generally in an unusually forward condition, and very severe weather occurring now, would doubtless prove seriously injurious to many things.

BRIDPORT.—Aurora on 4th; large lunar halo on 21st; solar halo at 4.30 p.m. on 23rd; peaches and apricots in blossom at the end of the month.

BODMIN.—A magnificent display of aurora between 6 and 8 p.m. (on the 4th), when cloud came on; nothing equal to this marvellous sight has ever been witnessed here; at 7.15 p.m., the most brilliant streamers of deep rose colour and bright white light radiated from a point close to the Pleiades, and extended to an immense distance; at 7.30, streamers of the same colours formed just below Capella; a beautiful Maltese cross, and so bright at times was the light that every slate on the roof could be counted; the S.E. wind blew with a force of 8, and brought dense clouds, which obscured all the sky at 8 p.m. The rainfall of this month $9\cdot59$ in., and of January $10\cdot18$ (together $19\cdot77$ in.), is far greater than any recorded during the past 23 years; mean temp. of month $46^{\circ}\cdot1$, being no less than $3^{\circ}\cdot2$ above the average.

HAUGHTON HALL.—Another rainy month, the wettest February for 38 (or more years), as was January, thus exceeding the average of seven years by $1\cdot12$, as January did by $2\cdot30$; the winds, with three exceptions, never left the S. quarter, in which they had continued throughout the previous month; only six frosty nights; the max. temp. low, but equable, the bar. remarkably so; a sudden rise on 27th from $29^{\circ}\cdot24$ to $29^{\circ}\cdot80$, with change of wind from the S.W. to N.; brilliant aurora on the 4th, at 6.30 p.m., commencing in S.W., and veering round to N. and N.E.; snowdrops open on the 1st; primroses on the 6th; crocuses on 15th; black-bird first heard on the 24th.

ORLETON.—A very rainy, gloomy month, with frequent fogs, but no T or L; the rainfall in February during 41 years, has only once reached $4\cdot00$ in., and that was in 1833, when it amounted to $5\cdot725$ in. after a very dry January, and was followed by a dry March; bar. steady, but much below the average; the land saturated with wet all the month; temp. nearly 3° above the average, and tolerably steady, with a few frosty mornings; rough winds on 10th and 29th; aurora in S.W. at sunset on the 4th.

WIGSTON GRANGE, LEICESTER.—Remarkable humidity throughout the month, the ground too wet to flow or spread manure; both rainfall and temp. above the average for February; vegetation very forward.

BOSTON.—Very wet all the month. River Wotham in flood. Fen-lands much under water, and ground so wet that spring corn could not be sown; very mild in temperature; snowdrops and hepatica in flower on the 2nd. Vegetation too much vanced at the end of the month.

GRIMSBY, KILLINGHOLME.—February has well maintained its character of "Fill Dyke;" the ground is so wet that gardening is at a stand still; we have had no frost beyond rime on the grass; crocus began to flower on 1st; snowdrops in flower on 7th; hepatica on 12th; yews shedding pollen on 21st; skylark singing on the 2nd; frogs spawning on 23rd; distant T in S.W. and S. in the evening of the 23rd.

DERBY.—This month is remarkable for its high temperature, the ther. (5 feet above ground), never once reaching freezing point; the mean temp. for the month is 4° above the average, and the rainfall double the mean of 21 years.

MANCHESTER.—A fall of more than 1·00 on 29th, and flood of the Irwell.

YORK.—Constantly damp, though no heavy falls of R; aurora on 4th and 9th; solar halo on 23rd; lunar halos on 16th and 23rd.

NORTH SHIELDS.—Rose-coloured aurora on 4th.

W A L E S.

HAVERFORDWEST.—The wettest February in my 23 years' record, and characterized also by exceeding mildness; spring flowers in blossom; peach bloom almost fully out; bar. low all the month, an almost entire absence of frost, and no heavy storms of wind; some of the fine days interspersed towards the end of the month between the wet ones, were very lovely; prevailing winds S. and W.

CEFNFAES.—The month damp and wet; temp. mild; wind N.W. and S.E.; ten days without rain.

LLANDUDNO.—Splendid aurora on evening of 4th.

S C O T L A N D.

DUMFRIES.—There have been only four days during the month on which no rain has been recorded; on 16th and 17th some snow fell; several strong gales during the month; rainfall nearly double the average; mean temp. of the month 42°·9, or 1°·61 above the corresponding month last year; vegetation in an unusually forward state; fields verdant, and fruit trees bursting into bloom; on the night of the 4th a most magnificent aurora.

SILVERBUTT HALL, HAWICK.—The mildest and wettest February ever remembered here; on the 2nd a sparrow's nest was discovered in the ivy on a house in Slitrig Crescent, containing four eggs; the pastures are much greener now than they were in the middle of April last year; most splendid aurora on the night of the 4th; on 15th quite springlike for warmth, but no sunshine; on the following day cold easterly wind and S showers; rivers flooded on 24th and 25th.

AUCHENDRANE.—This February has been a month of low bar., with small range, and although the mean temp. exactly accords with our February mean, the humidity is greater, but the rainfall less, and extending almost as a drizzle over 20 days, the vapour-forming action has been stronger than the vapour-condensing power, which may, perhaps, be owing to the presence of only five days of Polar winds, four of calm, and 20 of equinoctials; the storms of the 24th, 25th, and 26th seem to have been accompanied by a bar. depression in the W.; the wind here on the 24th was E., which veered to S. on 25th, and backed again to E. on 26th, and ended in a calm on the 27th; the soil has not recovered from its January soaking, and the rivers are yet large. Beautiful aurora on the 4th; severe TS on 6th.

NOOKTON.—On 4th fine coloured aurora, reaching to the zenith.

DEANSTON.—Gale of wind and R on 1st from S.W., but the wind shifted about midday to E.S.E., and it cleared; aurora on 4th; gale on 12th, E.N.E., and very cold, rainy, stormy, and some sleet; 18th blasts; some L and distant T, and till the end of the month alternate days of rain, some frost and bright sunshine; very changeable; during the whole month no S except on the mountains; on 25th heavy R and floods in the rivers; smart frost on the night of 26th and morning of 27th; since then fresh and mild; very showery.

LOGIERAIT.—The aurora very visible on the 4th, converging from all points to the zenith continual, ever changing its pencillings from 5.30 to 10 p.m.; a month of remarkably heavy rainfall, and what is almost without parallel, the month of February without S, and almost without frost.

BALLATER.—A wet month altogether; the total rainfall much above the average; vegetation unusually advanced for the season.

ABERDEEN.—A mild, but wet, stormy month, indeed the wettest February on record ; several heavy storms, especially from S.E. ; no S, a little sleet and H ; hoar frost on eight days ; mean temp. $40^{\circ} \cdot 9$, or $3^{\circ} \cdot 3$ above the mean of 15 years ; S.E., S., and S.W. winds in excess of average ; estimated pressure rather below it ; red aurora on 4th ; L on evening of 15th.

PORTREE.—On the whole, this has been a mild, open month ; a very strong gale from the S. on the 4th, which continued all day ; S showers on 16th, 17th, 18th, 19th, 20th, and 21st ; frost on 24th and 27th ; fruit trees and bushes I fear are too far advanced in the bud so early in the season ; I strongly suspect they will get a check before March is out.

LOCHBROOM.—This has been the most remarkable February for warmth and mildness in the memory of anyone here, and the aurora, or rather red sky seen on the night of the 4th was the grandest ever seen here ; beautiful weather, more like summer.

I R E L A N D.

WATERFORD.—On the 4th there was a fine display of aurora, becoming visible soon after dark, and lasting several hours.

MONKSTOWN.—Dark crimson aurora on 4th ; the wettest February for eight years ; very little frost ; vegetation progressing rapidly.

DOO CASTLE.—Wet and cold month ; no farming operations carried on ; land completely saturated.

WARINGSTOWN.—Fine aurora from dusk till late at night on 4th ; month wet and warm ; occasional fine days ; land saturated, and labour greatly delayed.

PLACING RADIATION MINIMUM THERMOMETERS.

To the Editor of the Meteorological Magazine.

SIR,—It being admitted that uniformity of procedure in the method of carrying on meteorological observations is the one great desideratum for obtaining accurate data from a comparison of different records, the question, "How should self-registering minimum thermometers be exposed on grass?" suggests itself as one the discussion of which would be both interesting and advantageous to a great many of your readers, and especially to those among them who, like myself, are but simple amateurs.

I have been urged to propound this query from finding a diversity of practice to exist on the part of various observers, together with the want of any definite instructions generally accessible.

My custom has hitherto been to suspend the instrument—with its lower edge resting on the ground—under a species of small penthouse, so as to shelter it from the rain and the sun. But I find this a usage far from universally conformed to, whence I conclude I may be in error in the adoption of it ; and have, therefore, been led to believe that the ventilation of the subject by you might possibly set right, and oblige many besides your humble servant.—I am, Sir, yours truly,

F. BONNYCASTLE GRITTON.

West Tytherton, Chippenham, Wilts, Jan. 23rd, 1872.

[We should be glad to hear (not necessarily for publication) who are the other observers who have adopted this penthouse plan. Some persons do put their grass min. into a box during the day, for fear it should get too hot and burst, or evaporate its spirit to the top of the tube. Properly made thermometers will commit neither of these offences, and we leave ours resting on grass, night and day, winter and

summer, all the year round, and never have had anything go wrong, except when a pet quadruped put her foot just in the middle of the middle of the tube (we use *no* shield), with a result fatal to that thermometer. Letters, such as the above, strongly illustrate the necessity for a complete set of "Rules for Observers" for *all* subjects, similar to those adopted for rainfall.]—Ed.

DECREASE OF RAINFALL WITH ELEVATION.

To the Editor of the Meteorological Magazine.

SIR,—Let me explain to Mr. Malet that it was only as to particular mechanical forces that I supposed the atmosphere to be a regulator of rainfall. Does Mr. Du Port allow for the gain which, as rain-drops increase in size, accrues to the (constant) gravitation force, as against the retarding force of the air, and the (variable) deflecting force of the wind; and for the tendency of the last by its vertical and horizontal undulations to distribute the fall (even of continuous rain) in successive volumes of intermittent density? From the complex action of these forces, the different sized drops fall at different velocities along intersecting paths, coalescing more and more so as to give a maximum density at the lowest horizontal section of each centre of the fall; *i.e.*, the gain or loss, by unequal distribution in the vertical and horizontal, longitudinal and lateral, sections of the fall, is unequally compensated by the cumulative process of coalescence, so as to affect elevation-differences.

Nor should it be forgotten that, owing to the relative density of water and air, a column of rainfall brings down with it a current of cold air by which additional moisture is condensed. (I offer this in reply to Mr. Stow's objection, Vol. VI., p. 70, lines 8—15.) But on this intricate question I will only touch so far as to ask whether, taking the under surface of the clouds as the boundary line where visible condensation of aqueous vapour in colder air begins, we may not, as a rule, reckon the visible cloud above as a proportional measure of the invisible moisture below that line, and so infer that rainfall generated above will probably gather volume in its descent? In fact, is not each separate cloud the upper segment only of a volume of moist air?

Yours faithfully,

HUGH INGRAM.

Steyning, 7th March, 1872.

To the Editor of the Meteorological Magazine.

SIR,—The important qualification in the matter of atmospheric humidity contained in Mr. Stow's last letter, enables me to agree with him on that point. With regard to "Decrease of Rainfall with Elevation," I fear that the terms I used to place the pole and hill in strong contrast have impressed him with an idea of my views which is a little overstrained. If Mr. Stow means by a hill something shaped like a church tower, or sugar loaf, it is obvious that in proportion as it approaches such a form it will behave like towers and poles in catching rain; but that was not my meaning. The point I wished to enforce was

that elevated grounds catch much more rain than poles of the same height on plains, although equally exposed to the force of the wind. I will mention practical illustrations from this neighbourhood. The quality of the air brought up by the rain-bearing winds in Glamorganshire is very uniform, but the local distribution of the moisture varies considerably. The rainfall last year, at Cardiff and the surrounding lowlands, was from 37 to 41 inches, and about 18 miles to the S.W., close to the Bristol Channel, it was only 33·55 inches at 40 or 50 feet above half-tide level. In the hill country beyond, at elevations ranging from 350 to above 1000 feet, it varied from 47 to 76 inches. At some of these stations the gauges are freely exposed to the wind, so the angle at which the rain falls cannot differ much from that of one on a pole of the same height. Now if the hills were levelled, and the gauges left suspended on poles in the same localities and under precisely the same general atmospheric conditions they would receive next to nothing, instead of 50 or 70 inches. I regard this hill country as a mountain mass, although it is furrowed with valleys, and has summits and ranges of different altitudes. Comparison of the returns shows variation from height, and the many other circumstances that modify rainfall; but taking the hill gauges individually, and the average of them collectively, they *all* show a large excess over those of the lowlands, and still more so above one on a pole even one-tenth of the height on the plains to the S. or S.W. We constantly see rain falling heavily on these hills and valleys, and I remember a serious flood that much damaged a railway resulting from the bursting of a storm cloud on the highest hill in the county. In my previous letters I have not compared the rainfall of the hills with that of the valleys, but I feel sure that the influence of the former increases the rainfall of the latter in a very high degree. I believe that in some instances the rainfall of the vales exceeds that of the summits. The broad principle I advocate is that elevated regions of hills and valleys fully open to the wet winds receive more than their share of rain, and that gauges placed on poles in the plain catch less although the angle of fall cannot be very different. These facts prove that the angle cannot cause a loss of more than a small discount from the total, and that the pluvial process is cumulative, as I tried to show in my first letter. This latter point is confirmed by the softness and gentleness with which rain usually falls, and which could not be the case if the drops were all fully formed at a great elevation. Apologising for again troubling you, and promising not to trespass further upon your space in this controversy.

I am, &c., yours faithfully,

FRANKLEN G. EVANS, M.R.C.S., F.M.S., &c.

Tynant Radyr, near Cardiff, Feb. 17, 1872.

P.S.—A gauge on a pole 100 feet high at Cardiff would not catch 20 inches, although others 600 feet higher on the hills catch 60 or 70 inches, and yet the rain must pass over the lowlands before it can reach the mountains. The rainfall in the elevated valleys is great, because they get the advantage of the attraction of the mountain mass plus the cumulative effect of the moisture of the valley.