

SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

CXXXI.]

DECEMBER, 1876. [PRICE FOURPENCE
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SCIENCE AT SOUTH KENSINGTON.

(Continued from page 143).

RAIN GAUGES (continued).

THE most important is the **Electrical Self-Registering Rain Gauge** (2852*g*), sent by Yeates and Son, of Dublin, represented by the *frontispiece*. It consists of three parts, (1) a rain gauge, (2) a battery, and (3) a registering apparatus. The rain gauge may be best described as an improved Crosley's, the battery is of a simple and lasting form, and the recording apparatus is also simple and elegant in appearance.

As to the luxuriousness of the arrangement there is no question; it is very tempting, and we see no reason to doubt its being as accurate as it is elegant, but not having worked it, we cannot speak from experience. We should prefer a circular aperture to the rain gauge, but that of course is as easily made as a square one, and, doubtless, the makers supply either. The rain passes alternately into the right and left half of the tipping bucket, which tips over as soon as 0.01 in. of rain has fallen, and each time it tips contact is made, and the indicator carried forward one division. The principal objections to this mode of recording are—(1) that sometimes the rain falls so fast that a perceptible amount is lost during the change from one bucket to the other, (2) that the tipping parts of the apparatus become rusty and sluggish through the continued damp. Messrs. Yeates have adopted a new form of bucket, which they state “will register correctly, no matter at what rate the rain may fall.” As to rust and failure of record through defective contact, we, having had no experience, can only say that it is evidently very easy to clean the inside if and when necessary.

The advantages are numerous and obvious:—(1) the rain gauge can be put anywhere; one on the top of Skiddaw would record in Keswick or in London; it is mainly a question of telegraph wire; so with small distances, great advantage and comfort would often result from one being able to place the gauge in a garden or field, perhaps out of sight of one's residence, or separated from it by a public road; (2) the apparatus exposed to the weather is inexpensive and comparatively imperishable; (3) the battery can be placed anywhere, and the

recording apparatus would be an ornament to any study ; (4) it will evidently give most useful information as to the rate of heavy rains ; (5) it is also evident that the addition of a driving clock and paper-covered drum, with very slight alteration of the registering apparatus, would yield a continuous record, a fact which we commend to engineers.

HYGROMETERS.

THERE was no section of the exhibition more nearly complete than that of Hygrometers.

We have not been able to find the oldest one, which is thus described :—

2863. **Catgut Hygrometer**, dating from the first quarter of the 18th century. The property of His Highness the Prince of Pless.

Sub-Committee of Breslau.

Next to it in antiquity is probably that exhibited by the authorities of King's College, and which belongs to the Museum of George III. It (2871) is represented in fig. 27, and consists of a number of discs of thin paper (perhaps once saturated with salt) on a thread attached to the short end of a lever, the long end of which points to a higher or lower division on the scale, accordingly as the weight of the paper (by absorbing moisture from the air) increases or decreases. It appears to have been designed by John Coventry, and made by George Adams.

Three **Torsion Hygrometers** are exhibited, one (not in the catalogue) was made by Robinson, of Devonshire Street, Portland Place, formerly belonged to Captain Kater, is represented in fig. 28, and is lent by the Royal Society ; another is a **Whalebone Hygrometer** (2854), by Thomas Jones, of Oxendon Street ; and the third is an **Oatbeard Hygrometer** (2871a), by Casella. These last two are exhibited by Mr. G. J. Symons.

Saussure's Hair Hygrometers are shown in many forms. Dr. Henri de Saussure sends three original instruments, (2865) made by the inventor, and with tables in his own handwriting. An eight-haired one (2864), by Richer, of Paris, which was formerly the property of Mr. Francis Ronalds, and used by him at Kew Observatory in 1843, is exhibited by the Kew Committee. Another old one (2853), by V. F. Hausman, is exhibited by Mr. Symons. Three new specimens are exhibited, one (2784 as used in Russia), by the Meteorological Committee ; one (2871c) of Parisian construction, by Mr. Symons ; and one of the modified form (2867) adopted by the Geneva Association for constructing Scientific Instruments, is exhibited by that body.

Perhaps to this list we ought to add the following, but we are not certain of the mode of its construction :

2858. **Klinkerfues' Bifilar Hygrometer**, with reduction disc, executed by W. Lambrecht, Göttingen.

Professor Klinkerfues, Göttingen.

The bifilar hygrometer shows the relative dampness without further reduction,

upon a stereotyped scale of equal divisions, and also the dew point by means of the reduction disc.

The reduction discs for the psychrometer give likewise the dew point according to the following rule :—

The outer disc is turned round the inner one in such a manner that the two places of the evaporation temperatures, read off from the moist thermometer, coincide ; with the place of the air temperatures upon the one will then coincide the place of the dew point temperature upon the other. The one disc has yet a second division, which comes into use in case of the evaporation temperature falling below zero.

The barometric pressure is assumed to be 750 mm. ; for any other pressure, b , the quantity $\frac{b}{30}$ ($b-750$), taken in nearest round numbers, can be easily multiplied in the head by the thermometric difference, likewise taken in round numbers. The product expresses the number of hundredths of a degree, and has to be added to the air temperature, in order to obtain, after the setting of the disc, the dew point with greater precision. This correction is, however, seldom required in practice.

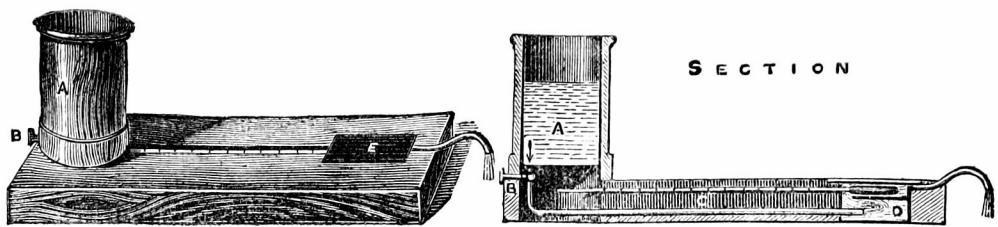
Of dew point instruments there are four patterns, two are tolerably well-known, viz., Daniell's and Dines's, but the others are rare, one from antiquity, the other from novelty.

The oldest is without name of inventor, maker, or owner, and is not catalogued—we, however, believe that it is the property of the Royal Society, it is represented in fig. 29. We should be glad if any of our readers can give its history. It appears to be an ordinary thermometer with a black glass bulb, surrounded by muslin so as to allow of its being cooled by ether being poured upon it, and, evidently, when the evaporation of the ether has cooled the bulb to the temperature of the dew point, the dullness deposited on the black glass will show it, and the thermometer scale will give the temperature. It seems to us by no means a bad instrument, and is extremely light and portable.

Daniell's Hygrometer (2855) is exhibited by Mr. G. J. Symons, who sends a specimen formerly belonging to Sir J. South, F.R.S. This instrument having been engraved and described in a previous number of this magazine*, nothing need be said respecting it.

Dines's Hygrometer (2871*f*) is exhibited by the maker, Mr. Casella. Its is, undoubtedly, the most delicate and the most easily controlled dew point hygrometer yet invented. The construction and the mode of use are as follows :—

A little water and ice, or cold water only, is put into the cup A, and allowed by the tap B to flow gently through the small chamber D, whence it rises through a perforated diaphragm into the space under the slab E. In this space, which is covered water-tight by a thin smooth piece of silver, or of black glass, rests the bulb of a sensitive thermometer, the water flowing gently from the spout, as shown, cools the cover E and the contained thermometer ; when the temperature reaches the dew-point, a strong film of vapour or dew will be visible, the temperature being shown on the graduated stem of the thermometer. The tap B enables the rate of flow of the water to be regulated with



accuracy, and the temperature of the water under E to be thereby kept at any required point.

The most novel hygrometer has by some vicissitude of fate been sent into the "heat" section, although catalogued under Meteorology. The entry is as follows:—

2868. **Hygrometer** modified by Dr. Geissler, with a delicate thermometer on a stand. *Will. Haak, Neuhaus am Rennweg, Thuringen.*

We have engraved this instrument in fig 30, but a full explanation is also indispensable. First there is a pillar carrying one ordinary thermometer, and one of the following intricate form. Starting from the top we find firstly an ordinary thermometer tube and its scale, then the tube is bent round and a double cylindrical bulb is formed, in the interstice of which is the mercury which forms the bulb of the thermometer, inside the cylinders are welded into one about half-way up, and thus the thermometer bulb is closed, then the cylinder is contracted to a tube and the tube ends in a hollow spherical bulb. Before closing this bulb, a little ether is poured through it and the tube into the cup of the inner cylinder of the thermometer bulb. Muslin is tied over the terminal bulb, and then the action is evidently as follows:— Drop ether on the muslin, its evaporation will cool that bulb, the ether in the thermometer-bulb-cylinder will evaporate and also cool, thus the temperature of the double cylindrical bulb will cool until dew is deposited on its surface, and then the temperature can be read off at once. Not having tried the instrument, we cannot speak positively as to its merits, but they appear to us to be very great.

August's Psychrometer, alias Mason's Hygrometer, alias Dry and Wet Bulb Thermometers, are exhibited in great variety. Large and fine ones are sent by Negretti, Casella, Hicks, and Pastorelli; good foreign ones are exhibited by Warmbrun, Quiltz & Co., by Haak, and by Geissler. Small portable ones are exhibited by Mr. Symons (an old one 2871b), and also by Casella and Pastorelli.

Prof. Buys Ballot exhibits (2856) a drawing and parts of a chemical balance hygrometer.

EVAPORATION MEASURERS.

We cannot pretend to classify these instruments, we do not believe that any of them can give even approximately accurate results, and we shall therefore pass them in review as rapidly as possible.

2789d. Lamont's Atmometer.

Meteorological Office.

In this instrument about a wine glassful of water is exposed in a metal dish, about 3 inches in diameter and less than an inch deep, it is to be observed under cover (because rain would splash out), and we believe it is also to be protected from the sun. Whether it is exposed to the sun or not, it cannot be accurate, because if exposed, the small quantity of water would heat up enormously beyond any natural water surface, and if sheltered, the influence of sunshine would be excluded.

2897. Evaporimeter, in the form of a spring steel-yard.

Professor F. Osnaghi, Meteorological Central Institute, Vienna.

This instrument shows on a sector the number of millimeters evaporated from a certain quantity of water in a given time. As its action is produced by gravity, it is also useful in winter, when ice is formed on the scale. It differs from other steelyards in the weight acting on the inner end of a spiral spring.

The term "steel-yard" in the above description is rather misleading, the instrument really consists of an evaporating dish 5 inches in diameter, supported by a rod which rests upon the inner end of a spiral spring. The decrease of the weight of water by evaporation releases the spring and causes an indicating hand to show the diminution upon a graduated arc. This instrument is open to all the objections urged against Lamont's.

2898. Apparatus for determining the Evaporation from different soils.

Sydney B. J. Skertchly, F.G.S., H.M. Geological Survey.

The apparatus consists essentially of an evaporimeter composed of two vessels, the innermost of which receives the material to be experimented upon, and the external one supplies water to compensate for evaporation. Over this is a glass vessel which receives the vapour given off by the material. The temperature, &c., are registered by a hygrometer and barometer in the glass receiver, and the temperature of the soil by a ground thermometer. Any given temperature can be obtained by means of a platinum spiral heated by a galvanic battery. The evaporimeter maintains the material in a natural condition so far as regards temperature and moisture. Dry air is admitted into the glass receiver, and the air with the evaporated water passes from the top of the receiver into a train of drying tubes; the current of air being produced by an aspirator containing oil. By means of this apparatus various soils, &c., can be brought under similar conditions of temperature, &c., and the evaporations compared for any temperature. The apparatus was especially designed to determine the proper amount of water which should be discharged by the artificial drainage system of the Fen Land.

The object of this instrument being fully stated in the above paragraph, we need say little respecting it. In fact, perhaps, the less we say the better.

2901. Ebermayer's Evaporation Apparatus, for determining the degree of evaporation from different kinds of soil.

Professor Ebermayer, Aschaffenburg.

This consists of a zinc box about 1 foot square and 4 inches deep, with a perforated tray at the bottom, adjoining this square box (which is to be filled with soil) is a cylinder 5 inches in diameter, and nearly a foot high (therefore overtopping the box by about 8 inches), which

is to hold a reserve of water. The general excellence of Prof. Ebermayer's work as indicated by his publication*, renders us inclined to mistrust our own opinion when it differs from his. Nevertheless, we must point out the respects in which his arrangements seem to us open to criticism. First then, Is it likely that the evaporation from a layer of soil only four or five inches deep will represent even approximately that of soil *in situ*, and in capillary connection with that beneath it to an unknown depth? Secondly, Is the apparatus to be under cover or not? All our previous remarks upon this point respecting Lamont's instrument apply here, and in addition, there is the fact that the super-elevation of the water-store cylinder would prevent rain reaching the soil, and cause other less important evils. Thirdly, the water in this store cistern would get very hot, and thus the soil would be saturated with water much warmer than would soil naturally circumstanced.

2902. **Morgenstern's Atmometer.**

W. Apel, Göttingen.

Morgenstern's atmometer differs from every other by its being founded on the principles of capillarity and of Mariotte's bottle.

The evaporating vessel is filled with siliceous sand, below which there may be placed a flat stone. This sand is saturated with water by capillarity; any loss of water by evaporation is at once replaced by a corresponding volume of water from a burette. This burette forms a Mariotte's bottle, the upper part of which is closed against the outer air by means of mercury. A tube, which dips into the sand and enters the burette from below, conducts air into the latter in proportion as water is lost through evaporation. When a large portion of the burette has become filled with air, the danger arises that the air column on expanding, by a possible rise of temperature, would exert a pressure upon the water below it in the burette, and thus lead to an over-saturation of the sand. To prevent this, the small globular vessel is provided, which is also connected by a small tube with the burette, and into which the water, pushed on by the expansion of the air column, enters. With progressing evaporation this water returns again into the burette or can later be drawn into the burette. This globular vessel is further intended for the filling of the burette with water, which purpose is accomplished by fixing an india-rubber tube, dipping into water to the open end, and sucking at the upper end of the pipette. Before the burette is completely filled the india-rubber tube is removed, and the sucking at the upper end of the burette resumed, when, in consequence, the globular vessel is emptied. The connexion of the burette with the sand is closed during the operation of filling.

The evaporating vessel has a surface area of one square decimetre ($4\frac{1}{2}$ inches diameter).

To exclude, as much as possible, the influence of the temperature, the evaporating vessel is enveloped in some bad conducting material.

The sensitiveness of the instrument is so great that a little dry sand, or a piece of blotting paper, or the fraction of a drop of water, put upon the surface of the evaporating vessel is immediately indicated by the water column in the burette.

This is a very pretty apparatus, but entirely unsuited for exposure to sun and rain. There does not appear to be any reason why it should not give accurate details of the loss from a surface of saturated sand, in a place protected from sun and rain, but that that fact would be of material practical use we are by no means sure.

* Die Physikalischen Einwirkungen des Waldes auf Luft und Boden. Aschaffenburg. 1873,

2903. **Atmometer or Evaporimeter**, for determining the quantity of water evaporizing from the surface of water, as well as from different sorts of soil.

Prof. Prestel, Emden.

We think that Prof. Prestel was the first to apply the principle of the bird fountain (or Mariotte's bottle) to evaporators, and this specimen is therefore of interest. Morgenstern's, which we have just described, is merely a refined edition of Prestel's, and, therefore, we need only say that No. 2903 merely consists of a shallow dish, about a foot in diameter, with a side tube about 2 feet high.

MISSING, MISCELLANEOUS, AND SUPPLEMENTARY.

Every classification, if rigorous, leaves something which falls under the head of "appendix," "miscellaneous," "sundries," or some similar designation. No one who has spent much time in the Loan Exhibition will be surprised that we have a long list under the above head, or that even now we do not guarantee it to be perfect.

2809e. **Skeleton of construction of the largest Barometers for Public Buildings**, (for demonstrating purposes).

M. Richard, Paris.

2896. **Barograph**, balance barometer, by Greiner and Geissler, Berlin.

Deutsche Seewarte, Hamburg.

2826. **Three Vacuum Thermometers** for studying Solar radiation.

2875. **Wind-Current Autograph**, or registering apparatus.

John G. Schoen.

This "Wind-Current Autograph" marks continuously on a strip of paper the direction of the currents of wind, in such a manner that the time is indicated as the abscissa, and the angle of elongation of the weather-vane towards the north shown at every particular moment, as the ordinate.

2-95a. **Registering Mercurial Thermometer**, after the plan of M. Hervé Mangon.

L. Redier, Paris.

All the above are missing, or rather we should say, that we have been unable to find them.

We now pass to the miscellaneous and supplementary.

2789g. **Hypsometer Apparatus**, as improved by Dr. G. Henderson, with two maximum thermometers, by Hicks, in leather sling case.

Meteorological Office.

This differs in three respects from the arrangement sold by all other opticians; (1) the source of heat is a piece of candle instead of a spirit lamp; (2) the thermometer is a maximum instead of an ordinary one; (3) the brass tube in which the thermometer is boiled forms its travelling case.

2821. **Sympiesometer**, a sensitive instrument for sea use.

Francis Pastorelli.

In this apparatus atmospheric pressure is indicated by its capability of compressing a small quantity of air or gas confined in a chamber, owing to its greater portability than a mercurial barometer, it was extensively employed at sea, but is now generally superseded by aneroids,
(To be continued.)

LOW BAROMETER ON DECEMBER 4TH.

THE depression centre which passed across England on the morning of December 4th had many features in common with that mentioned in this Magazine, and afterwards thoroughly discussed by Mr. Marriott in the Quarterly Journal of the Meteorological Society.

We have been favoured with a very large number of returns, some of them, *e.g.*, those forwarded from Babbacombe, Torquay, by Mr. Glyde, and from Addiscombe, by Mr. Mawley, very full; in fact, the former is superior to the results of the most costly self-recording apparatus. It would, however, be inexpedient for us to devote two or three pages to the record of a single station, and we must, therefore, confine our extracts, to some of the leading features.

We hold it to be part of our duty to urge on private observers the importance of system and accuracy; we must, therefore, mention that among the mass of returns which we have received are several which are not so full as they should be. Nothing could be further from our desire than to give offence, and if we do "look a gift horse in the mouth," it is but to help the donor to give one, more creditable to all parties next time. However, if we suppress the place, the hour and the readings, it will probably puzzle even the writers to recognise their own statements, and yet the object will be perfectly obtained.

"Z a.m. My barometer stands at —— (reduced and corrected for temperature). Barometer rising at Y a.m."

This does not tell us that the first-mentioned reading was really the lowest point, it only says it was rising from Z a.m. to Y a.m.; but what it was previously doing we are not told. Therefore the minimum may have been at Z a.m., or it may have been some hours earlier. If our correspondent had said "Barometer not looked at till Z a.m., when it was ——," this uncertainty would have been removed. Again, the expression, "reduced and corrected for temperature," is not clear; by the reverse term, "corrected and reduced," we understand "corrected for index error and temperature, and reduced to sea level." But the reading reported was *not* reduced to sea level (unless the barometer is incorrect), and, therefore, probably the word reduced is altogether redundant.

"Lowest barometer registered at —— at Z a.m., corrected and reduced to mean sea level."

This is very nearly perfect; the uncertainty rests upon the absence of readings before and after Z a.m., which, by their excess above that at that hour, would have proved it to be the true minimum. We have several notes of this class.

"Barometer corrected and reduced at Z a.m. ——."

A useful statement; but its value would have been greater had the observer said whether it was then rising or falling, or at its lowest point.

HYGROMETERS.

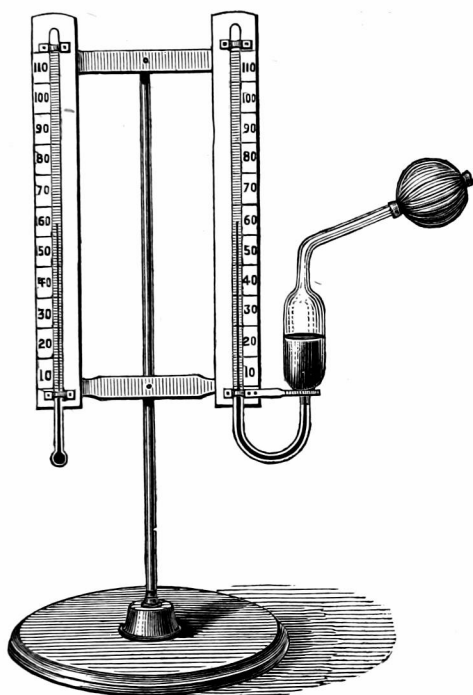


FIG. 30.

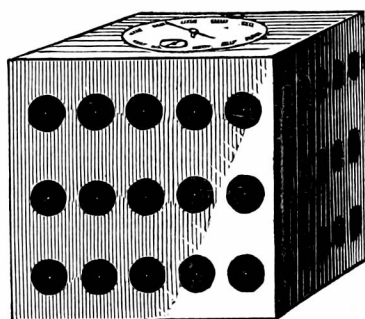


FIG. 28.

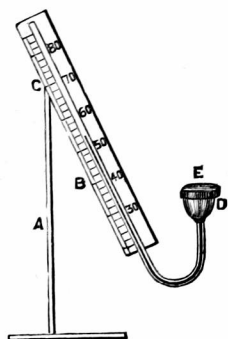


FIG. 29.

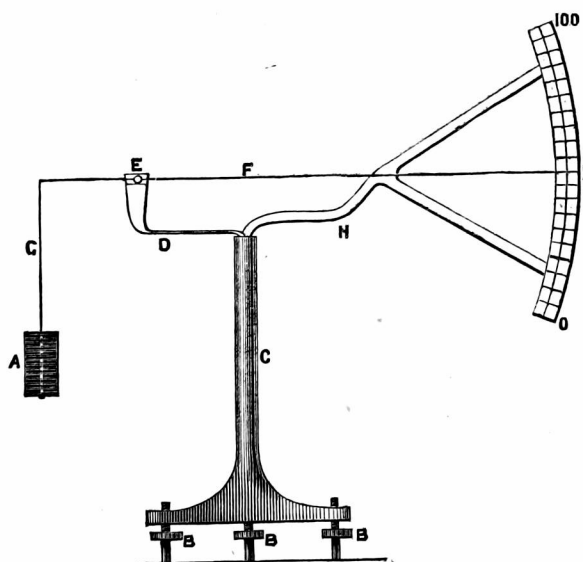
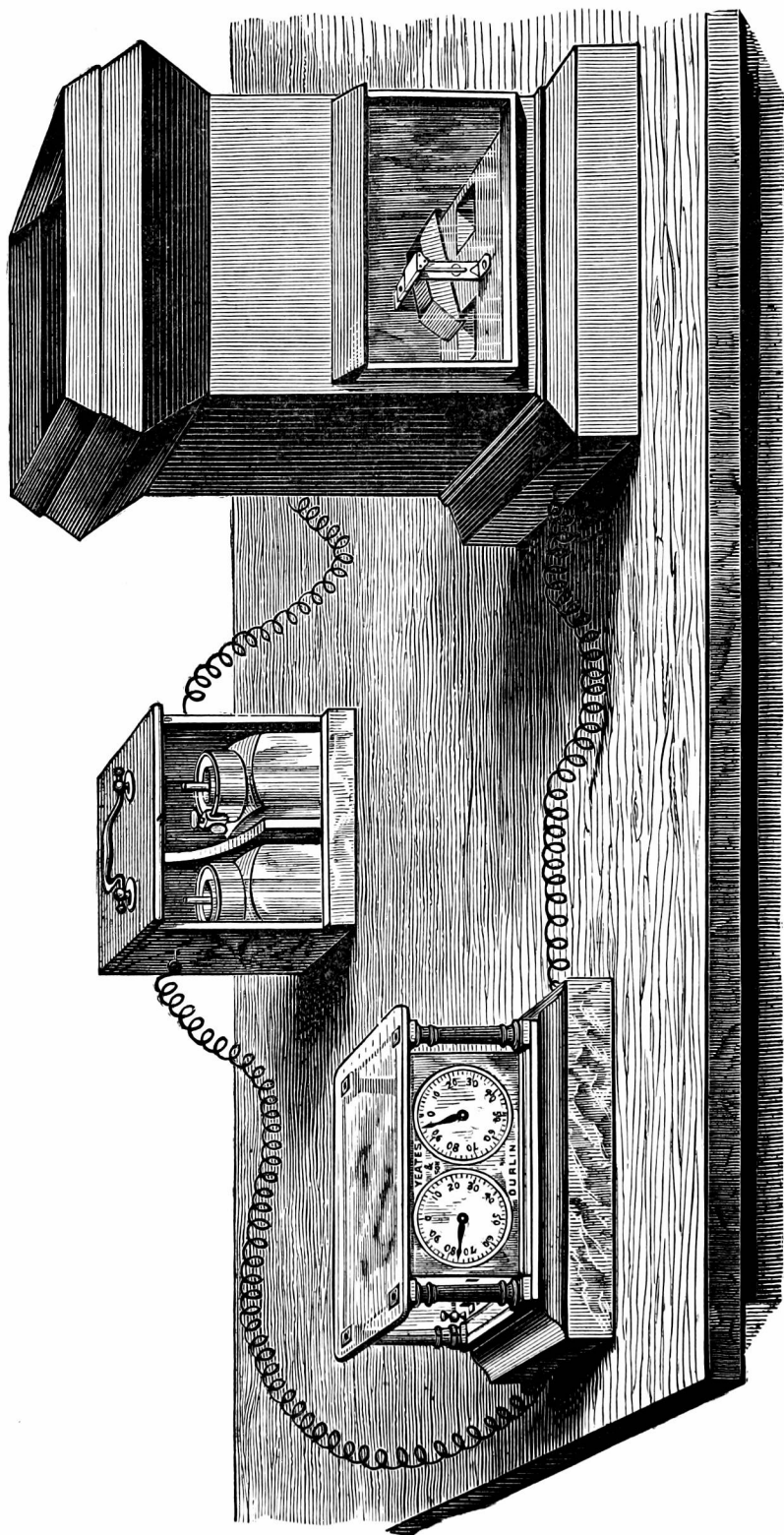


FIG. 27.



An observer sends a set of about a dozen readings, corrected for temperature but not reduced to sea level.

Tables for reducing barometric observations to their equivalent sea level pressures have been published by Lowe, Harvey Simmonds, Buchan, and in Scott's *Instructions* (a work which we strongly recommend, although the author does us the honour of ignoring our publications). We therefore hold that observers should provide themselves with some one of these works, and send the results completely reduced. Individually, the operation would not take long ; but, in the aggregate, it makes a considerable inroad upon our time.

Respecting the long series of readings furnished by several observers, we have only one suggestion to offer, viz., that observations made at hours, half-hours, and quarter-hours are more valuable than those made at irregular times, such as 5.42, 6.27, 7.11, &c. Mr. Marriott's paper (already referred to) will show at once that for tracking the progress of a depression centre we need (1) observations at each successive hour at a number of widely spread stations, and (2) the exact time and reading of the minimum at each station. It is, of course, possible to interpolate from observations such as those above-mentioned the probable pressure at 6 and 7, but it is in all respects better to have the absolute values.

Some of the long series of readings show the pumping of the barometer very clearly. We think that this feature has not received the attention which it merits. Practised observers are so accustomed to see their barometric columns oscillating or pumping to the extent of perhaps 0.01 or 0.02 in. that they perhaps rarely consider what it means, and we cannot tell them. Prof. Piazzzi Smyth (if our memory is not at fault) once wrote a paper on the difference between the barometric pressure on the windward and leeward side of a house. There can be no doubt that during strong winds the pressure must be less on the latter than the former. Similarly when a rush of air passes rapidly over a house, it causes a very partial increase and then decrease of pressure therein. If pumping only occurred during extremely violent and gusty winds, the explanation above-suggested would probably meet the case. But we do not think that pumping is proportional to the force of the wind, and if not, why is it not ? and how is it produced ?

Perhaps some observer will, when he finds the barometer pumping, try the effect of placing another against a very solid post in the open air, at a distance from buildings.

Perhaps it would be well to construct a rough pattern of barometer for such comparisons, one which should render the oscillations extra large.

There is one feature in the curve of the depression as observed at Camden Square, of which we find no trace elsewhere, except slightly at Addiscombe, and of which the explanation is not obvious, viz., a distinct rise before the occurrence of the minimum.

The following sea level pressures will be sufficient :—

	Camden Sq.	Addiscombe.	Qr.-hourly change Camden.	Half-hourly change.	
				Camden.	Addiscombe.
9.0 a.m. ...	28.398	28.421	— .006		
15 „ ...	28.392		+ .009	+ .003	+ .006
30 „ ...	28.401	28.427	+ .005		
45 „ ...	28.406		— .003	+ .002	— .002
10.0 „ ...	28.403	28.425	— .012		
15 „ ...	28.391		— .010	— .022	— .018
30 „ ...	28.381	28.407	— .005		
45 „ ...	28.376		— .012	— .017	— .009
11.0 „ ...	28.364*	28.398*			

*Minimum.

The above is not due to pumping, firstly, because the mercury was not pumping between 9.30 and 10 a.m. ; and, secondly, because if it had been, it would be in the highest degree improbable that three consecutive readings should have been made on the tops of oscillations ; and, thirdly, that the same should have been done at Addiscombe at the same instant.

In the following table we give a selection of barometric pressures, which we believe to be accurate ; and we also add a few notes.

Lowest, and lowest observed, Sea Level Pressures, December 4th, 1876.

Stations arranged as perpendiculars to a line running N.E. from the Land's End.

STATION.	OBSERVER.	Minimum Pressure.	
		inches.	Time.
Maker Vicarage, Devonport...	Rev. P. H. Newnham	28.28	4 and 5 a.m.
Babbacombe, Torquay	E. E. Glyde, Esq. ...	28.194	5 to 5.15 a.m.
Sidmouth	Dr. Radford.....	28.168	5.15 a.m.
Clifton	Dr. Burder	28.186	7.55 a.m.
Frenchay, Bristol	F. F. Tuckett, Esq. .	28.20	8.15 a.m.
Southampton	R. C. Hankinson, Esq..	28.254	8 a.m.
Ross.....	H. Southall, Esq.	28.220	8.50 a.m.
Hereford	E. J. Isbell, Esq.	28.242	8.30 a.m.
Mildenhall, Marlborough.....	Rev. C. Soames	28.27	9 a.m.
Swarraton, Alresford	Rev. W. L. W. Eyre ...	28.300	8.15 a.m.
Worthing	W. J. Harris, Esq.	28.409	7.40 to 8.10 a.m.
Strathfield Turgiss	Rev. C. H. Griffith.....	28.321	8.30 a.m.
Evesham	R. Burlingham, Esq. ...	28.216	10 a.m.
Weybridge	W. F. Harrison, Esq. ...	28.346	11 a.m.
Wrexham	Capt. Boscawen	28.359	9 a.m.
Banbury	T. Beesley, Esq.	28.175	11.15 a.m.
Kew.....	G. M. Whipple, Esq. ...	28.34	9.30 a.m.
Addiscombe	E. Mawley, Esq.....	28.398	11 a.m.
Maida Vale.....	K. J. Marks, Esq.	28.383	11 a.m.
Camden Square	G. J. Symons, Esq. ...	28.364	11 a.m.
Coventry	J. Gulson, Esq.	28.26	Noon.
Hinderton, Neston	R. Bushell, Esq.	28.329	7.44 a.m.
Heath Ho. Cheadle	J. C. Phillips, Esq.....	28.341	9 to 10.30 a.m.
Nottingham	E. J. Lowe, Esq., F.R.S.	28.311	11.45 a.m.
Geldeston, Beccles.....	E. T. Dowson, Esq. ...	28.36	1.40 p.m.

To the Editor of the Meteorological Magazine.

SIR,—I send you my barometric (minimum) readings for last two depressions. In the first we were near not only the centre of the cyclone, but also at the time of its greatest intensity, as judged by the comparison of minimum readings here and elsewhere.

The absolute minimum here, at 8.50 a.m. yesterday, the 4th, was 28.220 in., and at Portishead, at 8 a.m., 28.20 in., which I see was lower than yours at 11 a.m., 130 minutes later. To-day, at 2.28 p.m., the barometer again sank to 28.480 in. (sea level), or .260 in. above yesterday. You will see yesterday's reading was lower than any London reading since 1821—1843 being 28.266 in. It was lower than in 1872 and 1873, but we have no record for this district for 1843 that I know of. As to rain, we had from April 30th to Aug. 16th, 1876 (110 days), 3.22 in.; Aug. 16th to Dec. 5th, 1876 (111 days), *18.00 in.; July 10th to Oct. 28th, 1875 (111 days), 15.70 in.; July 6th to Oct. 25th, 1872 (112 days), 14.21 in.; Aug. to Nov., inclusive, 1852 (122 days), 19.80 in. So that we have had a larger fall this autumn than since 1852, if not than even then, and it is, perhaps, more remarkable that two extreme periods of opposite character should be immediately adjacent.—Yours truly,

H. SOUTHALL.

*The Graig, Ross, Herefordshire,
Dec. 5th, 1876.*

To the Editor of the Meteorological Magazine.

SIR,—The barometrical depression which has just passed over us is so remarkable, that I hasten to give you particulars thereof.

My barometer is an excellent mercurial one, which I have had in use, and have verified the accuracy of, for over 20 years. The readings were exactly followed by an exceedingly reliable small aneroid by Negretti and Zambra.

All readings are fully corrected, for temperature, capillarity, and scale error. Sea level is obtained from contour on ordnance maps, 12 inch scale.

1876.	Dec. 3rd.	9.0	a.m.	.....	28.91
	"	7.30	p.m.	....	28.88
	"	8.30	"	.....	28.74
	"	9.30	"	.....	28.62
	"	10.0	"	.....	28.56
	"	10.30	"	... ..	28.50
	"	10.45	"	... ..	28.47
	"	11.15	"	... ..	28.47
	Dec. 4th.	1.30	a.m.	.. ..	28.41
	"	4.0	"	... ..	28.28
	"	5.0	"	... ..	28.28
	"	9.0	"	.....	28.56

From 10.30–10.45, the gale blew with hurricane force. At 10.45 the wind stopped as suddenly as a clock when it has run down, and at 10.48 there was an absolutely dead calm; I suppose as a centre of the cyclone passed over us. The effect was most startling. It blew very

* To-day is not yet completed.

hard again at 3 a.m., just before the absolute minimum was reached ; and this again was followed by a period of dead calm.

I am, Sir, yours faithfully,

P. H. NEWNHAM.

Maker Vicarage, Devonport.

KEW OBSERVATORY.

WE are extremely glad to announce that the appointment of Director of Kew Observatory, held in the past by Francis Ronalds, John Welsh, and Balfour Stewart, has, at last, been conferred on the proper person. In so designating Mr. Whipple, we take an unusual position, but one which we believe to be impregnable. He has spent almost all his life in the Observatory ; since Prof. Balfour Stewart's resignation he has practically borne much of the responsibility of the management, and there is certainly no living man who better understands the establishment and the work to which it is at present devoted.

Some months since we complained of the anonymity of the Kew Committee. We do so still. We have no idea who they are, or whether they will, or will not, allow the Director to do more than carry out their orders. If they give Mr. Whipple reasonable scope, we believe that he is as certain to reflect credit on the Observatory, as were the past Directors whom we have mentioned. If they bind him tightly they will not get brilliancy, but judging by the past, they will get good and steady work.

We may as well perhaps add that Mr. Whipple is a B.Sc., F.R.A.S., and a Member of the Council of the Meteorological Society.

FINE METEOR.

To the Editor of the Meteorological Magazine.

SIR,—One of the most brilliant meteors it has ever been my good fortune to witness, appeared on Wednesday, 8th inst., at 5h. 33m. local (Berne) time ; 5h. 3m. Greenwich time.

It started from a point midway between the Pole Star and Cassiopeia, just above the constellation Camelopardus. It descended slowly through the latter constellation, perpendicularly to the horizon, disappearing after a course of about 10 degrees behind a high mountain.

Its colour was blue in the centre, fading to yellow-white at the edge—its size greater than I have ever seen Venus when at her greatest brilliancy, and it left throughout its track a tail equal in breadth to itself, but at no time longer than a degree.

The night was extremely clear, and the cold intense (15·0 Fahr.) at the time.

I observe in the *Times*, of 9th and 10th, just received, that a meteor was seen at the same time in various parts of England. Can it have been the same meteor ?

Your obedient Servant,

MICHAEL FOSTER WARD, F.R.A.S., F.M.S.

Rosinière, Switzerland, 12th Nov., 1876.

NOVEMBER, 1876.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which -01 or more fell.	TEMPERATURE.				No. of Nights below 32°	
		Total Fall.	Difference from average 1860-5	Greatest Fall in 24 hours.		Max.		Min.					
				Dpth.	Date.	Deg.		Date.	Deg.	Date.	In shade	On Grass	
		inches	inches.	in.									
I.	Camden Town	3·07	+ '66	'46	12	16	61·4	14*	27·6	11	5	9	
II.	Maidstone (Linton Park).....	2·33	— '86	'36	27	23	60·0	15*	31·8	8, 11	...	...
	Selborne (The Wakes).....	4·59	+ 1·05	1·04	24	17	58·5	14	22·0	11	8	11	
III.	Hitchen	3·89	+ 1·75	'66	27	21	54·0	16	24·0	10	10	...	
	Banbury	3·55	+ 1·35	'58	12	20	56·5	15	24·0	11	9	...	
IV.	Bury St. Edmunds (Culford).....	2·59	+ '20	'60	12	18	58·0	16	25·0	10	6	8	
V.	Norwich (Sprowston).....	2·76	...	'50	8	24	...	...	...	...	...	...
	Bridport	5·94	+ 2·78	1·05	26	17	60·0	14	22·0	10	8	...	
	Barnstaple.....	3·53	— '61	'56	12	19	60·0	5	31·5	7	...	...
	Bodmin	5·06	+ '08	1·25	12	18	63·0	4	24·0	10	4	5	
VI.	Cirencester	4·05	+ 1·26	'73	12	17	...	...	...	...	...	...
	Shifnal (Haughton Hall)	3·82	+ 2·25	'67	12	16	55·0	5, 16	24·0	10	11	14	
	Tenbury (Orleton)	4·12	+ 1·65	'75	11	20	60·5	15	25·2	11	8	17	
VII.	Leicester (Belmont Villas).....	2·99	...	'54	3	19	61·8	15	27·8	11	3	...	
	Boston	2·55	+ '41	'60	11	18	56·0	15*	29·0	10	5	...	
	Grimsby (Killingholme)	3·73	...	'90	12	22	56·0	16	28·0	11	2	...	
	Mansfield	3·91	...	'92	12	21	56·4	15	25·0	11	8	...	
VIII.	Manchester	3·30	+ '54	...	...	1	59·0	15	23·8	10	10	16	
IX.	York	3·11	+ 1·13	'72	12	17	58·0	15	24·0	10	7	...	
	Skipton (Arneliffe)	4·81	— 1·64	'68	18	20	53·0	14	21·0	10	12	...	
X.	North Shields	2·96	+ '26	'44	7	24	54·0	15	29·0	11	5	7	
	Borrowdale (Seathwaite).....	8·00	— 8·67	1·68	21	12	...	...	...	...	...	...
XI.	Cardiff (Ely) .....	...	...	...	...	...	...	...	...	...	...	...
	Haverfordwest	5·99	+ '32	1·10	24	19	57·0	3, 15	20·4	9	4	8	
	Machynlleth	6·03	...	'91	11	20	62·0	15	20·0	8	10	...	
	Llandudno.....	5·50	+ 2·34	'87	27	23	59·6	15	28·0	10	2	...	
XII.	Dumfries (Crichton Asylum).....	3·65	+ '39	1·30	14	9	55·0	17	22·0	10	12	12	
	Hawick (Silverbut Hall).....	2·80	...	'88	14	14	...	...	...	...	...	...
XIV.	Kilmarnock (Annanhill).....	2·60	...	1·31	14	17	56·1	6	23·0	10	10	14	
XV.	Castle Toward	2·78	— 1·86	1·33	15	12	54·0	3, 5	25·0	1, 8, 9	14	...	
XVI.	Mull (Quinish)	4·07	...	'80	19	12	...	...	...	...	...	...
	Leven (Nookton).....	...	...	...	...	...	...	...	...	...	...	...
	Grandtully	2·74	...	'95	14	13	...	...	...	...	...	...
XVII.	Braemar	2·86	+ '04	'91	14	15	60·0	18	10·0	10	16	22	
	Aberdeen	4·76	...	1·72	14	23	55·5	3	25·2	10	5	13	
XVIII.	Loch Broom	1·58	...	'36	12	8	...	...	...	...	...	...
	Portree	3·22	— 7·26	'51	27	18	...	...	...	...	...	...
	Inverness (Culloden)	1·76	— '83	'58	15	14	56·2	2	21·0	10	12	20	
XIX.	Helmsdale	4·23	...	1·09	14	18	...	...	...	...	...	...
	Sandwich	4·70	+ '70	'84	2	23	52·2	7	22·9	11	4	9	
XX.	Caherciveen Darrynane Abbey.....	6·19	...	'71	10	24	...	...	...	...	...	...
	Cork	7·28	...	1·20	13	20	...	...	...	...	...	...
	Waterford	6·00	+ 3·05	1·11	13	21	57·0	15	31·0	9, 10	2	...	
	Killaloe	3·66	— 1·23	'59	18	18	62·0	4, 15	28·0	1, 9†	3	...	
XXI.	Portlannington	3·11	— '81	'52	14	25	57·0	15	25·0	9	8	...	
	Monkstown, Dublin	5·04	+ 2·15	'73	16	17	...	...	...	...	...	...
XXII.	Galway	4·58	...	'72	15	22	59·0	25	30·0	9	6	...	
	Ballyshannon	3·67	...	'63	21	23	...	...	...	...	...	...
XXIII.	Waringstown	3·43	...	'56	14	23	57·0	5	25·0	8, 9	10	16	
	Edenfel (Omagh)	2·53	...	'41	10	23	55·0	5	24·0	9	12	...	

* And 16.

† 27.

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

METEOROLOGICAL NOTES ON NOVEMBER.

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.—The dust flying in clouds on the roads on the 1st was, perhaps, the most remarkable thing in the month; but a change speedily took place, and the second week was wintry, with frost and a little snow; the remainder of the month mostly wet, yet not remarkably so; and there were fewer fogs than usual for November. Bar. unsteady, and often low; winds during the first half N., but afterwards changing to the opposite direction.

SELBORNE.—Frequent fogs; dense ones on 6th, 14th and 23rd. White frosts on 1st, 2nd, 7th, 8th and 10th; min. temp. of November, 22°, on 11th. A very gloomy, foggy, and rainy month.

HITCHIN.—T on 27th, with .66 of rain, the max. fall of the month.

BANBURY.—Snow on 9th; hail on 11th and 26th.

CULFORD.—A very wet but comparatively mild month, the mean temp. being 42°·8; R fell on 18 days, and was slightly above the average; H and S fell slightly during the 7th and 8th. Easterly winds during twelve days; heavy fog on 10th.

OAK LODGE, SPROWSTON.—R fell nearly every day; frost and snow from 7th to 11th inclusive; the max. fall of month, .50 on 8th, is said to have been chiefly snow.

HAUGHTON HALL, SHIFNAL.—This has been a month of great changes of temperature and variety of weather; it opened with frost sufficient to cut dahlias; this was followed by a copious fall of R (.48) on the 3rd; then misty till the 7th, followed by 6 clear, frosty nights, with N. wind; this was succeeded, on 12th, by slight S and R from S.E., gauging .67, the max. fall of the month; followed by copious falls of R on most days till the 20th, then frost with fog for five days enabling many to fill their ice-houses; R fell daily, except on the 27th, till the close. Hardly any strong wind; so mild on the 5th that a humble bee was feeding on the arbutus. The greatest rainfall in any November for 35 years, except in 1852, when 6·59 fell.

ORLETON.—Fine and dry, with many severe frosts, till the 12th; soon after midnight between 11th and 12th a deep fall of snow set in, which covered the ground and continued falling all day on the 12th, changing to rain at night; the remainder of the month was cloudy, damp, and rainy, with a few fine days. There were no violent winds nor T or L during the month. The mean temp. was a trifle below the average.

LEICESTER.—A little S on morning of 12th; very mild in the middle of the month, the temp. reaching 61°·8 on 15th; less frost than usual; mean temp. of month, 42°·7.

BOSTON.—11th the max. fall of the month, .60 falling as R and S.

GRIMSBY.—With the exception of the second week, when we had hard frosts and two inches of S, the month was mild and wet; TS at 6 a.m. on 9th, the day on which the snow was two inches deep. The leaves remained on the trees longer than usual, and their colours were very fine.

MANSFIELD.—Slight S on 8th; heavy S with R on 12th, measuring .92, the max. fall of the month.

MANCHESTER.—Fog on 21st, and haze on the following day.

ARNcliffe.—28 melted snow on the 8th.

NORTH SHIELDS.—S fell on 7th, 8th, 9th and 10th.

SEATHWAITE.—S on the 9th, and on tops on 28th.

WALES.

HAVERFORDWEST.—Fine and dry till the 11th, and from the 7th to 11th frosty

(intensely so on the 8th and 9th), after which the fine weather, which had continued from the 20th of last month, broke up, and from that time to the end of the month it was mild, wet and stormy.

MACHYNLLETH.—S on the 11th and 12th, a great part of the fall on those two days, which together amounted to 1·45, being melted S; the month was very wet and mild for the time of the year, many days being more like summer than November; S on the mountains on the 28th.

LLANDUDNO.—Wet month; rainfall greatly above the average; but there were some very fine days, temp. very slightly below the average; only two nights' frost; S and sleet at 3.30 p.m. on 8th; H showers in the night of 9th; S on the hills on 10th and till the 14th, and again on 29th.

SCOTLAND.

DUMFRIES.—The usual November frost nip commenced this year on the 7th, and lasted a week; there was scarcely any frost again until the end of the month, hence the mean temp., 40°·8, is one degree higher than last year. A very heavy rainfall (1·30, the max. of month), with an easterly wind, was recorded on the 14th; the R generally has fallen when the wind was in that direction.

HAWICK.—On the morning of the 8th the ground was covered about six inches deep with S, which had fallen during the night, and as there had not been a breath of wind, the trees looked fantastic and singularly beautiful. The month has been remarkably mild.

ANNANHILL.—Mean temp. 41°·5; rainfall light, the max. of month, 1·31, fell on the 14th, with an easterly wind. Winds principally E. or S.E., usually light, the only exception being on the 12th, when a gale blew up from the E.

CASTLE TOWARD.—The rainfall (2·77) considerably below the average, and that of 1875; the weather throughout the month has been pretty favourable for out-door labour, as we had some frost, which kept the ground in good working order. There has been but little snow here during this month, only one slight sprinkling on the 12th; there has been but little wind.

BRAEMAR.—A month of changeable weather; the lowest temp. was 10°, being the min. of the year 1875, and on the same day, viz. 10th.

ABERDEEN.—Bar. pressure, mean temp. (42·1) and rainfall all above the average; winds from N., S.E. and S., more frequent than usual, the estimated pressure rather below the average. A month of dull, wet and dreary weather, with rather a high temp., notwithstanding the sharp snowstorms on the 7th to 11th.

LOCHBROOM.—A remarkably fine, dry month; outside work has been successfully prosecuted during the whole month; the finest November for years; 12th wet and stormy.

PORTREE.—A fine open month, 5·80 inches below the average of the last 16 years for November. Ground slightly covered with S on the 11th; solar halo on 8th; lunar halo on 29th and 30th; southerly gales on 15th, 22nd and 23rd; frosts daily 7th to 12th inclusive. Cattle and sheep healthy, and thriving well on the pastures.

CULLODEN.—S daily 7th to 11th inclusive; faint aurora on night of 19th; S on the morning of the 30th.

SANDWICK.—November has been wet and cold; the ground was covered with S from the 8th to the 11th inclusive, which was much earlier than usual; auroræ were noticed on 10th and 19th.

IRELAND.

DARRYNANE.—A mild but wet month; rain generally at night, the days often dry and spring-like.

KILLALOE.—Month very mild and fine, unusually so for the season.

MONKSTOWN.—Month unusually wet, and also remarkable for the absence of frosts, which only occurred on three nights; heavy H on night of 8th, the ground being quite white next morning.

BALLYSHANNON.—The month, though wet, has been mild, and consequently cattle have been left out longer than usual, and thus a great saving in fodder has resulted. A sharp frost came on the 8th, and though lasting only till the 10th, any bedding plants remaining in the open ground were killed; rainfall more than corresponding period of last year, '01 of inch.

WARINGSTOWN.—Mild (except 7th, 8th and 9th), and rather wet, giving sufficient intervals for sowing the wheat crop, which was got in fairly well.

OMAGH.—Weather of the first week a continuance of the fine period which commenced on 19th of October; remainder of month dull and rainy, but mild, with little frost and no snow.

SUPPLEMENTARY TABLE OF RAINFALL IN NOV., 1876.

[For the Counties, Divisions, Latitudes, and Longitudes of these Stations, see Met. Mag., Vol. XI., p. 28.]

Station.	Total Rain.	Station.	Total Rain.
	in.		in.
Acol	3·55	Llanfrechfa	6·52
Hailsham	3·37	Castle Malgwyn	4·93
Andover.....	3·25	Heyope	4·40
Strathfield Turgiss	4·06	Rhug, Corwen	4·37
Addington Manor.....	3·60	Port Madoc	5·32
Oxford	3·07	Melrose	3·62
Cambridge.....	2·57	Cessnock, Glasgow	3·64
Sheering	3·25	Gruinart	2·89
Ipswich	3·50	Keith	3·62
Diss	2·59	Stratheonan .....	...
Swaffham	2·84	Springfield, Tain	3·45
Compton Bassett	3·78	Skibbereen .....	...
Dartmoor	8·94	Glenville, Fermoy	7·76
Teignmouth	5·77	Tralee.....	4·07
Torrington (Langtree) ..	4·34	Newcastle W., Limerick ..	3·57
Trevarrick, St. Austell..	6·15	Kilrush	2·41
Taunton.....	4·54	Kilkenny	3·79
Bristol	4·48	Kilsallaghan	5·05
Sansaw	4·22	Twyford, Athlone	4·29
Cheadle	4·02	Ballinasloe.....	3·07
Ashby-de-la-Zouch .....	...	Kylemore	10·84
Coston, Melton Mowbray ..	3·02	Bangor .....	...
Bucknall	3·25	Carrick on Shannon.....	3·61
Walton, Liverpool	4·46	Rockcorry	2·81
Broughton-in-Furness ..	3·67	Warrenpoint	6·38
Stanley, Wakefield	3·10	Bushmills	3·05
Gainford	3·11	Buncrana	3·13
Shap	4·01		