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ANEMOMETERS.

(Continued from page 66.)

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

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

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

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

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

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

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

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

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

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

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

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

The cost of this instrument is £32.

Abstracts of Meteorological Works. No. II.

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

PUBLISHED A.D. 1783.

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

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

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

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

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

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

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

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

REVIEWS.

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

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

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

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

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

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

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

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

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

"Ever since I considered the subject, I have been of opinion that changes of weather are not more probable a few days after full or new moon than at other times; and with regard to 'lying on her back' being a prognostic, it seems too absurd to require refutation, for astronomers could tell us the angle at which she would lie a hundred lunations hence, though no one could pretend to give us a very correct description of the weather immediately to follow. It depends on her position when first seen, and as she appears to lie more on her back *when seen early*, or a little above the sun, than when she has made considerable progress in growth and from the sun."

We are as yet very far from being converted to the theory of lunar influence on the weather; but still it should be known that recent investigations instituted by Mr. Glaisher seem to open the question once more with some chance of arriving at definite conclusions on the subject. In his interesting paper on "The Influence of the Moon on the Direction of the Wind,"* this scientific meteorologist avers that

* Proceedings of Meteorological Society, March 20, 1867.

"from the discussion of the observations [extending over seven years], it seems that when the sun and moon were in and near conjunction the air was less frequently calm; the duration of the north wind with its east compounds was less frequent; the south wind with its west compounds was more frequent than when the sun and moon were in and near opposition. From this it would seem that the position of the moon in respect to the sun has exercised an influence on the direction of the wind in these years."

Now, as wind and weather go together, it would seem that the popular belief is becoming avenged on the learned authorities (Arago, among them), who have hitherto ridiculed it as unfounded in fact and reason. Oddly enough, this very saying about the moon lying on her back, which Mr. Clouston thinks ridiculous, is confirmed by Mr. Glaisher's investigations. It occurs only at *new* moon, and this is the period, according to Mr. Glaisher, that a *sou'wester* will blow if at any time, and everybody knows what sort of weather this wind generally makes.

It is curious to find that the adage is at least as old as Aratus (2,000 years ago), and that Mr. Glaisher should have been destined to prove its correctness. Aratus not only refers the south wind to the moon's *lying on her back*, but the north wind to her upright *nodding*. With all our vaunted scientific progress, the influence of declination, thus early pointed out, has we believe, never been thoroughly tested.

Here is the axiom of Aratus:—

Εἰ δέ κέν οἱ κεράων τὸ μετήορον εὖ ἐπινεύοι
Δειδέχθαι βορέω· ὅτε δ'ὑπτιάῃσι, νότοιο*

Respecting the saying that "rain with a south-east wind is expected to last for some time," Mr. Clouston observes:—

"This saying is very common, but I was much at a loss to account for the fact till the idea now prevalent regarding the winds came under my notice, as there is no great mass of water in a south-east direction to send us its evaporation; but the south-east wind is now viewed as a combination of a polar and tropical current, deflected in this direction by the rotation of the earth, and no mixture of currents is more likely to supply us with continued rain than this—the cold polar current condensing the moisture in the watery tropical one, and causing rain."

This is Admiral FitzRoy's view, but it appears to us that the explanation given long ago by Luke Howard was equally rational:—

"Vapour brought to us by such a wind [S. or S.E., to be decomposed by the prevalent N.W., W., and S.W. winds] must have been generated in countries lying to the south and east of our island. It is, therefore, probably in the extensive valleys watered by the Meuse, the Moselle, and the Rhine, if not from the more distant Elbe, the Oder, and Weser, that the water rises, in the midst of sunshine, which is soon afterwards to form *our* clouds, and pour down in *our* thundershowers. And this island, in all probability, does the same office for Ireland—nay, the eastern for the western counties of South Britain . . . . . After nearly

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* *Dioscmeia*, 794. "When her upper horn nods well forward, expect the north wind; but when she lies on her back, the south wind.

"When the moon lies on her back,
Then the Sou'-west wind will crack;
When she rises up and nods,
Then North-easters dry the sods."

nine days wet weather, attended as usual with mixed winds, in our district, upon the wind changing from S.E. to N.E., it became fair with us; and on the same day (26th May, 1817) a rain of three days and nights commenced in the country east of the Upper Rhine about Stuttgard, so heavy as to produce a serious inundation. In the meantime we had no rain, though the barometer was very low, and the change of the wind above mentioned had been attended with thunder. The rain ceased in those parts upon the evening of the 28th, and on the next two days it rained again with us."*

"Easterly gales without rain during the spring equinox, foretell a dry summer." On this axiom Mr Clouston says:—

"The *new* views on this subject are very important indeed. It will be most advantageous if we can make sure, according to the theory of Mr. de Boulay, that 'extraordinary weather at the vernal equinox, is followed by a repetition of that weather, and of the aërial movements which caused it, during the succeeding summer.'"

Now, if we admit the importance of these views, they are certainly not *new*. It was Dr. Kirwan who long ago propounded them from observations made during the series of years from 1677 to 1789, and they were quoted and verified by Luke Howard in 1808 (vol. ii., 41). Dr. Kirwan's rules are—(1) when there has been *no storm* before or after the vernal equinox, the ensuing summer is generally *dry*, at least four times in six; (2) when a storm happens from an easterly point on the 19th, 20th, or 21st of March, the succeeding summer is *dry*, four times in five; (3) when a storm rises on the 25th, 26th, or 27th March, and not before, *in any point*, the succeeding summer is generally *dry*, four times in five; (4) if there should be a storm at S.W. or W.S.W., on the 19th, 20th, or 22nd of March, the succeeding summer is generally *wet*, five times in six.

Dry summers, says Kirwan, are the consequence of *uniform* winds, from whatever quarter they may blow; as *wet* summers are of variable winds, particularly in opposite directions. Now, southerly winds are most frequently accompanied with rain in most parts of Europe, at least, and probably in most parts of our hemisphere, but northerly and easterly, with clear, dry, and serene weather, and, as Luke Howard observes, it seems reasonable to suppose that the wind which is to prevail during the summer, *may most frequently set in with the vernal equinox*. In one case we get a *tropical* summer, incessantly pouring, in the other a *polar* summer, as most strikingly exemplified this year, when during June and July we sweltered on the south side of a street, and shivered on the north—whilst the sun shone—with a huge "daily range" of the thermometer. Kirwan's second maxim was verified in spring. Last March began with N.E. or N.N.E winds, continuing with scarcely a change to the 17th when the wind advanced to a point or so to the S. of E., but returned to E.N.E. on the 19th, and so continued to the 21st; stormy, with a 12-pound pressure from S.E. on the 22nd. Consequently, the summer should have been dry, which, however, it was not.

Mr. de Boulay's prediction for this year is not clearly expressed as to whether it will be wet or dry, but he distinctly says that "the

* Climate of London, i., 122.

coming season in Great Britain does not promise to be a bountiful one as regards the yield of cereals." (*Mark Lane Express*, April 29th).

The study of periodic phenomena will throw great light on practical meteorology, so that in time we may hope to have something like a weather almanac not destined to be right by chance, and wrong on principle.

No one is in a better position to aid in this development than Mr. Clouston, a veteran meteorologist of 40 years' experience, and furnished with the best instruments—among the rest, one of the self-registering anemometers belonging to the Government. Not only should he be able to test the periodic variations of temperature, but especially the grand question of lunar influence on the weather, as apparently involved in the winds that may characterize not only her mere *phases* (which the vulgar note,) but her positions in declination apogee and perigee, as shown by the *Nautical Almanac*, with reference to the sun's all-important declination. If Mr. Clouston will institute this process, *de lunatico inquirendo*, we doubt not that something will come of it, and shall always endeavour to find a monthly place for his results in the *Meteorological Magazine*. *Verb Sap.*

Report on the unusual intensity of the Frost of December, 1860, *and January*, 1861, *with its injurious effects on Trees, Shrubs, Pines (coniferous), &c.; and a Comparison between the great Cold of this Period and that experienced in the severe Winters of* 1837-8, 1841, *and* 1855; *with some Remarks on the intense Frost of January in the present Year* [1867.] By DUNCAN FORBES, of Culloden. Aberdeen: G. Clark & Sons. Large 8vo, 30 pages.

NOTWITHSTANDING its lengthy title, this is a capital pamphlet, giving in double columns the minimum temperatures at the principal gardens and nurseries in the North of Scotland, and the coniferous pines, &c., which have borne those temperatures without injury. This able report should be in the hands of all who take interest in the ornamentation of our parks by the acclimatization of the rarer pines; botanists and meteorologists here meet on common ground, and each has much to learn from the other. We presume not to dictate on botanical matters, but find even in this pamphlet ample proof that it is not alone intensity of frost that determines its destructive power; the previous condition of the plants, the dampness or dryness of the soil and of the air, and the duration of the low temperature, these, and perchance other conditions which we know not of, all have their influences; and such labours of love as this now under notice must be pushed on, not alone in one district, or by one person, however zealous, but in different districts and by many minds, and then without doubt the practical benefits conferred by the present publication will continue to extend in ever widening circles. Just as a type of the information contained in the pamphlet, we may state that particulars are given of 21 localities where specimens of the *Wellingtonia Gigantea* were exposed to temperatures of which several were near zero, and the lowest was —8°, and yet in every case they escaped uninjured.

Everybody's Weather Guide. By A. STEINMETZ. Reeve. Large 8vo, 24 pages.

A WELL designed epitome of the weather wisdom of the present day, which will we think enable "everybody . . . to form a probable opinion of coming weather;" but Mr. Steinmetz's readers will be far ahead of the rest of us if they are by it "enabled to know when they are likely to need umbrellas and when they may leave the encumbrance at home, although the sky be overcast and cloudy." Mr. Steinmetz is the most likely man to achieve this, and we would not presume to suppose he was ever caught in a shower, though our own carelessness or want of skill often places us in that predicament. The author of the "Manual of Weathercasts" and of "Sunshine and Showers," comes before us crowned with the laurels they have won for him; he has succeeded to a great extent in popularizing meteorology; may he be equally successful in the matter he has now taken up.

Reference is made in the body of the pamphlet to a set of meteorological instruments prepared Mr. Pastorelli, of Piccadilly, and on the cover an engraving is given of the stand which is supplied with them. We have made some enquiries on the subject, and find that the set consists of *barometer*, oak and ivory, (certified by Mr. Glaisher as having no greater error than 0·02,) with double scale thermometer; *dry and wet bulb* thermometers, divided on their own stems, metal scales; *maximum and minimum* thermometers, similarly mounted; *rain gauge* and *thermometer stand*; the last alone requires altering, by the addition of wings to keep off the morning and evening sun. The price of the set is £5 or £5 5s., we forget which; but either is low, considering the quality of the instruments. We should much prefer a metal scale barometer, even if the set cost £1 more, but with the certificate above mentioned, the wooden barometer is obviously correct enough for all ordinary purposes.

HEAVY RAINFALL IN THE UNITED STATES.

For the past three weeks the Atlantic coast of the United States has been visited by the most heavy and long-continued rain storms. These storms have prevailed all along the coast from Boston to Savannah, and in the interior as far back as the Alleghanies. An enormous amount of water has fallen, and for the month of August in this part of the world the rainfall has been unprecedented. Between the 1st and the 15th of August inclusive the rainfall at Philadelphia was 14·56 inches, of which no less than 6·68 inches fell on the 15th. These heavy rains, which have been seldom accompanied by thunder, a very strange circumstance for the season, have generally been in the form of drenching showers of short duration, coming at frequent intervals. On August 15th the rain fell in torrents and was more like the bursting of a waterspout than anything else. The floods made the streets impassable, and put a stop to all business, and this effect is not alone reported from this city, but from New York, Baltimore, Washington, and elsewhere. On August 16th, owing to the great freshets in the streams, there was scarcely a railroad or highway passable in New York, Pennsylvania, New Jersey, Maryland, or Virginia. Our great rivers ran as mountain torrents, carrying everything before them, and overflowing all the low portions of the cities. Scarcely a telegraph wire was in operation, and the damage to roads and canals and other property is almost incalculable. Of course, such drenching rains have had a bad effect upon the few crops in the ground at this late season; and the great fall of water for August is the subject of universal remark.

AUGUST, 1867.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Dpth	Date.	Days on which 01 or more fell.	TEMPERATURE. Max. Deg.	Date.	Min. Deg.	Date.	No. of nights below 32°.
			inches	inches.	in.							
I.	ENGLAND.	Camden Town	2·63	— ·01	·89	19	10	88·2	14	40·9	3	0
II.		Staplehurst (Linton Park)	1·55	— 1·16	·41	6	10	90·0	14	44·0	2	0
,,		Selborne (The Wakes)	2·43	— ·74	·54	5	11	79·0	14	39·5	1	0
III.		Hitchen	1·86	— ·49	·58	6	12	80·0	14	40·0	2	...
,,		Banbury	2·75	+ ·62	1·39	15	12	83·2	13	41·0	8	0
,,		Wisbech	2·15	...	·59	6	12	88·6	14	42·8	3	0
IV.		Bury St. Edmunds (Culford)	1·49	— ·95	·52	6	7	87·0	14	36·0	2	0
V.		Calne	3·07	...	1·33	15	11	86·0	13	42·5	27	...
,,		Plymouth (Goodamoor)	1·93	— 3·06	...	...	...	83·0	...	43·0	...	...
,,		Barnstaple	2·06	— 2·13	·35	29	14	85·6	14	47·0	22	..
,,		Taunton (Fulland's School)	1·47	— 1·20	·38	5	12	94·0	12	45·5	20	0
VI.		Shrewsbury (Highfield)	·79	— 2·10	·30	31	12	88·0	13	...	...	...
,,		Tenbury (Orleton)	2·19	— ·69	·61	31	16	86·3	13	40·0	28	0
VII.		Leicester (Wigston)	2·18	— ·02	1·24	16	10	90·0	13‡	41·0	27	0
,,		West Retford	...	...	..	...	..	...	...	...	...	...
,,		Derby	4·21	+ 1·61	2·11	19	15	87·0	13	46·0	7, 22	0
VIII.		Manchester	1·41	— 2·09	·27	15	16	90·0	13	45·0	27	0
IX.		York	4·34	+ 1·63	2·40	15	9	88·0	13	47·5	22	...
,,		Skipton (Arncliffe)	4·05	— ·89	·95	15	15	71·0	14	45·0	27	0
X.		North Shields	2·35	— ·50	·70	15	13	73·0	13	46·2	7	0
,,		Borrowdale (Seathwaite)	13·05	+ 1·03	1·73	6	21	...	...	...	...	...
XI.	WALES.	Abercarn	1·76	...	·35	6, 8	12	83·0	14	47·0	28	0
,,		Haverfordwest	3·45	— 1·43	·96	9	14	80·5	13	44·0	12	0
,,		Rhayader (Cefnfaes)	1·24	— 3·42	·30	17*	13	86·0	...	42·0	..	0
,,		Llanberis (R. Victoria Hotel)	3·78	...	·68	5	16	...	...	...	...	...
XII.		Dumfries	3·36	— ·52	·47	12	20	82·0	13	43·5	27	0
,,		Hawick (Silverbut Hall)	2·31	...	·25	6	20	...	...	...	...	...
XIV.		Ayr (Auchendrane House)	3·69	— ·28	·49	30	22	76·0	12	41·0	27	0
XV.		Otter House	5·06	— ·96	·99	7	16	75·0	14	43·0	1	0
XVI.		Leven (Nookton)	2·04	— ·95	·57	20	..	73·0	27	43·0	27	0
,,		Stirling (Deanston)	4·48	— ·14	1·36	20	20	76·0	14	41·0	27	0
,,		Logierait	3·32	...	1·61	20	14	...	...	...	...	..
XVII.		Ballater	2·85	...	1·08	20	13	81·0	14	34·5	2	0
,,		Aberdeen	3·56	...	·72	20	19	75·0	14	43·6	27	0
XVIII		Inverness (Culloden)	2·03	...	1·33	31	6	72·0	13	45·4	2	0
,,		Fort William	4·75	...	·59	20†	25	...	...	...	...	...
,,		Portree	6·32	— 1·13	1·39	24	18	74·0	14	38·8	1	0
,,		Loch Broom	1·86	...	·46	20	15	...	...	...	...	...
XIX.		Helmsdale	1·95	...	·84	20	10	...	...	...	...	...
,,		Sandwick	1·72	— 1·99	·34	20	15	69·2	12	45·0	20	...
XX.	IRELAND.	Cork	2·29	...	·44	31	18	...	...	...	...	...
,,		Waterford	3·35	— ·10	·80	30	22	77·0	14	49·0	27	0
,,		Killaloe	4·70	— ·23	·96	19	23	80·5	13	42·5	27	0
XXI.		Portarlington	2·79	— 1·71	·47	14	22	74·0	13	43·0	27	0
,,		Monkstown	1·53	— 1·68	·40	31	15	77·5	13	40·0	1	0
XXII.		Galway	4·39	...	·48	25	22	77·0	1, 14	47·0	27‖	0
,,		Bunninadden (Doo Castle)	2·78	...	...	...	...	...	...	...	...	...
XXIII		Bawnboy (Owendoon)	3·85	...	·68	22	21	81·0	13	21·0?	2	2
,,		Waringstown	2·72	...	·84	30	18	82·0	13	41·0	6	0
,,		Strabane (Leckpatrick)	3·05	...	·54	30	21	77·0	12	40·0	2	0

*And 30th. †And 24th. ‡And 14th. ‖And 29th.

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

METEOROLOGICAL NOTES ON THE MONTH.

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.

CAMDEN TOWN.—L from 9 p.m. on 19th almost without intermission till 3 a.m. on the 20th; 14th very hot and unusually damp with such great heat.

LINTON PARK.—T S on 14th, 15th, and 20th, and but very little L at any other time; no high winds, and the weather on the whole favorable for harvest operations.

BANBURY.—Mean temp. slightly above the average for August; harvest about two-thirds completed. T on 15th, T S on 19th and 20th.

WISBECH.—Generally fine month, with temp. above the average; T S on morning of 20th, but not heavy.

CULFORD.—A month of favourab'e weather for the harvest, which has in many instances finished with the month; T on 19th.

TAUNTON.—T S 9·50 p.m. 19th. The heat on the 11th, 12th, and 13th was very oppressive; it was like a heavy heat wave passing through the valley of Taunton Deane.

ORLETON.—T S from evening of 19th to morning of 20th.

DERBY.—We were visited on the morning of the 19th with a T S of unusual magnificence, commencing about 1 a.m. and continuing for three hours; 2·11 in. of R fell but as there was no wind the corn was not laid to any great extent, and though we have had R on 15 days it seems scarcely to have interferred with harvest operations.

YORK.—Heavy R from 9 p.m. on 19th to morning of 20th, equal to 1·48 in., and 20 hours steady R on 15th, equal to 2·40 in.

WALES.

ABERCARN.—Distant T S, with very vivid L, to the S. on 20th. A very calm month, generally dry and warm, temp. very even but rather higher, towards the end than the beginning of the month.

HAVERFORDWEST.—Till the 11th fine, air pleasant, moderate heat, with light R chiefly at night, from that time to the 15th very warm indeed, remainder of the month warm and pleasant, the R falling mostly at night, there were many fine days, and on the whole fine harvest weather.

CEFNFAES.—Excessively hot on 12th, 13th, and 14th.

SCOTLAND.

DUMFRIES.—The first four days very fine, the rest of the month showery. Temp. both of day and night above that of last year. On the 24th the night temp. was 60°. Harvest commenced on 8th, but not general till the 26th. The weather has been unfavourable for harvest operations. Barley, average crop; wheat fully an average; oats good and above the average, and potatoes considerably above the average, but some disease appearing.

HAWICK.—Leading hay first four days; falling stars on the 10th; T S on 12th; first barley cut on the 20th, but it will take another week's ripening weather before the harvest will be general in this district.

OTTER HOUSE.—A cloudy wet month, not favourable for harvest; the cutting of barley will commence here next week if the weather is propitious.

DEANSTON.—Severe T S with much L and heavy R on 20th.

LOGIERAIT.—A genial month. Severe T S on 20th. Harvest not begun.

BALLATER.—From the commencement of the month the weather has been a great improvement on that of July, the temp. being 2° higher; on the 9th there was a remarkable H shower (in the afternoon) pieces of ice ½ in. in diameter falling in large quantities; a single peal of T occurred in this locality at the same time; a smart T S with much L and heavy R on the afternoon of the 20th.

ABERDEEN.—Heavy T SS on 9th and 20th.

CULLODEN.—Heavy T S on 20th, with 1·33 in. of R in five or six hours.

PORTREE.—Rather a wet month, but drier than August usually is in this locality; the crops have made good progress; there will be a good supply of straw and hay, but fully a month later then usual; there can be no shearing before October.

LOCHBROOM.—This month on the whole has been a grand one, and another such would finish a most bountiful harvest of all kinds. On the morning of the 20th, between 1 and 2 a.m., a severe shock of an earthquake was felt here, it

seemed to have travelled from S.E. to N.W., it shook the houses and broke the crockery therein, and pieces of rock fell from the hills from its effects.

SANDWICK.—August has been fine and dry, the driest since 1856; the latter part of the month was warmer than the mean, and very pleasant. Auroræ on 25th, 26th, and 27th. Lunar halo on 2nd.

IRELAND.

DOO CASTLE.—First half of month very fine, latter part broken, with very few whole fine days; the atmosphere was close and I should say favorable for the production of caterpillars, which have destroyed the cabbages in this locality; I have employed boys to pick them off, but find them so numerous as to bid fair to destroy all before them.

OWENDOON.—T S on 13th. The potatoe blight made its general appearance early in this month, but the tubers still appear sound; the crops have all much improved; scarcely any apples to be seen; wall fruit scarce. Frost on 2nd and 18th.

WARINGSTOWN.—A fine seasonable month except the last three days; harvest ripening unusually fast, reaping will commence much earlier than was expected.

LECKPATRICK.—A fine month; has ripened the corn in good time; harvest not begun, but promises to be abundant.

TEMPERATURE IN THE SHADE AND IN THE SUN.

To the Editor of the Meteorological Magazine.

SIR,—The extraordinary accounts in the papers of the heat in the shade and in the sun having attracted my attention, I was induced to make some experiments, in order to form an opinion of what these terms meant. With this view, I selected four thermometers, by Negretti and Zambra, and compared them to see that they agreed. These I numbered 1, 2, 3, and 4, and thus placed them:—No. 1 outside a window, facing the north, so placed that the direct rays of the sun never fell on it. No. 2 was suspended freely in a verandah, the rays of the sun never falling on it, and subject to a free current of air. No. 3 was placed against a north wall, not part of the house, with high shrubs on the east and west, completely screening the wall from the sun at all times. No. 4 was suspended freely in the dense shade of trees.

The average of a great many observations taken at noon was—No. 1, 68°; No. 2, 69°; No. 3, 64°; No. 4, 61°. Thus it appears that the shade of the trees was cooler by from 3 to 8 degrees than the other three indicated.

I account for the difference thus:—The thermometer No. 1, placed outside a north window, though not exposed to the *direct* rays of the sun, was affected by heat reflected from an opposite wall, though at some distance. No. 2, though hanging freely in the shade of a verandah, was yet affected, in consequence of the sun shining in the morning on a slate roof, which continued to give out its heat during the rest of the day. In the case of No. 3, though the sun never shone on that part of the wall where the thermometer was hung, yet it did on other parts of the same wall, and heat was thus transmitted.

I conclude, therefore, that the true heat of the atmosphere in the shade is only to be obtained in the complete shade of trees, where the sun never penetrates, and where the air circulates freely.

Again, as to the heat in the sun. What does it mean? I suppose in general it means the heat indicated by a thermometer hanging against the south wall of a house. But this surely is deceptive, as the instrument so placed indicates not only the heat of the direct rays of the sun, but also the accumulated heat of the wall.

To determine this, I placed a thermometer against the south wall of my house, and another about 30 yards in front of this, hung to a rail, but fastened so as to face the sun in the same way as the former. The result was that the thermometer against the house stood from 4° to 25° higher than that on the rail, as the day was more or less constantly bright; but the difference always increased as the day advanced, for the reason already mentioned.

If we wish, therefore, to have any comparative returns of the heat in the shade and in the sun, we should come to some agreement as to the method we adopt to procure the information we communicate.—Yours very faithfully,

August 22nd, 1867. W. E. H.