

SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CXXX.]

NOVEMBER, 1876.

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

En Memoriam.

Prof. C. STE. CLAIRE-DEVILLE,
DIED
October 10th, 1876.

Dr. CARL JELINEK,
DIED
October 19th, 1876.

France has lost in M. C. Ste. Claire-Deville one of its foremost meteorologists, and one who, as Inspector-General of Meteorological Stations, was doing much to ensure that, without which Meteorology can make no progress—need we say that in thus writing we refer to uniformity of observation.

Germany has lost the Director of its finest Meteorological Observatory, and of its Meteorological system.

But the loss is not limited to these countries. Dr. Jelinek was the chief Editor of the *Zeitschrift der Österreichischen Gesellschaft für Meteorologie*, a journal which has no equal, and of which the circulation is only limited by the absence of a universal language. Jointly with Buys-Ballot, Scott and Wild, he may be regarded as the founder of the International Meteorological Congresses, while the success of the Vienna meeting was largely due to his personal exertions.

We need not go into details ; both men, by their writings and their labours, had deserved and obtained the esteem of their fellow-men, *e.g.*, they were both among the very select list (only 18) of Honorary Members of the Meteorological Society, and each will be regretted far beyond the limits of his own country.

SCIENCE AT SOUTH KENSINGTON.

(Continued from page 94).

1054. **Thermometer Stick**, for measuring temperatures at some depth.

Ludwig Meyer, Berlin.

Merely a hook-handled walking stick, pierced throughout. The bulb of the thermometer is in a clamp at the bottom near the ferrule, and the scale (the tube being bent) lies in the handle, which opens to enable it to be read.

Under Section 13, "Chemistry," among Class V. "Apparatus illustrating Agricultural Chemistry," we find—

2760. Soil Thermometer of peculiar construction.

Professor Dr. Leonard Roesler, Klosterneuburg.

This may best be described as a large gimlet, strongly made in iron, with a gimlet point, and a powerful cross-handle for driving it down. The pattern sent is about 4 ft. long, the scale of the thermometer is above the cross-handle, and alongside of it is a second thermometer, perhaps intended to give the temperature of the air on the surface of the ground.

Finally, under Section 14, "Meteorology," we have three other patterns—

2789f. Tube, Lath and Thermometer, by Hicks, A164, for taking earth temperatures.

Meteorological Office.

A rather thin brass case, a lath to which one or more thermometers could be attached and which drops into the brass case, and one of the thermometers.

2825. Von Lamont's Terrestrial Thermometer, for determining the temperature of soil from one to four feet deep.

Professor Ebermayer, Aschaffenburg.

2826f. Symons's Earth Thermometer.

L. Casella.

These have been so recently described and engraved in this Magazine (Vol. X. pp. 183-4) that we need only refer to that article for all details.

SOME OTHER BAROMETERS.

The collection is occasionally augmented, and now being dispersed, we take the present opportunity of mentioning two recently added barometers, at the same time that we extract from the paper mentioned in a previous number (and of which Dr. Wild has kindly sent us a copy), a few particulars respecting his modification of the syphon barometer.

The additions are:—

2789B. Portable Barometer, graduated on the glass tube, with a sliding vernier, invented and used by Sir J. Richardson, M.D.

Meteorological Office.

A pocket instrument very much resembling a sympiesometer. It was registered November 25th, 1839, the instrument having been made by Ronketti, of Museum-street, London.

A Self-registering Barometer.

Dr. G. F. Muller.

An extremely elaborate electrical recording barograph, which, however, appears to us far inferior to Redier's.

Wild's Syphon Barometer is a hardy rather than an elegant instrument. It is stated by Dr. Wild to be an improved form of the barometer used by Kupffer, and from the comparisons in the pamphlet quoted above, it evidently gives good results, while Dr. Wild's report upon its bearing transport is very satisfactory. Its construction is rather complex, and the inventor says that it is both heavier and dearer than a Fortin barometer. The general principle can, however, be easily understood. Fig. 24 gives a front view of the instrument; it consists of two tubes, one closed at the top to hold the barometric column, the other short one corresponds to the short leg of the usual form of syphon—a screw and tap at *A* close the short leg, and then the instrument can be rendered portable by the screw *B*. The reading is taken by making the collar *C* form a tangent to the top of the meniscus of the mercury in the short leg, then noting the reading of the other collar on the graduated tube, then a reading of the top of the long column is taken in the usual way, and subtracting the former from the latter, the height of the column is obtained.

ANEMOMETERS.

Following the order (such as it is) of the Catalogue, we proceed to notice the Anemometers.

We commence with one which we either do not understand, or, if we do, of which we fail to see the great value. The catalogue entry is as follows:—

2830. Static Anemometer, for measuring the force of the horizontal component of the wind, especially of gusts.

Scottish Meteorological Society, General Post Office Buildings, Edinburgh.

Two sets of Robinson's cup anemometers are placed one above the other on one vertical spindle, so that the couple tending to turn the spindle depends on the force of the horizontal component of the wind, not on its direction. To the spindle is attached a spring, so that the magnitude of the couple (and therefore the force of the horizontal component) is measured by the angle through which the spindle is turned. This is recorded by a pencil which is raised and lowered by a screw cut on the spindle. The clockwork and paper for recording have not been sent. Designed by Professor Crum Brown, M.D., F.R.S.E., Member of Council.

It seems to us, that as the motive power acts upon ordinary Robinson cups, this instrument registers more than the "horizontal component," for the vertical component acting on the inside of a hemisphere would surely exert some pressure. The record of an ordinary Robinson with four hemispheres has always appeared to us independent of direction, and we do not see what is gained by having eight, *i.e.*, one at each 45°. It appears to us that the instrument is virtually a pressure anemometer, with cups instead of a pressure plate, and therefore, as far as relates

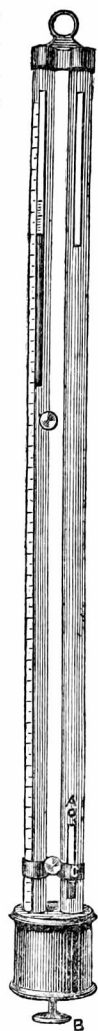


Fig. 24.

to azimuth, always in position for receiving the full force of the wind, which is not the case with pressure plates, whether governed by fans or vanes. As the resistance is that of a spring it is of course open to objection, on the ground of change of elasticity.

The **Robinson Cup** arrangement is represented in almost endless variety of detail and size ; as regards the latter quality the extremes are, one by Pastorelli (No. 2845), which would go comfortably in a coat pocket, and the full-size Meteorological Office pattern (2841A) by Casella, nearly 10 ft. high and 6 ft. across. We are inclined to regard this as the best velocity anemometer in the Exhibition, and Mr. Cator's (2879A)* as the best pressure instrument.

There must be nearly a dozen ordinary Robinson Cup Anemometers, some hardly distinguishable except by the names painted upon them. Several are arranged for registering (not recording†) electrically at a distance which we need not say—a very desirable feature, as positions where daily observations are impracticable become thereby available.

Howlett's Anemometer (2835b) is exhibited by Elliott Brothers ; but it has never commended itself to our approval, and we do not know of one that is at work. Its essential principle is the displacement from the perpendicular of a vertical rod suspended intermediately by a ball and socket joint having a light sphere on its upper and exposed end upon which the wind blows, while its lower weighted end carries a pencil. Evidently from whatever azimuth a puff of wind comes the ball will be driven and the pencil will travel towards that point of the compass, and the length of its trace will *cæteris paribus* be proportional to the force of the wind. This instrument evidently gives no indication of time. A *fac-simile* of the indications of one of these instruments is given in *Met. Mag.* Vol. III., p. 9.

Wild's Pendulum Anemometer (2784) is exhibited by the Meteorological Committee. It has the undoubted recommendation of being very inexpensive ; not having tried it, our opinion can be of little value, but we think that it must be very difficult to read. Its essential features are a long vane to secure steadiness of direction ; a slab of metal of known area and weight, supported at its two top corners at a right angle to the direction of the vane ; the bottom of the slab is free, and the stronger the wind the more is the slab blown from its naturally vertical position. A roughly notched scale is so fixed that the angle of deflection can be approximately read off.

A specimen of **Whewell's Anemometer** (2880) is sent by Elliott Brothers.

By far the most elaborate apparatus is **Dr. Von Oettingen's "Self-**

* For engraving and description, see *Met. Mag.*, Vol. II., p. 123.

† Registering refers to the placing of an index as in a minimum thermometer, or the hands as on a gas meter ; recording implies the production of a record upon paper.

recording Wind Components Integrator," of which the following is the description in the 2nd edition of the Catalogue.

"The wind moves a system of hemispherical cups, like Robinson's, acting on a circular plate whose velocity is ordinarily proportional to the velocity of the wind. Four systems of sliding rollers rest on this plate, whose bearings can be moved round a vertical axis, the principal planes of which imitate all variations of a wind vane. Each sliding roller can rotate about a horizontal axis, but only in one direction, and after a half rotation an electrical contact is made. A mechanism limits the contact to a fraction of a second. When the contact is made, one of four wheels, with number-types, is moved. Every half an hour the position of these four wheels is shown by printing numbers on a strip of paper. The differences of those readings represent the mean velocity of the wind from N., E., S., and W. They are converted into absolute values by means of a table. Different mechanism adjusts the portion [? position, *Ed.*] of every sliding roller."

We do not understand this description, though it is less bewildering than that in the 1st edition of the Catalogue. Possibly we may be favoured by some one who has mastered the intricate construction of this instrument with a clear description, but failing that, and subject to correction, we may state that the impression left upon our mind is that it is a combination of a recording velocity anemometer and a Babbage's calculating machine—*i.e.*, that while the original mechanical arrangements indicate velocity and direction, the instrument is so designed that the record is given in N.-S. and E.-W. components, similar to the results which would be given by the application to the ordinary records of Lambert's formula. As, however, neither vane nor set of cups is attached, and the parts of the apparatus do not seem to be in position, it is quite possible that the above inference is wholly erroneous.

RAIN GAUGES.

Most of the rain gauges exhibited are of patterns familiar to nearly all the readers of these pages. We, therefore, pass at once to the novelties.

Stutter's Self-recording Rain Gauge is exhibited by the patentee and manufacturer, Mr. Hicks, but for some unknown reason it is not to be found in the catalogue. However, we, instead of passing it over, engrave it, and reprint the maker's description, with merely a few verbal alterations.

"The importance of *Self-recording* instruments in yielding *continuous* records of Meteorological changes is now fully recognized; their cost has, however, hitherto prevented their general use. The rain-gauge here described is a step in the direction of cheapness without sacrificing efficiency. Fig. 25 represents the instrument with its cover and receiving funnel taken off.

"It is made in two forms, one with 12 and the other with 24 compartments.

"In the centre is an eight-day clock with its upright spindle, bearing a small funnel with a horizontal tube which revolves once in 12 or 24 hours, the end passing successively over the mouths of the 12 or 24 compartments on the rim of the instrument. Beneath each compartment, which is funnel-shaped, is placed a tubular glass jar, as shown in Fig. 26.

"The rain is received by the outer funnel (Fig. 26), drips into the smaller revolving funnel, and running along the horizontal tube falls into the compartment corresponding to the hour of the day. So that all rain falling, for example, between two and three o'clock will be found in the tube marked 2.

In taking an observation the dome is taken off, the inner ring, with its 12 or 24 divisions is lifted out and each tube inspected, those that contain rain are lifted out and their contents poured separately into the one *graduated* tube supplied with each instrument, read off in hundredths of an inch and noted against the hour.

Each tube (Fig. 26) can contain half-an-inch of rain. Any overflow runs into a vessel beneath, and can be measured, the tube which has overflown shows the hour.

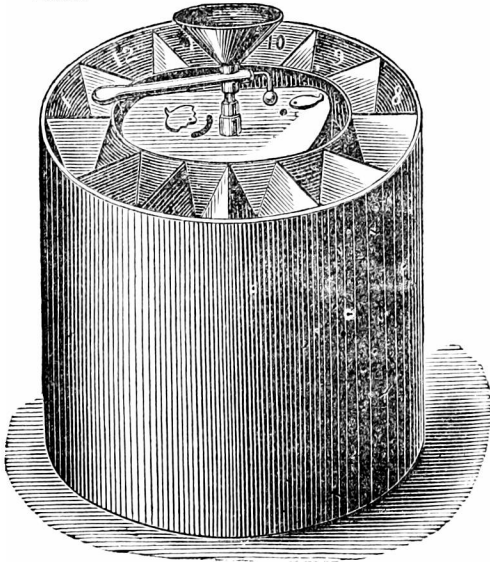


Fig. 25.
SCALE ABOUT 1-7TH.

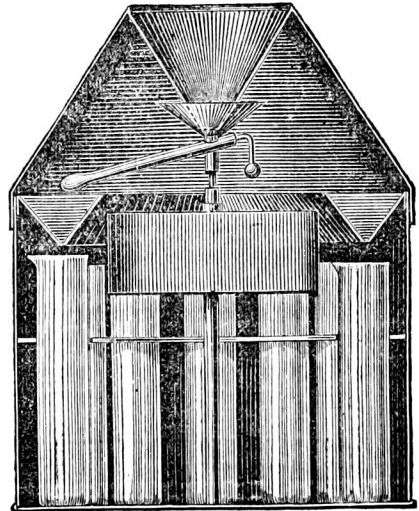


Fig. 26.
SCALE ABOUT 1-7TH.

Not having tried the instrument, we cannot speak decisively respecting its merits. But there are a few remarks which can be made with safety. In the first place we admit that self-recording instruments must be made at lower prices than previously, or they cannot be so generally used as is desirable. Mr. Hicks charges, we believe, about six times as much for a Beckley's rain gauge as for a Stutter's—so far so good, very good in fact.

The general arrangement may be regarded as satisfactory, except that it wants a Snowdon rim, the instrument is not too tall, and will, therefore, collect the true amount of rain, and its broad base will prevent its being overturned. We see several objections to the instrument as exhibited at South Kensington, but we see also how they may be met without greatly increasing the cost, and we make Mr. Hicks a present of the suggestions.

(1) It is a pity that the jars only hold 0.50 inch, and quite possible for more than half-an-inch to fall in two hours out of 24; in that case the overflow could not be properly apportioned.—Remedy: Let each glass stand in an open topped cylinder, having a capacity of $1\frac{1}{2}$ to 2 in., double overflow would then be, in the highest degree, improbable.

(2) There must be some loss in the wetting of so many jars, and in pouring from them into the one graduated jar at present supplied.—

Remedy: Divide all the jars; this would cost a guinea or, perhaps, two extra, but the accuracy and convenience would be well worth the money.

(3) There seems liability to damage from rain getting into the clock while the cover is removed for the measurement and emptying of the tubes, and also loss of record while this emptying, &c., is in process.—Remedy: Provide a spare can which could be placed under the collecting funnel during this time, this would secure continuity of record, and then the gauge and clock could be examined under cover, either temporary (an umbrella) or otherwise.

(4) We are afraid that it will be troublesome in frosty weather. A night-light under the second funnel would be useful, but probably the rotating tube would freeze first, and if it were blocked all other arrangements would be futile. However, in this respect it is only like all other self-registering rain gauges.

HAIL STORMS—AN EXPLANATION NEEDED.

To the Editor of the Meteorological Magazine.

SIR,—I enclose a proposal for an insurance against hail, and you will see in the last paragraph that "All crops growing within twelve miles of Somersham railway station, Huntingdonshire, are charged double the usual rate," and this is the custom of all insurance companies. I shall be very glad if any of your correspondents can explain why there should be twice as many hail storms in that district as in any other district in England.

I think it is an interesting subject for meteorologists.

I am, yours faithfully,

A. S. LESLIE MELVILLE.

The Long Hills, Lincoln, Oct., 1876.

THREE WET AUTUMNS.

To the Editor of the Meteorological Magazine.

SIR,—It is a singular fact, and one worth recording, that in this locality we have now experienced three abnormally wet autumns in succession, and that in each case the duration of excessive rain has been identical, extending over nine weeks. Comparing the three periods, and the rainfall of each, we arrive at the following figures:—

					inches.
1876	...	Fall of 9 weeks,	Aug. 17th to Oct. 18th	...	13·968
1875	...	"	Sept. 19th to Nov. 20th	...	15·942
1874	...	"	Aug. 6th to Oct. 7th	...	13·521

The yield of these periods is (taken separately or collectively) considerably more than double the average quantity.

I am, Sir, your obedient servant,

W. F. DENNING, F.M.S.

*Tyndale House, Ashley Down, Bristol,
October 20th, 1876.*

JUNE AND OCTOBER.

To the Editor of the Meteorological Magazine.

SIR,—So many persons have the idea that the Undercliff, because it is comparatively warm in winter, is exceptionally hot in summer, that I take the liberty of enclosing the table of the temperature here for the first 19 days in October, compared with the first 19 of June, by which you will see that the latter was actually a cooler period than the former.

Although the average maximum for the two periods is practically the same, the average mean is higher in October, in consequence of the nights in October being warmer than the corresponding nights of June.

Yours very sincerely,

C. MALDEN.

*St. Lawrence Rectory, near Ventnor,
Oct. 21st, 1876.*

[As the daily entries are in nowise remarkable, unless it be for uniformity, we have only printed the means, and for the sake of comparison we have added the corresponding values for London, from a louver-boarded stand, such as, we believe, Mr. Malden uses.

		St. Lawrence.				London.	
		June 1-19.	Oct. 1-19.			June 1-19.	Oct. 1-19.
		deg.	deg.			deg.	deg.
Mean Max.	...	61·8	61·9	.....		65·8	64·4
„ Min.	...	50·8	56·7	.....		48·7	51·8
„	...	56·3	59·3	.....		57·3	58·1
Absolute Max.	...	70·1	64·6	.....		77·8	70·5
„ Min.	...	46·0	51·0	.....		40·1	40·1

The table shows two features at the same time, (1) that both at St. Lawrence and in London, the first 19 days, especially the nights, of October were warmer than those of June, and (2) it shows in a marked manner the diminished range of temperature on the south coast, viz., almost exactly one-third less than in London.—ED.]

REVIEWS.

Theorie eines neuen Thermometers, welches aus der Vereinigung des Luftthermometers mit dem Wagebarometer entsteht und sich zur automatischen Aufzeichnung der Temperaturen sehr leicht verwenden lässt. Von Dr. PAUL SCHREIBER. [From Carl's *Repertorium* Bd. XI.] Munich, 1875. 8vo.

DR. SCHREIBER begins by saying that the air thermometer is recognised as the best instrument for the estimation of temperature, and that it has the great advantage over the mercurial thermometer that the observations can be made elsewhere than in the position of the instrument. Although to a slight extent we disagree with both portions of the above statement, we object chiefly to the second part. We believe that if an air thermometer is made to act through a length of tube, its

indications are sure to be vitiated in exactly the same way as were those of the old fashioned underground thermometers.

No specimen of the instrument had been made when the pamphlet was written, and we can therefore only state briefly the proposal as we gather it from the letter-press and the plate; the former, we may mention, occupies 40 pages, but a large proportion of the space is devoted to the mathematical investigation of the probable corrections.

The proposal involves five distinct parts :—

- (I.) A balance barometer with recording cylinder.
- (II.) An air-baro-thermometer which consists of another balance barometer, with a small flexible tube leading out of the upper part, the other end of which tube terminates in a hollow metal sphere exposed to the external air.
- (III.) A similar air-baro-thermometer for showing the temperature of the internal parts of the apparatus.
- (IV.) An electric battery with three induction coils.
- (V.) A clock for regulating the transmission of the induced currents.

To parts (I.), (IV.) and (V.) we have no objection; but, to our regret, it appears to us that parts (II.) and (III.) are impracticable. We can apply no other term to a proposal that the upper part of a barometer tube should have a side tube inserted in it, to which a long flexible tube is to be attached. The entire accuracy of the apparatus depends upon the possibility of keeping these connections absolutely air-tight, which we believe to be impracticable for any length of time.

Under these circumstances we do not think it necessary to consider other objections, such as that the indications of the air-baro-thermometer must have as their base-line the variable indications of the balance barometer, and the complicated corrections which would be necessary. It also seems to us that there would be serious difficulties in the construction, and therefore, while admitting the ingenuity of the design and the skill shown in some parts of the treatment of the theory of the instrument, we feel bound to wait for the completion of a specimen before pronouncing a verdict in its favour.

Commission de Météorologie de Lyon. 1873 Trentième année. Lyon, Pitrat Aîné, 1875.

It is some years since we have had the pleasure of noting the appearance of the reports of the Lyons Commission, but we find this body as active in the thirtieth year of its existence as in the earliest of which we have any record. It will be remembered that we mentioned, at the time, the great loss which the Commission sustained in the death of its former President, M. Fournet. We think that both Meteorology and the City of Lyons have reason to be glad that Professor Lafon now occupies the presidential chair.

The principal features which strike us as improvements in the present

volume are, (1) the placing of the meteorological curves for each month opposite the numerical tables, so that all can be compared with great facility ; (2) the insertion of a list of errata—we always distrust publications which make light of human fallibility ; and (3) the detailed chronicle of atmospheric changes, which is very well done.

We think that it would be very convenient if one or two pages, in each annual volume, were devoted to giving the total rainfall at some (or all) of the stations of the Commission in each year, from the commencement of the observations. And if we may be allowed to make two suggestions in one year, the second will be that a skeleton map of the basins of the Rhone and Saone, with the hydrometric stations of the Commission distinctly marked and also the mountains and principal water courses, would be a very handy addition to the already excellent volumes.

L'Orage du 7 au 8 Juillet, 1875. [Extrait du Journal de Genève, du 9 au 12 Juillet.] Genève : RAMBOZ ET SCHUCHARDT, 1875. 8vo.

FEW hailstorms have been as destructive as those which occurred at the southern end of the lake of Geneva soon after midnight of July 7th–8th, 1875. It is, therefore, fortunate that a very complete record of the phenomenon was prepared and published (at the small price of 30 centimes). The pamphlet occupies 40 pages, and contains a map giving the boundaries of the districts principally injured.

The premonitions of the storm are thus described :—

“Wednesday, July 7th, the weather was particularly sultry. A heavy heat, the enervating effect of which was untempered by the least breath of air, produced in every one unusual lassitude. The air was charged with vapour, and the least details of the mountains were visible ; they seemed as if one could touch them. Soon after noon threatening clouds formed on the top of the Jura, and the sun at its setting bathed its sides in a tawny light. The evening was calm, but a little after 10 p.m. an electric storm broke out with extraordinary intensity, but without a single clap of thunder. From 10.30 to 11.30 the flashes were so frequent that one could see as in broad day-light, and one might consider the town wrapped in a sheet of flame. Although the heat continued stifling, and there was not a breath of air on the pavements, yet after 11 p.m. all the little objects upon the roofs began to spin round as if driven by a tempest. At the same time a hollow rolling sound, which was neither that of wind nor that of thunder, announced the approach of the terrible phenomenon which, at midnight, broke upon Geneva with all its fury.

“An avalanche of enormous hailstones, without any trace of rain, was discharged, driven by the S.W. wind upon the roofs and walls of the houses, and against the windows, whence they rebounded with an indescribable clatter. Those windows which were not protected by external shutters, no matter how thick the glass, were smashed into into fragments. In the twinkle of an eye almost all the street lamps

were extinguished, and the only light of the town was that of the lightning reflected as from a sheet of ice. All the glass roofs (so numerous in the new part of the town) have been pulverized, and scattered over the staircases they were intended to protect. Such has been especially the case with our printing office [*Journal de Genève*], of which the double glass roof was broken in and scattered over our presses at the very moment when we were preparing for publication.

"It was unfortunately the same with the glass roof of the Rath Museum, whose windows have been reduced to dust. Twenty-two paintings have been more or less damaged, some of them slightly, several pierced with holes as large as a fist. The exhibition of the pupils of the Schools of Design was entirely destroyed by the hail, rain, and fragments of glass."

The destruction of the vintage and various crops is then stated, and appears to have been more or less serious over an area of about 250 square miles.

As the meteorological details are more essential for these pages than the social or statistical, we pass over all the details of disasters in the country with the following exception—"On these last two points (Annemasse and the hill of Monthoux) the violence of the tempest exceeded anything previously known. Not only is the country completely cleared, but there hardly remains a tile upon the roofs."

"Persons worthy of trust assure us that at Annemasse hailstones fell weighing 1 lb. 12 oz. This almost incredible fact is stated to us upon such good authority that we are obliged to admit it. Moreover, we have ourselves seen the sketch of hailstones, picked up at Pinchat, after lying in the sun and rain for a whole day, and which were still nearly 3 inches in diameter. The stones were generally of a lenticular or nearly spherical shape; their structure was usually a central opaque nucleus, surrounded by a radiated and semi-transparent exterior. These masses of ice, driven almost horizontally by the S.W. wind, were discharged with almost resistless violence on all obstacles which barred their passage. We are informed that, at Annemasse, one of these hailstones pierced a solid wooden shutter, broke the window, and subsequently had sufficient force to star a mirror.

We may mention some facts worthy the attention of meteorologists.

"(1) During the whole of the day preceding the storm the, as yet unexplained, phenomenon, known as *ladières*, was seen on the surface of the lake. They are currents which manifest themselves suddenly without apparent cause, in one direction or another, and whose influence is felt upon the boats. We do not know what is the value of this indication, nor even if it has any connection with the storm of the night; but everything bearing in the least on the disorder of the elements is worthy the attention of meteorologists. (2) In the evening, a little before sunset, two clouds of unusual form were observed in the S.W. One of these was like an immense cone whose base was lost in the sky, while its slightly truncated summit touched the earth. The rays of the setting sun striking obliquely upon this mass of vapour,

gave it a lovely violet colour. The other cloud was more irregular : the upper part formed an enormous udder-shaped mass, connected at the base by a sort of strangulation.—[Probably the Orcadian Pocky Cloud. Ed.] (3) A little after sunset a singular red glimmer, which has been compared to that of an aurora borealis, was seen near the N.W. horizon."

We have before us a fragment of the glazing of the printing office of the *Journal de Genève*. It is a sheet of glass 0·11 in. thick, pierced in its centre with a slightly elliptical hole, as cleanly cut and as regular as if done with a diamond and a pair of compasses ; the lesser diameter is 2·64 inches, and the greater 2·76 inches. One may notice all round, an elongated ellipse in which the glass has lost its transparency, and seems divided into a series of very close and regular concentric ellipses.*

We ought also to mention the frequency of the singular fact of trees being entirely stripped of their bark.

Prof. Colladon, in his report to the *Académie des Sciences de Paris*, states that the most usual size of the hailstones was $\frac{3}{4}$ in. in diameter, but that they reached nearly 4 inches in rare cases ; they all had an opaque nucleus about $\frac{1}{4}$ in. in diameter, surrounded by alternate layers (usually six to eight) of clear and opaque ice. The large hailstones were mostly flattened, and these lenticular stones were evidently not broken fragments of larger ones.

Prof. Colladon believed that the path, and greatest intensity of the storm, were influenced by the river Arve.

It is fortunate that both a self-recording barometer and thermometer were at work at Geneva, and that neither was injured. The following is the account of the results as given by M. Grosclaude :—

The barometer, after a slightly disturbed course, rose suddenly 0·39 in. in half-an-hour, between 0.15 and 0.45 a.m. During storms it generally rises, but rarely so suddenly as in this instance. After 0.45 a.m. it resumed the fall which lasted uninterruptedly throughout the next day.

Still more remarkable were the thermometer changes. After a perfectly natural decline of temperature up to 0.15 a.m., when it was 72°·9, it fell suddenly to 61°·9, that is to say, 11°·8 in a quarter-of-an-hour. Half-an-hour later it had risen to 63°·5, at which it remained until the morning.

We may add that Dr. Metcalf, of Geneva, to whom we are indebted for our copy of the pamphlet, informed us that he himself saw stones which after lying for four days in sun and rain were the size of large walnuts. He considers that at Geneva the average size was about 2 inches diameter by half-an-inch thick.

* This is, or was, (No. 2912) in the Loan Exhibition of Scientific Apparatus,

OCTOBER, 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.	Differ- ence from average 1860-5	Greatest Fall in 24 hours.			Max.		Min.			
				Dpth	Date.		Deg.	Date.	Deg.	Date.		
I.	Camden Town	inches 1.40	inches. — 1.19	in. .43	12	14	71.2	6	34.2	31	0	2
II.	Maidstone (Linton Park).....	1.32	— 1.78	.38	1	19	72.0	6	35.0	31	0	...
III.	Selborne (The Wakes).....	2.11	— 2.10	.56	9	15	66.5	5,19	30.0	25*	2	4
IV.	Hitchen .....	.97	— 1.58	.25	6	14	64.0	7	28.0	31	2	...
V.	Banbury	1.39	— 1.04	.45	3	14	69.0	7	32.0	31	1	...
VI.	Bury St. Edmunds (Culford).....	.84	— 1.87	.26	12	12	70.0	7	31.0	31	2	2
VII.	Norwich (Sprowston) .....	...	...	...	...	...	...	...	...	...	...	...
VIII.	Bridport	2.27	— 1.76	.46	17	17	73.0	3	32.0	30	...	...
IX.	Barnstable	3.58	— .54	.75	17	15	70.0	4	46.0	16†	0	...
X.	Bodmin	3.97	— 1.35	.74	16	18	64.0	4	38.0	29	0	0
XI.	Cirencester	1.46	— 2.03	.24	6	14	...	...	...	...	...	...
XII.	Shifnal (Haughton Hall)	2.81	+ .57	1.55	8	16	65.0	4,6	32.0	31	1	2
XIII.	Tenbury (Orleton)	2.29	— .94	.62	8	19	68.5	5	34.2	30	0	3
XIV.	Leicester (Belmont Villas)	1.55	...	.43	3	14	70.2	7	35.0	31	0	...
XV.	Boston	1.17	— .95	.34	6	12	68.0	5	34.0	31	0	...
XVI.	Grimsby (Killingholme)	1.85	...	.48	6	12	66.5	7	35.0	31	0	...
XVII.	Mansfield	2.28	...	.75	8	21	68.0	7	32.6	31	0	...
XVIII.	Manchester	2.60	— 1.21	1.45	8	11	72.0	19	28.0	31	1	1
XIX.	York	2.47	— .05	1.15	8	13	66.5	7	31.5	30	1	...
XX.	Skipton (Arncliffe)	3.91	— 2.75	.73	8	17	65.0	7	29.0	25	4	...
XXI.	North Shields	1.78	— 1.50	.45	8	14	65.0	7	34.0	31	0	0
XXII.	Borrowdale (Seathwaite).....	7.32	— 9.00	1.63	11	15	...	...	...	...	...	...
XXIII.	Cardiff (Ely) .....	...	...	...	...	...	...	...	...	...	...	...
XXIV.	Haverfordwest	7.38	+ 2.19	1.85	8	17	65.5	3,5	31.5	31	1	1
XXV.	Machynlleth	5.49	...	1.77	8	16	71.0	6	25.0	31	3	...
XXVI.	Llandudno	3.07	— .89	.53	17	15	66.3	5	41.4	23	0	...
XXVII.	Dumfries (Crichton Asylum).....	4.48	— .69	1.10	10	15	62.8	7	28.4	31	1	2
XXVIII.	Hawick (Silverbut Hall).....	2.66	...	.40	12	16	...	...	...	...	...	...
XXIX.	Kilmarnock (Annanhill).....	6.70	...	1.34	11	16	64.3	5	30.1	31	1	3
XXX.	Castle Toward	6.58	+ .83	1.37	19	18	59.0	7,8	27.0	31	1	...
XXXI.	Mull (Quinish) .....	...	...	...	...	...	...	...	...	...	...	...
XXXII.	Leven (Nookton).....	...	...	...	...	...	...	...	...	...	...	...
XXXIII.	Grandtully	5.19	...	.85	8	14	...	...	...	...	...	...
XXXIV.	Braemar	3.53	+ .78	.67	10	18	59.8	7	33.2	30	0	3
XXXV.	Aberdeen	2.64	...	.53	13	23	61.2	8	35.4	31	0	5
XXXVI.	Loch Broom	3.70	...	.86	18	18	...	...	...	...	...	...
XXXVII.	Portree	8.13	— 2.65	1.33	10	21	...	...	...	...	...	...
XXXVIII.	Inverness (Culloden)	2.53	— .13	.66	12	14	65.6	6	30.5	22	1	6
XXXIX.	Helmsdale	3.46	...	1.12	13	18	...	...	...	...	...	...
XL.	Sandwick	3.80	— 1.12	.85	13	23	61.6	7	34.6	30	0	0
XLI.	Caherciveen Darrynane Abbey	5.35	...	.95	2	19	...	...	...	...	...	...
XLII.	Cork	6.88	...	1.23	2	14	...	...	...	...	...	...
XLIII.	Waterford	7.02	+ 2.62	1.31	15	20	64.0	3	32.0	24	1	...
XLIV.	Killaloe	4.52	— .50	1.04	15	16	73.0	7	33.0	24	0	...
XLV.	Portarlington	2.91	— 2.22	.47	11	24	65.0	7	31.0	23	1	...
XLVI.	Monkstown, Dublin	5.00	+ 1.08	.72	18	16	...	...	...	...	...	...
XLVII.	Galway	4.63	...	.93	14	19	65.0	7	32.0	23*	2	...
XLVIII.	Ballyshannon	3.86	...	.90	8	15	...	...	...	...	...	...
XLIX.	Waringstown	4.65	...	.79	2	19	67.0	7	37.0	30	0	0
L.	Edenfel (Omagh)	4.48	...	1.03	2	17	62.0	6,7	27.0	31	1	0

* And 31.

† 29.

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

METEOROLOGICAL NOTES ON OCTOBER.

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

ENGLAND.

LINTON.—The first fortnight showery, and heavy rains not uncommon; after that time dry and fine, though mostly dull until the last few days, when it became brighter, and the unusual sight of dust flying in October presented itself. Bar. mostly high. On the whole a fine month, and the latter part of it especially so; drier than any preceding October I have on record. No frost to do any harm except on the last morning of the month.

SELBORNE.—TS on 5th; T on 6th; dense fogs on 8th and 19th; fogs frequent after the 17th; frost on the grass on 15th; white frost on 25th, and mist on the Hanger. Bar. remarkably even the latter part of October and beginning of November, from the 24th October to this day (November 6th) the total variation has not exceeded .15 in., viz., 29.80 in. to 29.65 in. (uncorrected) in 13 days. Prevailing wind up to 20th, S.W., after that date, variable. [Erratum.—In September Remarks, for "greatly retarded" vegetation read "cultivation" vegetation was exceptionally profuse.

BANBURY.—T and L on 6th.

CULFORD.—The latter half of the month remarkably fine, no R having fallen between the 14th and 31st. Mean temp. above the average, viz., 52°·6; max. 70°; min. 31°; a great prevalence of southerly winds; polar winds prevailing only on five days. A great depression in temp. set in on the 31st, the max. only reaching 44°.

BODMIN.—Rainfall 0.87 in. above the average of 27 years. Mean temp. of the month, 48°·3.

SHIFNAL.—The copious rains with which September closed continued with more or less persistence till the 19th of October, the only exceptions being the 1st, 10th and 14th. The fall on the 8th (1.55 in.) was most extraordinary, falling as it did in 21 hours, and without any symptoms of T. From the 18th a dry spell set in, accompanied by easterly winds, most acceptable to the farmers for drying the saturated earth. The mistiness that prevailed through the greater part of the month was most unusual, no less than 14 days being so affected. A high wind on the 11th was the only one in the month. Dahlias, &c., remained unscathed till the close, the only frost being on the 31st, and the average min. being as high as 45°·2. Ring dove still cooing; on 4th large dragon fly still hawks about on 6th.

ORLETON.—Very cloudy, damp and warm, with R every day till the 19th, but generally in small quantities; the wind then changed from S.W. to N.E., and the remainder of the month was dry and pleasant, but much cooler and very favourable for wheat planting. The mean temp. of the month was about 2¼° above the average. The wind was great on 1st, 9th and 11th; on the latter day the bar. fell to a low point. The river Teme overflowed its banks on the 9th. No T heard.

LEICESTER.—A mild and fine month; the max. temp. was very high at the beginning of the month, rising to 70° on 5th, 6th, and 7th, and being never below 60° (with one exception) from 3rd to 19th; the night temp. very high, especially during the first week; only .03 of R fell after the 12th; L on morning of 14th. Mean max. 59°; mean min. 47°·7; mean of month 52°·6; mean of 1st to 19th, 56°.

BOSTON.—A very fine month; mean temp. 3° above the average. Rainfall 1.14 in. below the average of the previous 20 years. The dry weather has been of immense advantage to the lands after the very heavy rainfall of the previous month.

GRIMSBY.—A very fine month, with many pleasant days; a good deal of fog; the last day quite wintry. Last year the fine, dry weather broke up on October 9th, when the bar. fell with a N. wind. This year the rain ceased and dry weather set in at the same date. L at 8 p.m. on 14th; T at 10 a.m. on 17th.

MANSFIELD.—The month commenced with a continuation of the September weather; dull and showery R falling, more or less, every day; this was followed

by genial weather ; R falling chiefly at night ; then followed some damp, raw, November-like weather—foggy and gloomy, but the month closed with beautiful calm, bright, sunny days. 11th, very stormy and bright night.

MANCHESTER.—A very dry October, R falling upon 11 days only. The total fall (2·60 in.) is more than 1 in. below the average, and more than half of this fell in one day (the 8th).

ARNCLIFFE.—Thirteen consecutive days (19th to 31st, inclusive) gave only ·01 of R—most unusual.

NORTH SHIELDS.—Distant lunar halo on 6th ; distant solar halo on 8th ; T S on 9th.

WALES.

HAVERFORDWEST.—The first nineteen days excessively wet, and at times very wild ; T with vivid L on 8th, and again on the evening of the 11th, with a terrible storm of hail. A change took place after the 19th, when the weather became clear, calm and cold, the first half of the month having been characterized by excess of temp., especially high at nights, fourteen of which were 50° and upwards. Wind easterly from 16th to 31st.

MACHYNLLETH.—A very wet month up to the 18th ; temp. rather high ; very close, warm and muggy up to that time. L at night on 11th and 17th ; very fine and dry from 18th to the end.

LLANDUDNO.—The temp. of the month about 1°·5 above the average ; nevertheless, the sky was more than usually cloudy, and much haze prevailed during the latter half of the month. No R fell during the last twelve days, and the total fall was considerably below the average.

SCOTLAND.

DUMFRIES.—Upwards of 1·00 in. R fell on the 10th ; it was preceded by T and H, and followed by a heavy gale of wind from S.W. Latter part of month dry and fine ; mean temp. 50°·2, being 3° higher than last year ; sharp frost on 31st.

HAWICK.—Excepting the four days, 9th to 12th, inclusive (which were very windy), the month has been very mild ; scarce any bright sun during the month.

ANNANHILL.—Temp. 2°·1 lower than last month ; winds moderate, except in the middle of the month ; hard gale from W.S.W. on 10th and 11th, with T and L ; H and heavy R ; 1·20 in. fell between 9 a.m. and 4 p.m. This heavy R was followed by a brilliant double rainbow in E.N.E. An especially heavy squall of wind about 4 p.m. on 11th ; frequent fogs and much cloud ; T S on 10th, 11th and 14th. Death-rate at the rate of 21 per 1,000 ; principal causes, consumption and bronchitis.

BRAEMAR.—A very wet, damp month ; crops much damaged. T and L at 5.30 p.m. on 11th.

ABERDEEN.—A mild but most unseasonable month ; ruinous to the crops, still out when it commenced ; bar. pressure and temp. above the average, the rainfall below it. L on 10th and 11th ; S on 30th and 31st.

LOCHBOOM.—A peculiarly mixed month—all sorts of weather, but on the whole good and favourable, particularly the latter, for the lifting the potatoes, which are exceedingly good in this part, and quite free of taint : that, with the ample supply of herrings got here, make a good prospect for the poor.

PORTREE.—First two days dry, thence to 18th very wet and stormy, after that date moderately fine to the end, which enabled the ingathering of the last of the crops to be effected in pretty good order. Potatoes sadly diseased. Rainfall considerably below the average of the last 16 years ; a number of shooting stars on 25th, direction from S.E. to W. ; ground covered with S on morning of 15th ; H showers on 10th ; Heavy gale on 16th.

CULLODEN.—Last swallow seen on the 1st ; sprinkle of S on Ben Wyvis, in Ross-shire (3,422 ft. high), on 2nd ; slight showers of S and sleet on 30th and 31st.

SANDWICK.—October has been cloudy, hazy, wet, and very unfavourable for cutting and taking in the cereal crops. Bar. fell to 28·48 in. at midnight on the 11th, and two hours after there was a gale of 65 miles an hour from 2 to 3 a.m. on 12th. There was also a long continued gale from the morning of 29th till

noon on 31st, from 40 to 60 miles an hour. T on 11th; aurora on 6th; lunar rainbow on 7th; Hoy Hill white with S on 31st.

IRELAND.

DARRYNANE.—First half of month, westerly winds and unsettled weather; second half, easterly winds, fine weather, and mild. T and L on 10th and 15th.

KILLALOE.—Remarkably fine autumn weather from 19th to end of the month, with sharp frost on the last night.

MONKSTOWN.—The early and middle part of the month mild and wet, the latter part fine and dry, cooler, but not cold; no frost. Bar. very high and steady.

BALLYSHANNON.—The month has been unusually mild, and very favourable to the completion of harvest work. In the early part of the month there were some heavy falls of R, but as they were of short duration they did not interfere with the farmers. Rainfall '68 in. less than the corresponding period of last year.

WARINGSTOWN.—Very wet until the last week, but warm and genial; no frost.

OMAGH.—Weather very wet and unsettled, though mild, up to the 19th; thence to the end of the month remarkably fine, balmy, and summer-like. No frost, except on the last day; the fruit and foliage of the forest trees having been allowed to ripen and mature without the interference of frost, the autumn tints have been beautiful beyond recollection.

SUPPLEMENTARY TABLE OF RAINFALL IN OCT., 1876.

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

Station.	Total Rain. in.	Station.	Total Rain. in.
Acol	·85	Llanfrechfa	4·90
Hailsham	1·57	Castle Malgwyn	5·86
Andover	·55	Heyope .....	...
Strathfield Turgiss	1·83	Rhug, Corwen	4·48
Addington Manor	1·34	Port Madoc	6·05
Oxford	1·02	Melrose	2·75
Cambridge	1·04	Cessnock, Glasgow	6·40
Sheering	1·24	Gruinart	7·02
Ipswich	1·15	Keith	2·83
Diss	·90	Strathconan .....	...
Swaffham	·84	Springfield, Tain	2·95
Compton Bassett	1·65	Skibbereen	4·39
Dartmoor	7·61	Glenville, Fermoy	6·34
Teignmouth	4·21	Tralee	4·15
Torrington (Langtree) ..	4·23	Newcastle W., Limerick ..	3·38
Trevarrick, St. Austell..	4·71	Kilrush	2·38
Taunton	2·90	Kilkenny	4·82
Bristol	3·20	Kilsallaghan	5·45
Sansaw	2·76	Twyford, Athlone	5·27
Cheadle	3·38	Ballinasloe	4·33
Ashby-de-la-Zouch .....	...	Kylemore	9·66
Coston, Melton Mowbray	1·39	Bangor .....	...
Bucknall	1·45	Carrick on Shannon	4·38
Walton, Liverpool	2·66	Rockcorry	3·67
Broughton-in-Furness ..	4·26	Warrenpoint	6·10
Stanley, Wakefield	2·11	Bushmills	4·44
Gainford	1·69	Buncrana	4·12
Shap	5·05		