SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CCCXXIII.] DECEMBER, 1892. [PRICE FOURPENCE, *or 5s. per ann. post free.*

FORGOTTEN METEOROLOGICAL OBSERVATIONS.

As was shown in the *Quarterly Journal* of the Roy. Met. Soc., Vol. vii, p. 65, there has been a series of Meteorological Societies in London since 1822. The early ones were frequently in difficulties, monetary and otherwise, hence many of the books and papers which they collected have been lost or destroyed. When any of them can be found they should be placed in the care of the Royal Meteorological Society, of which the position is now so strong that there is little probability of anything entrusted to its care ever wandering again.

We have lately purchased a volume of this kind. A large folio volume of blank paper, in which newspaper cuttings and small meteorological tables received between 1837 and 1843 were pasted. The label on the side is as follows :—

> METEOROLOGICAL SOCIETY
> OF GREAT BRITAIN.
> EXTRACTS, SUMMARIES, &c., &c.
> From 18 to 18

It thus confirms the evidence (*Q. J.*, vii, p. 97) that about 1842 the name of the Society was changed from the Meteorological Society *of London* to the Meteorological Society *of Great Britain.*

Before passing the volume on to the Society we have looked through it, and made some discoveries which we think it may be of interest to mention.

BAROMETER INDICATORS.

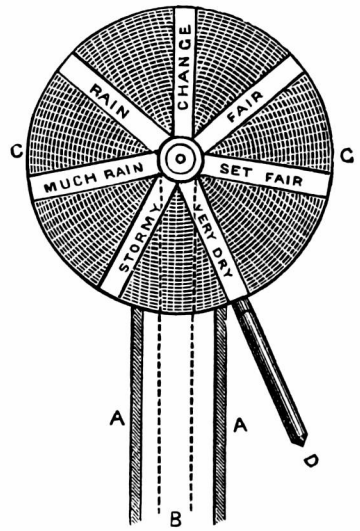
We were under the impression that the first person to suggest or design barometer indicators was the late Mr. Sopwith, F.R.S., who, in conjunction with Mr. Glaisher, F.R.S., erected three on the Northumberland coast in 1860. Mr. Sopwith read a paper, "On Barometer Indicators," at the meeting of the British Meteorological Society on January 16th, 1861, and the paper is printed *in extenso*

in the Eleventh Annual Report of the Society. As this paper contains no reference to any previous work upon the subject, we may be quite sure that the designs then brought forward originated with Mr. Sopwith.

We find, however, a cutting from a Welsh paper seventeen years earlier, giving a sketch and explanation of one, and reproduce it; if any one can trace the invention still further back we shall be glad if he will do so.

Extract from the "Carnarvon Herald" of January 21st [or 28th], 1842.

"The following are the diagram and explanation forwarded in illustration of the suggestion of our correspondent "Cymro" in the *Herald* of last week :—



A A Post.
B Cordage and machinery to adjust the indicator D.
C C A double casing of metal, to support a rack and pulley, and to hold the indicator firm, 3 feet in diameter.
D The indicator, 3 feet long, one half of which would be at all times outside the metal casing C C, which will give it a range of 6 feet."

Of course we do not suggest that the above is a good pattern—far from it; we place it upon record merely because of its date—more than half a century since.

Early Colonial Observations.

Another point on which we have received considerable enlightenment, is the early date at which meteorological observations were made and recorded in many of our colonies. The data are mostly

fragmentary, but they are sufficient to show that careful search through files of early Colonial newspapers will probably enable the officials of most Colonies to carry their meteorological records further back than they have done at present.

We give merely enough to enable persons interested to follow up the investigation.

Antigua.—Rainfall at St. John's Reading Room, January, 1842.

Bahama.—Rainfall returns for Nassau during 1840—42.

Barbados.—Rainfall one mile from Bridgetown, September, 1842.

Canada.—Complete Meteorological Observations at Ancaster, Wentworth, Canada West, 1842.

Rainfall at Ancaster in 1842.

Jan. ...	2·45	May ...	·90	Sept ...	3·75	Year...	36·68
Feb. ...	2·20	June...	3·60	Oct. ...	1·75		
Mar....	2·48	July...	4·80	Nov....	4·05		
April..	3·50	Aug....	2·70	Dec. ...	4·50		

Grenada (?)—Rain at the Rochester Collegiate Institute, 1840 to 1842.

New South Wales.—Met. Obs. at South Head, Sydney, at Port Jackson, and at Port Macquarie during 1840—42.

Saint Vincent.—The observations from this island are probably the most important in the book; the footnote shows that the record began with 1823. We reprint the whole of the rain tables, and are glad to add that there is indication of accuracy having been secured. It will be remembered that St. Vincent is one of the Windward Isles in the West Indies, about 100 miles W. of Barbados.

Rainfall at St. Vincent, West Indies.

OBSERVATIONS MADE AT KINGSTOWN (Lat., 13° 13′ N.; Lon., 61° 13′ W.), By J. DRAPE, ESQ.

	1830.	1831.	1832.	1833.	1834.	1835.	1836.	1837.	1838.	1839.	1840.	1841.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Jan.	5·82	2·56	2·96	2·39	8·53	4·81	3·79	3·22	7·78	4·11	3·90	2·03
Feb.	1·63	1·17	3·96	·59	2·36	3·27	3·88	2·87	1·81	2·54	4·80	1·56
Mar.	6·76	2·97	1·42	1·74	3·73	5·53	4·86	·39	1·82	3·25	2·93	1·97
April	6·41	1·16	3·39	3·44	1·58	3·56	2·45	4·03	6·55	2·00	4·98	2·96
May	7·64	8·58	4·53	8·32	7·11	6·39	6·32	9·44	9·49	·50*	2·16	4·96
June	8·21	10·70	7·94	4·36	8·04	11·68	10·83	11·72	10·58	6·33	10·31	6·02
July	8·45	10·52	9·70	6·23	7·14	9·25	6·27	11·24	7·75	6·70	9·05	6·33
Aug.	13·99	11·18	8·56	4·36	6·05	8·49	13·55	7·90	9·27	2·53	7·60	6·16
Sept.	6·84	9·35	13·38	6·16	9·11	7·26	6·81	8·63	6·66	8·15	13·04	11·35
Oct.	8·62	6·24	9·31	13·27	9·31	11·20	9·58	7·64	9·90	8·78	6·35	9·32
Nov.	7·71	13·19	8·62	5·42	5·14	17·33	11·75	11·04	6·35	11·72	4·47	3·77
Dec.	1·72	9·84	4·33	3·68	5·07	6·20	9·81	7·74	5·39	·58	4·58	6·99
Total	83·80	87·46	78·10	59·96	73·17	94·97	89·90	85·86	83·35	57·19†	74·17	63·42

* Previous dry months :—1823, February, ·39; 1837, March, ·39.
† Driest since 1823; 1824=68·90; 1829=65·15; 1833=59·96.

OBSERVATIONS MADE AT BAYABOU* (Lat. 13° 12′ N. ; Lon. 61° 11′ W.)

	1831.	1832.	1833.	1834.	1835.	1836.
	in.	in.	in.	in.	in.	in.
January ...	2·43	1·98	1·20	3·08	4·40	1·09
February..	·31	1·84	·25	3·04	1·57	5·02
March.....	1·53	1·16	1·07	4·13	2 21	6·92
April	·67	3·95	·34	1·57	2·22	1·48
May.....	6·44	2·76	9·75	7·68	4·84	6 72
June	7·47	8·05	3·85	5·33	10·92	10·06
July.....	8·31	5·91	6 37	5·11	8·60	10·02
August ...	6·55	7·46	2·86	6·20	6·94	10·47
September	11·29	15·14	8·94	8·45	6·66	9·98
October ...	6·80	8·40	11·56	5·15	10 41	12·40
November	8·18	9·68	5·20	2·10	16·41	11·82
December	5·25	2·75	2·50	4·80	4·20	7·18
Total...	65·23	69·08	53·89	56·64	79·38	93·16

* On the E. side of the Island, about 6 miles E. of Kingstown.

South Australia.—Rainfall at Adelaide from August, 1838, *i.e.*, in the year prior to the first of Sir G. S. Kingston's celebrated register.

In another place we find the records *in extenso* of temperature at Charlestown, S. Carolina, at 11 a.m., 3 p.m. and 8 p.m., for every day during the years 1769—1772. This record does not appear to have been known to Blodget (*Climatology of the United States*, p. 43.)

Coming back to England there are references to four records, of which we were not previously aware :—

Penzance, Public Library.—Mr. Farrant in 1843.

Durham Observatory.—In 1843.

Newcastle-on-Tyne.—Lit. and Phil. Soc. in 1841.

Thirsk.—Mr. York, 1800 to 1837.

We shall be thankful to anyone who can put us in the way of getting the whole of these records.

THE LOW BAROMETER OF JANUARY 13TH, 1843.

We have found several notes on the remarkable depression of the barometer upon the above date, and as we are not aware that it has ever been fully discussed we have extracted them all, added a few others, and worked them all up. We prefix a verbatim reprint of a summary given at the time by Mr. Ick, the meteorological observer at the Philosophical Institution, Birmingham, because of its general interest, and as showing the then existing knowledge of the subject. Unfortunately there had then been no general levelling throughout the country, and the values given in Mr. Ick's table are not reduced to sea level. Hence the difference between his values and those we shall give further on.

Extract from Report by Mr. Ick.

The fluctuations of the mercury appear to have been general throughout Great Britain, although some places escaped the storm. I learn from Mr. Atkinson, of Harraby, near Carlisle, that at that place the barometer, at twelve at noon on the 13th, had fallen to 27·983 in., while the only result of the fall was a few gusts of wind between midnight of the 13th and sunrise on the 14th.

The following comparative table will be interesting :—

Lowest depression of the Barometer at twelve different places on Friday, January 13th, 1843.

Name of the Place.	Name of Observer.	Height of the mercury in inches.	Time of Observation
Birmingham Philosophical Inst	Mr. William Ick..	27·638	11½ a.m.
Manchester	Dr. Dalton	28·020*	2 p.m.
	Mr. Peter Clare...	27·950	noon.
Liverpool Lit. and Phil. Inst.....	—	27·830	noon.
Preston.....	Mr. M. Holden ...	27·93	11½ a.m.
Bolton-le-Moors	Mr. H. H. Watson	27·720	11 a.m.
			2 mer.†
Ackworth School, Pontefract, Yorkshire	—	27·920‡	noon.
Harraby, near Carlisle	Mr. Atkinson.....	27·983	noon.
London, Royal Society's Rooms.....	Mr. Robertson ...	28·196	0¾ p.m.
Bruce Grove, Tottenham, Middlesex...	Mr. Luke Howard	28·270	4 p.m.
Reading, Berkshire	Mr. Bromley	27·500	11 a.m.
Sligo, Markree Observatory.....	Mr. A. Graham...	27·877	6½ a.m.
Edinburgh, from the *Scotsman*	—	27·400	—

* Lower by ·16 of-an-inch than Dr. Dalton ever observed it at Manchester. The only depression which he has found in his journal of observations, made at that place for upwards of 49 years, that approaches nearest to the present, occurred on the 23rd of November, 1824, when the mercury stood at 28·18 inches.

† Probably 2 p.m. ; the bar. remained nearly steady for about two hours.—G.J.S.

‡ By the kindness of Mr. Luke Howard, I learn that the lowest observation recorded by that gentleman occurred on Christmas day, December 25th, 1821, when the clock barometer at Ackworth fell to 27·80 in. ; which allowing twelve hundredths-of-an-inch for the difference between the scale and that of a standard upright barometer, makes the depression as near as possible that of the 13th January. At 5 a.m. on the 25th of December, 1821, a portable barometer observed by Mr. Howard at Tottenham fell to 27·83 in. "No storm of wind followed this depression near London, but a similar state of the barometer was extensively observed on the continent, and very tempestuous weather attended it far to the south of our island."

WILLIAM ICK.

Birmingham Philosophical Institution, Cannon Street, February 6th, 1843.

Very fortunately Mr. J. Glaisher, F.R.S., was, in January, 1843, at the Observatory at Cambridge, and noticing how low the barometer was when he took the reading at 9 a.m. on the 13th he at once began a series of readings which he continued until the minimum had passed. These readings corrected for temperature and reduced, give the absolute minimum as 28·212 in. at 1.35 p.m, Moreover in the village of Swaffham Bulbeck, about six miles N.E. of Cambridge another veteran observer (who also we still have with us), the Rev. L. Blomefield, was making equally careful observations of his barometer; and his reading corrected for temperature and reduced to sea level agrees marvellously with Mr. Glaisher's, for it gives 28·208 in. at 2 p.m. Looking at the whole of the readings by the two observers it is absolutely certain that the min. at Cambridge was 28·21 in. at 1.50 p.m,

For London (including Greeenwich) we obtain for sea level pressures:—

Royal Observatory, Greenwich	28·266 at 0.53 p.m.
Melina Place, St. John's Wood	28·255 at 1. 0 p.m.
Royal Society, Somerset House	28·251 at 0·45 p.m.

Hence for London we cannot be wrong in taking 28·26 at 0·45 p.m. (Greenwich being E. of London would be a few minutes later).

Another value which we believe to be true within ·01 in. is that for Birmingham, viz., 28·09 in. at 11.30 a.m.

The value for Epping 28·19 in. at 1.30 p.m. seems to be about ·03 in. too low—but the time is doubtless correct.

At Makerstown Observatory, Roxburghshire, the minimum sea level pressure recorded is 28·067 in. at 1.15 p.m.

As regards the values in Mr. Ick's table with which we have not dealt, the reason is that we cannot ascertain the index errors of the barometers; nor whether the values quoted are reduced to 32°; nor what was the altitude of the barometers. Apparently Luke Howard did not catch the absolute minimum, the reading is a trifle too high, and the time too late by two hours.

At Reading the barometer must have been half-an-inch wrong, but the time is nearly right.

At Manchester, Dr. Dalton like Luke Howard was about two hours too late.

The following values are not to be relied upon, but may be correct:—Plymouth, 28·41 in. at 9 a.m.; Kelso, 28·09 in.; Harraby, Carlisle, 28·05 in. at noon; Bolton, 28·02 in. at 11 a.m.

Plotting the whole of the values (but paying slight attention to the doubtful ones) we arrive at the following facts:—

1.—The depression was travelling towards E.N.E. at the rate of about 35 miles an hour.

2.—The lowest indisputable sea level pressure was 28·07 in. at Makerstown in Scotland; in London it fell to 28·25 in., and at Plymouth probably to 28·40 in.

3.—As regards Scotland this depression had been exceeded on several occasions.

4.—As regards the Metropolis the pressure had not been so low since 1821. In London the only sea level pressures below 28·30 in. since 1811 have been :—

1814.	January 29th, 5	p.m.	28·233 in.
1821.	December 25th, 5	a.m.	28·016 in.
1843.	January 13th, 0.53	p.m.	28·266 in.
1886.	December 9th, 4.45	a.m.	28·295 in.

MODERN THERMOMETRY.

UNDER this title our contemporary, *l'Atmosphère* for November, has a very able paper by M. C. E. Guillaume, of the *Bureau international des Poids et Mesures.* On another occasion we may, perhaps, give an account of that unique establishment; for the present we can say only that it is recognised throughout the world as the centre of the utmost attainable precision in all questions of measurement. Temperature necessarily plays a very important part in the work of the office ; the mere presence of an observer's body near a measuring bar would warm it sufficiently to alter its length; and, therefore, absolutely accurate thermometers are indispensable, and by the words "absolutely accurate" we mean thermometers not merely true to 0°·1 F., but to 0°·01 F., or 0°·001 F.—thermometers, in fact, far superior to any needed by meteorological observers.

Some portions of M. Guillaume's article deal with the thousandths of a degree; with these, meteorologists have nothing to do, but other parts are of general interest.

We assume that all our readers are aware that if the bulb of a thermometer be blown, and it be shortly after filled with mercury and closed, and the divisions be forthwith placed upon the stem, the thermometer will soon be erroneous, indicating a temperature considerably above the truth. This fact was noticed early in the present century, and up to 1881 the only known mode of avoiding this error consisted in having the bulbs blown, filled and sealed, and then stored for three years, after which the divisions were placed upon the tube. This plan was adopted because it had been found that nearly the whole of the change technically called "rise of zero" took place within the first two years after filling.

On November 15th, 1882, Mr. S. G. Denton, F.R.Met.Soc., exhibited at the meeting of the Meteorological Society a set of thermometers, with reference to which the following note appeared in the *Meteorological Magazine* for December, 1882 :—

"At the close of the meeting Mr. S. G. Denton, F.M.S., exhibited a set of 46 mercurial thermometers, which were made by him between February and June, 1881 ; they were all tested at Kew Observatory in June, 1881 ; were then

placed at the Observatory under seal, and the case was only opened for their re-verification in January, 1882, and June, 1882, when it was found that scarcely any rise of zero point had taken place. As no paper descriptive of the mode of manufacture was submitted to the Society, we can, of course, merely state the above somewhat remarkable facts. Until the method adopted is explained, we shall prefer to rely upon age as the most certain mode of escaping serious change of zero, but in cases where a thermometer of special pattern is required to be made and used within a few months, Mr. Denton's method, whatever it may be, appears likely to be very valuable."

The further history of these thermometers will be found in the *Met. Mag.* for February, 1885 (Vol. XX., p. 11); there was practically no change, nothing approaching 0°·1 F.

We understand that Mr. Denton's brilliant result was obtained by keeping the thermometers at a very high temperature for a long time, upwards of a week. Other opticians have adopted modifications of his method, but with Mr. Denton must remain the credit of showing the path to everyone else. Our French friends speak of a thermometer so treated as *un thermomètre recuit*; perhaps the shortest English equivalent would be "stoved"—we will use that word until someone suggests a better.

We turn now to M. Guillaume's paper, which he gracefully and justly commences by stating that he is about to treat only of modern progress, and that for elements and definitions reference must be made to classical treatises, and for facts previous to 1876 to the excellent *Histoire du thermomètre*, by M. Renou.

Passing all portions which do not interest meteorologists (such, for example, as the possibility of making a mercurial thermometer record temperatures beyond the boiling point of mercury), we come first upon an interesting note as to the extreme superiority of hard over soft (leaden) glass as the material for thermometer tubes:—

"If we keep during several days a soft glass thermometer at 700° F., the zero will rise permanently 36° F. to 45° F. (Crafts); for hard glass the displacement is only about 5° F. In the course of years a soft glass thermometer always employed at temperatures below 122° F. will rise as much as 1°·8 F., while for hard glass the rise will scarcely reach 0°·2 F. . . . Soft glass should therefore never be used for thermometers."

Of course any such rise as 36° F. never occurs with such thermometers as meteorologists use, and as we have previously shown, Denton's process does away with even the 1°·8 F., and gives us thermometers which are, and will remain, true to 0°·1 F., which is nearer the truth than many observers are able to read.

M. Guillaume then comes to a point vital as regards the work of the *Bureau international*, and which, though far beyond the requirements of meteorologists, is of general interest, viz.: When several thermometers are made of precisely similar glass, and all corrections are applied for zero point, calibration, &c., will they agree? And to this he is able to give the triumphant answer, Yes—to 0°·02 or

0°·03 F. Even the *Bureau international* can hardly aim at going beyond that.

The next point interesting to meteorologists is that, M. Guillaume tells us, of a substitute for alcohol in thermometers. Mercurial thermometers cannot be used below about —40° F. or 72° F. below freezing, because mercury then becomes solid—freezes, in fact—and can be made into bullets and fired from a gun. Consequently, for such low temperatures as occur in the Arctic regions, alcohol thermometers can alone be used. We are not sure that meteorologists, even in the Arctic regions, are ever troubled by the temperature falling so low that even alcohol becomes pasty, but if they have been that need not happen again, for the distinguished experts at the *Bureau* have found in *toluène*,* a substance which remains fluid when alcohol is pasty, and which hitherto has resisted every effort to freeze it.

In delicate researches we almost always come upon some of the work of the distinguished English physicist, Prof. C. V. Boys, F.R.S. Although it has nothing to do with meteorology, the following portion of M. Guillaume's article will, we are sure, be read with interest. He has been speaking of modifications of the thermopile, and continues :—"This idea, perfected by M. Boys, has led him to construct a micro-radiometer as sensitive as the bolometer of Prof. Langley. If the receiver of this instrument is placed in the focus of a telescope, it will indicate the heat radiated by a candle distant *more than a mile and three-quarters.* This result appears fabulous, but it is scrupulously accurate."

M. Guillaume closes his interesting article with the following

"*Conclusions.* Fifty years ago thermometry was as advanced as the then state of science demanded; fifteen years ago it had made no progress, while science in general had advanced rapidly; thermometry was therefore in the rear. Since then thermometry has been so developed that its instruments are now equal to all calls that can be made upon them, and further advance can hardly be needed before the close of the century; in fifteen or twenty years further advances towards perfection may be necessary."

We congratulate M. Guillaume and *l'Atmosphère* on the whole paper.

---

* Not having the least idea of what *toluène* is, we asked Prof. Meldola, F.R.S., and his reply is Toluène—Toluene, is a coal-tar, hydrocarbon, colourless, transparent, mobile and inflammable. Sp. gr. at OC. 0·882, at 15 C. 0·872, and at 35 C. 0·851.

ROYAL METEOROLOGICAL SOCIETY.

THE first meeting of the Session was held on Wednesday evening, November 16th, at the Institution of Civil Engineers, 25, Great George Street, Westminster, Mr. A. Brewin, Vice-President, in the chair.

Mr. E. T. Adams, Mr. A. L. Jones, M.R.C.S., Mr. J. E. Prince, and Mr. W. Tattersall, C.E., were elected Fellows of the Society.

An interesting paper, by Mr. J. Lovel, was read on the "Thunderstorm, Cloudburst, and Flood at Langtoft, East Yorkshire, July 3rd, 1892." The author, after describing the thunderstorm as it occurred at Driffield, gave an account, illustrated by photographs, of the havoc in the Wold valleys, which lie N. and N.W. of Driffield, where torrents of water fell, and great quantities of soil and gravel were removed from the hillsides and carried to the lower districts, doing a large amount of damage; the water flowed down to Driffield, and many houses in the lower parts were flooded, and a bridge was so much damaged that it had to be entirely rebuilt.

About six miles N. of Driffield, to the west of the village of Langtoft, is a basin-like range of valleys about a mile wide, the only outlet from which is at the S.E. corner. Running northwards from this basin is an abrupt valley with steep declivities, where, at a place named "Round Hill," on June 9th, 1888, a waterspout tore its way into a slight hollow or comb on the hillside, taking a north-easterly course, and formed three large roughly circular holes from 8 to 9 ft. deep in the chalky rubble, scattering the stones all around, and produced a flood which inundated the village lower down the valley.

Not more than 20 yards from the site of this former cloudburst, or waterspout, and a little further to the south, three gutters or trenches were on July 3rd, 1892, scooped out of the solid rock, nearly parallel to each other and at right angles to the valley bottom; the direction they take being slightly more easterly than that on the former occasion. From the appearance of the trenches it is highly probable that there were three waterspouts moving abreast simultaneously.

Two of the trenches, or ravines, are 68 yards in length and of great size and depth, and as the hillside here is composed of strata of solid rock slightly inclined to the vertical, beneath a thin layer of earth, the force exerted in removing the ponderous mass of material, about 180 yards in circumference, must have been very great indeed. The smaller trench, 15 yards to the left and much shallower, is rather over 50 yards long, but this is discontinued before the summit of the hill is reached, as the gyratory power of the tornado had evidently become weaker. There are no definite signs of any whirling motion to be seen in the trenches, but midway of the two larger ones a perceptible widening of the ravine has taken place, and the dimensions of that on the right are 12½ feet diameter and 8½ feet deep. This particular locality seems to be favourable to

the formation of cloudbursts, as there are records of great floods having previously occurred at Langtoft, notably on April 10th, 1657, in June (?) 1857, and, as before mentioned, on June 9th, 1888. The author gives, in an appendix, a number of quotations from several authorities as to the formation of waterspouts, tornados, &c.

Mr. W. H. Dines read a paper entitled, "Remarks on the Measurement of the Maximum Wind Pressure, and Description of a New Instrument for Indicating and Recording the Maximum." This paper is the result of several months' study of the tube anemometer with the head designed by the author, which was described in the report on "Anemometer Comparisons," read at the April meeting.* The good opinion then expressed is confirmed, the capabilities of the instrument for exhibiting all variations of pressure, from the slightest breeze up to a pressure of 30 lbs. per square foot, are dwelt upon, and a convenient form of indicating arrangement, which was exhibited, is described.

The indicator can be so arranged as to show the ever-varying force of the wind, and to mark by an index similar to that of a spirit minimum thermometer, the greatest pressure reached between the times of observation; or by contracting the tube, the indications may be so damped, or rendered sluggish, as to give a good idea of the strength of wind which has prevailed for some preceding time. This contraction may be carried to any desired extent; it may be so slight that gusts of a few seconds duration will be the only ones eliminated; or the tube may be contracted to so fine a bore that all variations of strength which do not last for thirty minutes or an hour may be smoothed down.

SPARKLING RAIN.

RAIN which on touching the ground crackles and emits electric sparks is a very uncommon but not unknown phenomenon. An instance of the kind was recently reported from Cordova, in Spain, by an electrical engineer who witnessed the occurrence. The weather had been warm and undisturbed by wind, and soon after dark the sky became overcast by clouds. At about 8 o'clock there came a flash of lightning, followed by great drops of electrical rain, each one of which, on touching the ground, walls, or trees, gave a faint crack, and emitted a spark of light. The phenomenon continued for several seconds, and apparently ceased as soon as the atmosphere was saturated with moisture.—*Western Daily Mercury*, November 1st, 1892.

---

* *Quar. Jour.*, vol. xviii., p. 165.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MAY, 1892.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	84·7	31	28·4	7	66·4	45·4	43·2	65	130·2	23·1	1·51	11	5·1
Malta	83·2	23	53·2	4	71·9	58·1	56·5	78	138·8	46·7	3·23	5	4·2
Cape of Good Hope	77·9	4	40·5	17	64·6	48·7	...	...	...	...	4·15	12	6·0
Mauritius	83·1	12	64·2	28	80·0	69·5	64·8	73	131·7	56·0	1·25	14	4·8
Calcutta	97·9	4	71·0	27*a*	95·0	78·7	77·8	75	158·1	70·5	4·29	8	4·3
Bombay	96·2	5	79·6	2	91·2	82·2	75·3	70	143·6	71·4	·11	1	3·2
Ceylon, Colombo	90·7	19	75·0	21	88·0	79·2	72·5	75	156·0	70·0	3·00	14	3·5
Melbourne	70·2	15	35·9	24	60·9	45·9	46·7	79	119·9	30·9	1·58	9	6·2
Adelaide	78·1	15	41·5	4	63·9	48·8	46·2	72	135·5	32·8	2·45	13	5·9
Tasmania, Hobart	...	...	...	...	...	...	...	...	...	...	...	...	...
Wellington	68·5	6	36·0	25	59·5	46·3	46·3	78	110·0	30·0	4·74	15	4·5
Auckland	70·0	6	42·0	24	62·9	51·2	52·2	84	127·0	35·0	3·10	15	5·8
Jamaica, Kingston	90·5	13	69·8	1	86·9	72·8	70·2	72	...	...	1·07	6	...
Trinidad	92·0	17	63·5	8	87·8	70·7	72·3	80	155·0	58·0	11·61	24	...
Toronto	75·0	31	35·1	8	59·8	44·9	36·8	74	...	28·8	3·48	18	7·0
New Brunswick, Fredericton	74·0	26	24·4	1	58·1	38·2	39·8	68	...	...	2·44	22	6·0
Manitoba, Winnipeg	73·8	17	27·5	3	54·0	35·2	...	.	...	...	1·38	13	6·0
British Columbia, Esquimalt	69·6	19	37·9	3	60·3	45·0	50·1	92	...	...	1·95	16	6·0

a And 28.

REMARKS.

MALTA.—Mean temp. 63°·5. Mean hourly velocity of wind 10·1 miles. The sea temp. rose from 62°·5 to 72°·0. Rainfall three times the average. J. SCOLES.

Mauritius.—Mean temp. of air 1°·5 above, dew point 0°·6 above, and rainfall 2·77 in. below, their respective averages. Mean hourly velocity of wind 10·1 miles, or 0·1 mile above average; extremes, 30·3 on 16th and 0 on 4th, 5th, and 6th; prevailing winds S.E. by E. Thunder on 5th and 6th; lightning on 19th.

C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—Thunderstorms occurred on the 10th, 11th, and 31st.

J. C. H. CLARKE, Lt.-Col. R.E.

Melbourne.—Mean temp. of air 0°·1, rainfall ·52 in., and amount of cloud 0·4, below their respective averages; mean temp. of dew point 0°·5, and humidity 1, above their averages. Prevailing winds N. and N.E., strong on 7 days. Heavy dews on 15 days. Hoar frost on 3 days. Hail on 2 days. Thunder and lightning on 2 days.

R. L. J. ELLERY, F.R.S.

Adelaide.—Mean temp. 0°·5 below, and rainfall ·53 in. below, the average of 35 years.

C. TODD, F.R.S

Wellington.—Showery in the early part of the month; on 7th very heavy rain from 2 p.m. to 5 p.m., causing floods; from 9th to 26th showery, unpleasant, and cold, with frequently strong winds from N.W. and S.; the last few days fine, with light winds. Aurora on 1st. Mean temp. 0°·9 above, rainfall ·25 in. below, the average.

R. B. GORE.

Auckland.—Rainfall rather more than an inch below the average; mean temp. almost precisely the average.

T. F. CHEESEMAN.

SUPPLEMENTARY TABLE OF RAINFALL, NOVEMBER, 1892.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger Hall.	3·20	XI.	Rhayader, Nantgwillt..	4·77
,,	Birchington, Thor	1·89	,,	Corwen, Rhug	2·12
,,	Brighton, Prestonville Rd	2·77	,,	Carnarvon, Cocksidia ...	3·65
,,	Hailsham	2·88	,,	I. of Man, Douglas	3·95
,,	Ryde, Thornbrough	3·04	XII.	Stoneykirk, Ardwell Ho.	2·72
,,	Alton, Ashdell.....	3·23	,,	New Galloway, Glenlee	7·14
III.	Oxford, Magdalen Col...	1·67	,,	Melrose, Abbey Gate ...	1·53
,,	Banbury, Bloxham	1·67	XIII.	N. Esk Res. [Penicuick]	2·40
,,	Northampton, Sedgebrook	1·25	,,	Edinburgh, Blacket Pl..	1·43
,,	Cambridge, Fulbourne..	...	XIV.	Glasgow, Queen's Park.	3·11
,,	Wisbech, Bank House..	1·47	XV.	Islay, Gruinart School..	7·28
IV.	Southend	2·15	XVI.	Dollar.....	2·85
,,	Harlow, Sheering	1·80	,,	Balquhidder, Stronvar..	8·96
,,	Rendlesham Hall	1·87	,,	Coupar Angus Station..	1·90
,,	Diss	1·62	,,	Dunkeld, Inver Braan..	4·76
,,	Swaffham	1·78	,,	Dalnaspidal H.R.S. ...	6·57
V.	Salisbury, Alderbury ...	3·32	XVII.	Keith H.R.S.	·98
,,	Bishop's Cannings	2·09	,,	Forres H.R.S.	1·13
,,	Blandford, Whatcombe.	4·37	XVIII.	Fearn, Lower Pitkerrie.	1·60
,,	Ashburton, Holne Vic....	5·50	,,	Loch Shiel, Glenaladale	11·09
,,	Okehampton, Oaklands.	3·46	,,	N. Uist. Loch Maddy ...	6·52
,,	Hartland Abbey	4·76	,,	Invergarry	9·09
,,	Lynmouth, Glenthorne.	3·78	,,	Aviemore H.R.S.	2·02
,,	Probus, Lamellyn	3·69	,,	Loch Ness, Drumnadrochit	2·96
,,	Wincanton, Stowell Rec.	2·79	XIX.	Lairg H.R.S.	...
,,	Weston-super-Mare	2·07	,,	Scourie	4·45
VI.	Clifton, Pembroke Road	2·36	,,	Watten H.R.S.	2·36
,,	Ross, The Graig	2·55	XX.	Dunmanway, Coolkelure	10·34
,,	Wem, Clive Vicarage ...	1·77	,,	Fermoy, Gas Works ...	7·20
,,	Cheadle, The Heath Ho.	2·17	,,	Killarney, Woodlawn ...	9·40
,,	Worcester, Diglis Lock	2·30	,,	Tipperary, Henry Street	6·24
,,	Coventry, Coundon	2·18	,,	Limerick, Kilcornan ...	4·38
VII.	Ketton Hall [Stamford]	·93	,,	Ennis	4·20
,,	Grantham, Stainby	1·04	,,	Miltown Malbay.....	6·12
,,	Horncastle, Bucknall ...	1·08	XXI.	Gorey, Courtown House	4·41
,,	Worksop, Hodsck Priory	1·01	,,	Mullingar, Belvedere ...	3·92
VIII.	Neston, Hinderton	2·00	,,	Athlone, Twyford	3·78
,,	Knutsford, Heathside...	2·51	,,	Longford, Currygrane...	3·47
,,	Lancaster	...	XXII.	Galway, Queen's Coll...	5·66
,,	Broughton-in-Furness..	5·68	,,	Crossmolina, Enniscoe..	8·36
IX.	Ripon, Mickley	1·78	,,	Collooney, Markree Obs.	4·01
,,	Scarborough, South Cliff	1·62	,,	Ballinamore, Lawderdale	4·66
,,	East Layton [Darlington]	1·20	XXIII.	Lough Sheelin, Arley ..	3·86
,,	Middleton, Mickleton..	1·23	,,	Warrenpoint	4·27
X.	Haltwhistle, Unthank..	1·59	,,	Seaforde	4·66
,,	Bamburgh.....	1·44	,,	Belfast, Springfield	3·72
,,	Newton Reigny	2·36	,,	Bushmills, Dundarave...	3·36
XI.	Llanfrechfa Grange	3·58	,,	Stewartstown	4·57
,,	Llandovery	4·04	,,	Buncrana	4·36
,,	Castle Malgwyn	3·60	,,	Lough Swilly, Carrablagh	5·42
,,	Builth, Abergwessin Vic.	5·93			

NOVEMBER, 1892.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date	No. of Nights below 32°. In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	2·53	— ·13	·77	15	15	60·8	14	30·8	2	1	6
II.		Maidstone (Hunton Court)...	2·39	— ·54	·80	16	15	...	...	...	...	...	...
,,		Strathfield Turgiss	2·13	— ·59	·62	15	22	58·7	14	28·2	8	8	13
III.		Hitchin	1·49	— 1·19	·34	15	15	57·0	14	27·0	1	9	...
,,		Winslow (Addington)	1·78	— 1·15	·33	19	16	60·0	14	23·0	2	7	11
IV.		Bury St. Edmunds (Westley)	1·62	— ·93	·39	17	10	55·0	14*a*	31·0	21	...	...
,,		Norwich (Cossey)	1·39	— 1·18	·36	26	8	...	...	...	...	...	...
V.		Weymouth(LangtonHerring)	3·55	— ·11	·53	4	18	58·0	14	32·0	2	1	...
,,		Torquay, Babbacombe...	3·14	— ·98	·60	4	20	58·4	3	33·3	8	0	12
,,		Bodmin (Fore Street)	4·52	— ·95	·93	18	24	...	...	...	...	...	...
VI.		Stroud (Upfield)	2·54	— ·79	·66	4	19	57·0	14	30·0	1, 7	2	...
,,		ChurchStretton(Woolstaston)	2·21	— 1·31	·70	4	18	54·0	3, 14	30·0	2, 18	2	8
,,		Tenbury (Orleton)	2·18	— ·96	·53	4	12	58·0	3, 6	25·5	2	6	11
VII.		Leicester (Barkby)	1·04	— 1·25	·24	4	13	57·0	4, 14	23·0	1	12	20
,,		Boston	·90	— 1·30	·28	26	7	60·0	14	30·0	25	3	...
,,		Hesley Hall [Tickhill].....	1·11	— ·91	·28	13	16	57·0	14	24·0	2	6	...
VIII.		Manchester(PlymouthGrove)	2·46	— ·54	·46	4	16	58·0	5	28·0	1	3	7
IX.		Wetherby (Ribston Hall) ...	1·37	— ·70	·60	15	9	...	...	...	...	...	...
,,		Skipton (Arncliffe)	4·41	— 2·34	·75	13	18	55·0	9, 15	23·0	2	8	...
,,		Hull (PearsonPark)	1·28	— ·73	·31	26	16	57·0	14	28·0	1, 18	7	10
X.		Newcastle (Town Moor)	1·57	— ·83	·48	6	15	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	11·82	— 2·97	1·46	28	20	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	3·06	— 1·85	·52	4	19	...	...	...	...	...	...
,,		Haverfordwest	5·61	— ·25	1·41	19	22	56·8	6	28·2	17	3	7
,,		Aberystwith, Gogerddan	3·47	— 1·64	·63	26	19	58·0	5, 14	24·0	16*d*	7	...
,,		Llandudno.....	1·98	— 1·11	·77	5	16	...	...	...	...	...	...
XII.	SCOTLAND.	Cargen [Dumfries]	3·79	— ·77	·64	14	19	59·8	15	26·0	1	8	...
,,		Jedburgh (Sunnyside).....	·97	— 1·53	·28	14	11	56·0	4	20·0	19	8	...
XIV.		Old Cumnock	3·49	— 1·48	·50	14	20	...	...	...	...	...	...
XV.		Lochgilphead (Kilmory).....	7·67	+ ·38	1·70	14	22	...	...	29·0	13*e*	5	...
,,		Oban (Craigvarren)	7·35	...	1·30	8	21	55·9	4	30·9	13	1	...
,,		Mull (Quinish).....	7·06	+ ·07	1·38	14	20	...	...	...	...	...	...
XVI.		Loch Leven Sluices	2·60	— 1·36	·40	15*g*	12	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	2·10	— ·60	·45	14	17	54·3	4	30·2	1*f*	6	...
XVII.		Braemar	2·60	— 1·98	1·00	14	18	51·7	28	20·7	19	11	18
,,		Aberdeen (Cranford)	2·74	...	·73	14	20	52·0	5, 28	26·0	1	11	...
XVIII		Strome Ferry.....	5·89	— 1·99	1·46	28	21	...	...	...	...	...	...
,,		Cawdor [Nairn]	1·46	— 1·39	·41	29	12	...	...	...	...	...	...
XIX.		Dunrobin	1·71	— 1·12	·36	28	12	53·0	28	28·0	30	4	...
,,		S. Ronaldsay (Roeberry).....	3·29	— ·13	·71	28	20	51·0	5, 8*b*	30·0	30	3	...
XX.	IRELAND.	Darrynane Abbey.....	9·24	...	1·10	21	30	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	4·87	+ 1·20	·52	30	23	57·0	4	26·0	1	5	...
,,		O'Briensbridge (Ross)	4·11	...	·76	19	24	57·0	6	31·0	1	1	...
XXI.		Carlow (Browne's Hill)	3·73	+ ·67	·78	18	22	...	...	...	...	...	...
,,		Dublin (FitzWilliam Square)	2·40	— ·43	·72	18	19	56·8	4	31·0	1	1	9
XXII.		Ballinasloe	4·47	+ ·56	·76	17	27	52·0	4, 5	30·0	1, 16	7	...
,,		Clifden (Kylemore)	12·98	...	3·07	20	26	...	...	...	...	...	...
XXIII		Waringstown	4·07	+ ·97	1·06	18	24	57·0	4*c*	27·0	19	8	10
,,		Londonderry (Creggan Res.).	4·80	+ ·28	·92	18	24	...	...	...	...	...	...
,,		Omagh (Edenfel)	5·54	+ 1·67	·85	18	26	54·0	4, 28	28·0	19	7	10

a And 15. *b* And 27. *c* And 5, 6. *d* And 19. *e* And 29, 30. *f* And 7, 17. *g* And 26.

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

METEOROLOGICAL NOTES ON NOVEMBER, 1892.

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

ENGLAND.

STRATHFIELD TURGISS.—A mild month, with many wet days, but no excess of R. Violets and primroses in bloom on the 8th. Much fog on the 18th.

ADDINGTON.—R on a good many days but never in any great quantity. On seven days just drizzle enough to measure, and at the same time, to make it very uncomfortable, the 11th, 12th, and 20th were the most foggy days.

BURY ST. EDMUNDS.—A mild, dull month; very little sunshine; no snow.

LANGTON HERRING.—A mild but very damp month. Mean temp. 1°·4 above the average of 20 years. The mean min., 42°·3, is 1°·1 above the mean min. of October. The mean reading of the Bar. is high, but notwithstanding this, the humidity was great. There was an absence of storms. Fogs occurred on the 12th and 25th, but many other days were misty. Solar halo on 20th.

BABBACOMBE.—A warm, foggy, unprecedentedly damp month, with deficient R, sun heat, and wind. Showery from 2nd to 5th, 11th to 19th, and 23rd to 30th; fine and sunny on 1st, 3rd, 6th, 7th, and 10th. Cold on 1st, 7th, 17th, 19th, and 30th; warm from 3rd to 5th, 11th to 16th, and 21st to 29th. The mean temp. (47°·5) was 0°·6 higher than that of October. The mean relative humidity (92) is the greatest recorded in any month since observations commenced in 1876. Fog on 9 days, the greatest number recorded in any November. L on 15th. Solar halos on 5th and 20th.

BODMIN.—Very mild and many rainy days. Very little frost and not many foggy days.

WOOLSTASTON.—A mild, open month, with very little frost and a good deal of fog. Mean temp. 43°·2.

TENBURY, ORLETON.—A very foggy month, with temp. about 1° above the average, and little frost. From the 14th to the 26th neither sun, moon, nor stars were ever visible with the exception of a few minutes on the 21st and 24th. Fog on 13 days.

MANCHESTER.—Bright and sunny on the 3rd, 4th, 5th, and 29th. Fine autumn weather on the 8th, 9th, 11th, 12th, and 20th. Dense fog all day on the 1st and 17th. Damp and foggy on the 6th, 7th, 10th, 18th, 21st, 22nd, 23rd, 25th, 27th, and 30th. Mean temp. 43°·1.

HULL, PEARSON PARK.—Fogs on 12 days.

WALES.

HAVERFORDWEST.—Very little fine weather during the entire month, but as mild as October was cold. Wind generally S. and S.W. R heavy from the 13th to 20th.

SCOTLAND.

CARGEN.—A very unsettled month, and exceptionally damp and cloudy, the hours of sunshine being not much above half the average, and the difference between the means of the wet and dry bulb thermometers only 0°·9. The R was somewhat under the average, but owing to the constant humidity of the atmosphere the land was never in a satisfactory state for ploughing. S. and S.W. winds prevailed for two-thirds of the month; fog on 7th and 17th; S and sleet on 29th and 30th.

JEDBURGH.—The temp. was generally low, but the month was dry, which allowed out-door work to go on unchecked. Prevailing winds S.W. and S., always moderate in force except on the morning of the 29th.

OBAN, CRAIGVARREN.—The month was, on the whole, mild and free from the usual heavy gales until the close, when wintry weather commenced somewhat early.

MULL, QUINISH.—A mild, unsettled month; S. and S.E. winds prevailed throughout.

ABERDEEN, CRANFORD.—A miserable, sunless month. Crops got into the yards in very bad condition. In the glens the crops were not cut at the close.

IRELAND.

DARRYNANE ABBEY.—A very wet month, no rainless day throughout, and only two since October 19th; R for the month, 4·32 in., or 88 per cent. above the average of the ten years 1870–79.

WATERFORD, BROOK LODGE.—Mean temp. 46°·5. Thick fogs on 7th and 25th, and fog on 10th; southerly gale on the 14th.

O'BRIENSBRIDGE, ROSS.—Full average R, with frequent fog and mist. Mean temp. 3° above that of October. Some heavy squalls of short duration. Mean temp 47°·3.

DUBLIN.—A dull, damp, open month, with a monopoly of winds from equatorial quarters (S.E., S. and S.W.), and scarcely any frost. The most remarkable feature in the weather was the advance in temp. as compared with the preceding month. The mean of the max. and min. readings of the ther. was as much as 2°·1 above that of October, and the mean dry bulb at 9 a.m. and 9 p.m. was 46°·1, compared with 43°·9 in. October, an advance of 2°·2. High winds were noted on 10 days, and attained the force of a gale on only one occasion—the 28th. Foggy on 8 days. A lunar halo was seen on the 5th, when also there was a lunar rainbow.

EDENFEL.—The R and temp. of the month were both much above the average. Soft southerly winds prevailed till the fourth week, when stagnant, foggy, anticyclonic conditions followed, with somewhat clearer, but equally wet and humid weather, at the close.

WHEN FIRMINUS WROTE "DE MUTATIONE AERIS."

IN the *Met. Mag.* for April, 1892, p. 36, we showed, upon the authority of M. Delisle, that the treatise, "De Mutatione Aeris," was written by Firmin, of Belleval, near Amiens, in the middle of the XIVth century.

Mr. Prince, of Crowborough Observatory, has a copy of the 1485 edition, on the first blank leaf of which there is the following note in XVth or XVIth century writing:—

"Iste liber composita est anno domini 1338, vide fol. 3, pte. 2a."

The back of leaf 3 (the leaves, *not* the pages, are numbered) contains a long statement as to the relative position of the stars in the zodiacal signs in the time of Ptolemy, and how they are in the year 1338.

We have already mentioned that the table on leaf 6 is made out for 1312; the above expression implies that the MS. was written in 1338, and as we have already shown, there is a MS. copy in the Bibliothèque Nationale dated 1345. It therefore appears that the treatise was written after 1312 and probably in 1338, that it was first printed in 1485, reprinted with fresh tables and notes in 1540, and its history ascertained in 1892.