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SOLAR HALOS AND PARHELIA ON JANUARY 29TH.

WE have been favoured with many accounts and sketches of the fine series of halos which appeared on the afternoon of January 29th. It would be wearisome to print them all, and we therefore select four fairly typical ones, and add an engraving which gives a general idea of the phenomenon when seen at its best. Some other notes will be found in the Remarks on the Month on page 15. It has been stated that the halos appeared earliest in the north, and gradually later further south; this is only partly true; we have plotted all the times that we can obtain, and the result is that the times increase as we go south-east, that is to say, are earliest in the N.W. of England. This is curiously corroborated by the series of sketches given in the *Daily Graphic* of January 31st, in which it will be noticed that the whole of the 22° halo is high above the horizon in the sketches from the Lake District, from Preston and from Liverpool, touches the horizon at York, and is partly below it at High Wycombe—that is to say, the phenomenon occurred in the N.W. of England when the sun was highest, and in the centre and S.E. of England when it was lower; this shows that the sketches were true as to solar altitude, and therefore are probably true in other respects. As the prevailing wind that afternoon was N.W., the above conclusions are justified and explained, the ice clouds which produced the halos evidently travelled with the wind from N.W. to S.E.

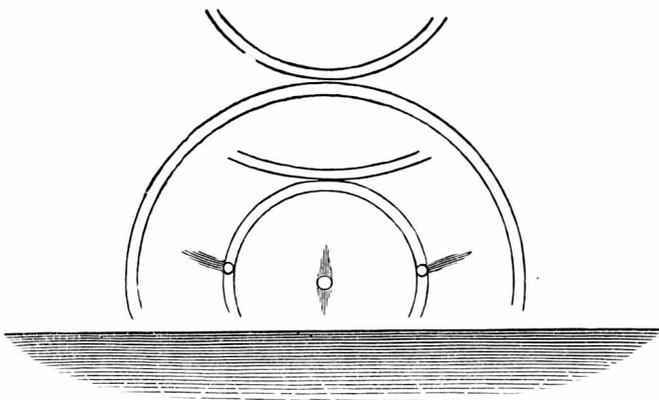
Our engraving is from a sketch kindly sent by Mr. Gulson, of Coventry, but there is great general similarity among the drawings, only some observers put the mock suns as sketched, and some put them precisely level with the real sun; and some make the two segments of circles drawn with the zenith as centre, much more acute, in fact one sketch shows the lower of the two as part of a circle struck from the vertex of the 45° halo as its centre.

A very similar, but more complex system, seen in Aberdeenshire, January 23rd, 1870, will be found described and illustrated in the *Met. Mag.*, Vol. V., 1870, p. 1, and a coloured representation of a system almost identical with that of January 29th, 1890, but as seen

in Sweden, October 4th, 1839, forms the frontispiece to *perfect* copies of Walker's translation of Kaemtz's "Meteorology."

We conclude with a suggestion. Will some competent person give a popular account of halos, thoroughly illustrated, and with the drawings on a uniform scale, and each halo clearly marked and named, so as to teach observers what to observe? Bravais' "*Memoire sur les Halos*" is too mathematical, and not suitably illustrated for any but advanced readers, and from it to the notes in most general treatises on meteorology the gulf is wide indeed.

Z



SIR,—A splendid solar halo with its accompanying parhelia was observed here this afternoon (29th) at 1.34 p.m. The halo (diameter 45°) was almost perfect; the lower part, however, was slightly obliterated by the thick atmosphere near the horizon. Attached to the upper side was an inverted portion of a similar halo, brilliantly illumined on the concave side, while the lower part shewed traces of a dull red light. Again, $22\frac{1}{2}^\circ$ above this, and also inverted, about 60° of arc, beautifully coloured with the prismatic tints, was clearly and distinctly visible, the red side innermost. This arc, if it had been produced, would have circled the zenith. The mock lights on each side of the principal halo, were drawn out into long cones of intensely bright light, while the sky inside the halo was of a very dark shade. The most noteworthy feature of the display, was a brilliant patch of pure white light in the north-western sky, at a distance of 90° from the western mock sun, and undoubtedly emanating from it, and which remained visible for nearly ten minutes. The whole phenomena disappeared at 2.8 p.m., the sky then being covered with streaky cirro-stratus haze from the N.N.W.

P.S.—A beautiful lunar halo was observed in the evening.

J. LOVELL.

Driffield, January 29th, 1870.

SIR,—Two parhelia or mock suns were well seen here on Wednesday afternoon last. The sun was encircled, or nearly so, with a luminous circle of above 22° radius, on the extreme limits right and left, and at about the same distance from the horizon as the sun itself, appeared two masses of light exhibiting vivid prismatic colours, the right hand or more northerly mock sun being of a distinctly violet hue.

The sunset which followed was most gorgeous. The western sky being ablaze with crimson light, and a column, rising perpendicularly from the horizon, nearly to the zenith, was of an intensely brilliant carmine colour.

I have never seen just such an effect before.—Yours, &c.,

H. SOUTHALL.

The Graig, Ross, February 4th, 1890.

SIR,—This afternoon the unusual phenomenon of a solar halo with three mock suns was visible here. The weather was fine and cold, with light wind from the north; the sun was bright, but shining through a very thin layer of cirro-stratus clouds. The parhelia appeared about half-past two o'clock; there were three, one on each side of, and one vertically over, the real sun, and all were distant 22° from it. They were all of very beautiful prismatic colours, with the commencement of lines running away from them, as if to form the full halo, but these lines did not complete the circle. From the upper parhelion there were traces of an inverted halo, but these were slight and like a broken rainbow. The sun was somewhat too low to see the fourth parhelion, if there was one. The phenomenon lasted for about three-quarters of an hour, and then faded away. On February 5th, 1887, there was also a very fine double halo visible round the sun in the morning here, but there were then only two parhelia.

CHRISTOPHER A. MARKHAM,
F.R. Met. Soc.

Sedgbrook, Northampton, January 29th, 1890.

SIR,—At about 2.50 p.m. on Wednesday, I observed a most interesting atmospheric phenomenon. The sun was shining faintly through a circular mass of clouds, and with the exception of about one-fourth part near the horizon, was surrounded with a large and well-defined ring or halo, tinged with prismatic colours similar to a rainbow, its angular diameter being about 60° . On each side of the circumference of the ring, or halo, appeared a circular disc of light resembling two other suns, but not so bright or so well defined as the real sun in the centre. In a few minutes the two circular images became fainter, and not so well defined, but they remained visible for about an hour. I have on several occasions seen the

sun surrounded with a large halo, or ring, but have never before noticed one like this with two mock suns, one on each side.

Shortly after the sun had set, the clouds in that part of the heavens were tinged with the most vivid crimson hues, forming a remarkable contrast with the sky beyond, which appeared to be of a brilliant green. It was truly a magnificent scene.

J. PHILLIPS.

Hereford, January 30th, 1890.

THE WEATHER PLANT.

SOMETIMES in trying to do good one does harm, in criticizing anything one advertises it—that is why we said nothing during the slight craze which existed upon the above subject about two years since.

We are not going to devote much space to it now that it has been tested and proved worthless; but if we put together some of the facts recorded they may afford a useful lesson.

The “discoverer” of the virtues of the plant was Mr. J. F. Nowack, a manufacturing chemist of Prague, and with him was associated a Mr. E. Bahlsen, a market gardener of the same city.

It is not clear when this discovery was made, but it appears that application was made for an English patent as far back as December, 1887. Of course the use of the plant could not be the subject of a patent, but the joint applicants for the patent stated that “certain conditions must be observed in order to cultivate Nowack’s weather plant in such a manner that it can be used as a weather indicator. In order to obtain and maintain these conditions, we have constructed an apparatus which, in combination with the weather plant, constitutes the principal subject of our invention.”

From that date onward, glowing accounts of the merits of the plant were sent, chiefly from Vienna, to the London newspapers, such as “32,000 observations made during the last three years tend to prove its infallibility.” “The Committee of the [Vienna] Exhibition have promised Professor Nowack, a certificate to the effect that the weather forecasts made by his plants were correct in 96 cases out of 100.” These statements were too much for Mr. W. Sowerby, F.L.S., the secretary of the Royal Botanic Society, who in September, 1888, wrote a letter to *The Times*, indicating his disbelief in the merit of the plant, and who at the meeting on November 10th, 1888, exhibited the plants, and stated that “the behaviour of the several specimens varied at one and the same time according to the special conditions under which they were growing.”

This was of course no proof of what the plants would do *if grown inside the patented apparatus*, and this was promptly pointed out by a Mr. Radeke, who wrote to *The Times*, announcing himself as the London correspondent of Prof. Nowack, and giving among other statements the following :—

“The observatory of the Austrian Tourists' Club, on the Sonnwendstein, at an altitude of 1,511 mètres, in the Styrian Alps, well known to many English tourists, which supplies the various branches of the club with weather forecasts during the season, has now for already over a year, discarded both aneroid and ordinary barometers for that purpose, and depends for its forecast upon the weather plant alone.”

We shall be greatly indebted to any of our Austrian readers, who will tell us whether the *abrus precatorius* has retained its position at the Sonnwendstein, or whether the discarded barometers have been fetched back.

We have but slight evidence respecting the sale of the plants and their stands (at £5 5s. Od. each), but it must have been very remunerative if many were sold.

We next learn that the Austrian Crown Prince (Rudolph) had been much interested in the plant—possibly that throws some light upon the very favourable notices sent from Austria to the London press.

In the early half of 1889, little was heard of the plant, then Mr. Nowack came to England, and obtained from H.R.H. the Prince of Wales an introduction to Mr. Thiselton Dyer, F.R.S., the director of Kew Gardens.

Mr. Dyer (very wisely we think) waived the rule whereby experiments intended to promote pecuniary objects are excluded, and allowed Mr. Nowack to take a series of his plants and apparatus to Kew, Dr. Oliver, F.L.S., undertook to observe them in conjunction with Mr. Nowack, Mr. Nowack making the predictions, Dr. Oliver and Mr. Scott, F.R.S., comparing them with the facts.

Any one who desires to see the unsatisfactory result, should buy the *Kew Bulletin*, No. 37, 1890, published by Eyre and Spottiswoode, price 2d.

Our record will not be complete until we hear what has been done at the Sonnwendstein. We hope to ascertain that, in time for our next.

ROYAL METEOROLOGICAL SOCIETY.

The Annual Meeting of this Society was held on Wednesday evening, January 15th at the Institution of Civil Engineers; Dr. W. Marcet, F.R.S., President, in the chair.

The Council, in their Report, congratulated the Fellows on the generally prosperous state of the Society; the past year's work, though not in any respect exceptional, having been thoroughly successful. The total number of Fellows is 550, being an increase of 25 on the previous year; the finances are improving, and the Library is overflowing.

Mr. Baldwin Latham, M. Inst. C.E., was elected President for the ensuing year.

The retiring President, Dr. Marcet, then delivered an address on "Atmospheric Dust," which he divided into organic or combustible, and mineral or incombustible. The dust lighted up in a sunbeam, consists of countless motes, rising, falling, or gyrating, although it is impossible to follow any of them with the eye for longer than a fraction of a second. It is difficult to say how much of the dust present in the air may become a source of disease, and how much is innocuous. Many of the motes belong to the class of micro-organisms which are frequently the means of spreading infectious diseases. Many trades, owing to their dusty nature are very unhealthy. Some dust, when mixed with air, is inflammable and liable to explode. After giving several instances of explosions due to fine dust in flour mills, and coal mines, and illustrations of the same experimentally, Dr. Marcet referred to inorganic or mineral dust, and gave an account of dust storms and dust pillars in India. He then proceeded to describe volcanic dust, which consists mainly of powdered vitrified substances, produced by the action of intense heat. The so called ashes or scoriæ shot out in a volcanic eruption are mostly pounded pumice, but they also originate from stones and fragments of rocks, which, striking against each other, are reduced into powder or dust. Volcanic dust has a whitish gray colour, and is sometimes nearly white. Dr. Marcet concluded with an account of the great eruption of Krakatoa in August, 1883.

The address was illustrated by a number of lantern photographs.

RAINFALL ON BEN NEVIS.

To the Editor of the Meteorological Magazine.

SIR,—The rainfall here last month was so exceptionally great that I send a copy of the daily rainfall copied from the monthly sheets, it amounts to the large quantity of 29·421 inches. We had only four hours sunshine, less than half any previous month.

Yours, very truly,

R. C. MOSSMAN.

Ben Nevis Observatory, Fort-William, February, 3rd, 1890.

1 ...	·085	12 ...	1·093	22 ...	·329
2 ...	·059	13 ...	2·045	23 ...	·126
3 ...	·063	14 ...	3·881	24 ...	·468
4 ...	·123	15 ...	·460	25 ...	2·569
5 ...	2·322	16 ...	·994	26 ...	·607
6 ...	1·058	17 ...	·653	27 ...	·506
7 ...	1·711	18 ...	·300	28 ...	·026
8 ...	·719	19 ...	·700	29 ...	·270
9 ...	1·347	20 ...	1·174	30 ...	1·922
10 ...	1·576	21 ...	·607	31 ...	·831
11 ...	·797				

Total for month = 29·421.

Of the heavy fall of 3·881 on the 14th—

1·68	inches	fell	in	2	hours.
2·45	"	"	"	4	"
3·31	"	"	"	7	"

REMARKABLY DRY AIR.

To the Editor of the Meteorological Magazine.

SIR,—Are not the annexed readings worthy of notice? I thought, on reading the German instruments at 2 p.m. on the 27th, that something must be wrong to produce so great a difference in winter, But as the hair hygrometer gave the humidity as only 5, I went to my own "Stevenson" in the garden, where I have dry and wet of Casella's best, and a self-recording one of Negretti's, and they all agreed; also another at my sitting-room window about 10 feet under the German cage. Jelinek's tables, which they use here for relative humidity, do not allow for such readings, and Guyot's, if I read them rightly, confirm the hair hygrometer.

I never saw solid snow go so fast. I find, on reference to former years, that five *cm.* (two inches) of solid snow which has lain for two months or more has, at the end of March, required two or three days to melt, but this vanished in five hours without any sun power.

The air was drying all the previous day, the relative humidity being: 8 a.m., 90 (under influence of hoar frost); 2 p.m., 68; 8 p.m., 46. It was most unpleasant to the feeling, nails and skin splitting on hands, quill pen nibs opening, ink drying in stand, &c.

Faithfully yours,

MICHAEL FOSTER WARD.

Partenkirchen, Bavaria, 29th January, 1890.

Bavarian cage at N. window, 20 ft. abv. ground.							Stevenson's stand in garden, Two sets of thermometers.					
1890. January.	Dry.	Wet.	Diff.	Leunbrecht's Hair Hygro.	Jelinek's Tables.	Guyot.	Dry.	Wet.	Diff.	Hüttinger's Hair Hygro.	Jelinek's Tables.	Guyot.
8 p.m. 26th	38·1	32·0	6·1	49	47	44	32·0	27·0	5·0	49	52	50
8 a.m. 27th	41·9	34·3	7·6	40	40	37	41·0	34·0	7·0	40	...	41
2 p.m. "	55·4	38·8	16·6	5	...	4	55·0	39·0	16·0	5	...	7
3 " "	54·7	38·8	15·9	5	...	7	53·0	39·0	14·0	5	...	14
4 " "	54·0	38·1	15·9	7	...	5	54·0	39·0	15·0	4	...	10
5 " "	54·0	37·8	16·2	7	...	4	53·0	38·0	15·0	4	...	8
6 " "	54·0	37·4	16·6	7	...	2	54·0	39·0	15·0	4	...	10
8 " "	52·5	37·4	15·1	10	...	7	53·0	38·0	15·0	6	...	8
9 " "	50·0	38·1	11·9	20	25	20	50·0	38·0	12·0	20	24	20

8 p.m. 26th, to 8 a.m. 27th, calm; 2 p.m. to 9 p.m., violent N.W. gale, with dense cir. str. travelling rapidly from N.W.

[We quite agree with Col. Ward as to the exceptional character of these records—we should have mistrusted both our eyes and our brains had we seen such differences—and yet it is not easy to see where error can have crept in. Four sets of dry and wet bulbs, and two hair hygrometers, are not at everybody's command; and they agree well, and are supported by the rapid disappearance of the snow, and by the cracking of the skin and nails.

Of course, in England we do not know what excessive dryness is. The most remarkable English cases that we can find are :—

Met. Mag. vol. xi. (1876) p. 176.	Wensleydale, Yorks.	Rev. F. W. Stow.
1877, January 2.....	Dry, 24°·5	Wet, 18°·9
		Humidity, 30.
Met. Mag. vol. xxi. (1886) p. 89.	Parkstone, Dorset.	R. H. Barnes, Esq.
1886, July 4	Dry, 85°·2	Wet, 63°·1
		Humidity, 28.

Of Foreign cases we select four :—

Met. Mag. vol. ix. (1874) p. 4.	Algiers.	M. Bulard.
1865, August 25 ...	Dry, 113°·0	Wet, 68°·0
		Humidity ?*
Met. Mag. vol. ix. (1874) p. 112.	Meean Meer, Punjab	W. Strahan, Esq.
1873, June 19.....	Dry, 112°·2	Wet, 70°·2
		Humidity 8.
Indian Met. Memoirs, vol. i. p. 103	Káshgár, 39°24' N.	76°7' E.
		Dr. Scully.
1875, March 7	Dry, 61°·6	Wet, 41°·4
		Humidity, 6.
Indian Met. Memoirs, vol. i. p. 333	Allahabad, 25°26' N.	81°52' E.
		S. A. Hill, Esq.
1879, May 4	Dry, 111°·6	Wet, 70°·6.
		Humidity, 7.

Ed. J

Buys-Ballot.

ONE by one, with saddening frequency, those whose names are known to Meteorologists of all countries are leaving us. On Sunday night, February 2nd, from his well-loved home at Utrecht, passed away the spirit which gave to the world the useful "Buys-Ballot's Law," by which the author will be remembered long after his many personal friends have themselves been removed. Prof. Buys-Ballot was often in this country; he was a corresponding member of the British Association, and attended its meetings, and he was one of the nineteen honorary members of the Royal Meteorological Society. He was 72 years of age, was an Honorary Member of the Society of Arts, of the German and of the Austrian Meteorological Societies, and Knight or Commander of Orders in Austria, Netherlands, Portugal and Prussia.

Besides discharging the duties of his Professorship from 1847 to 1887, Dr. Ballot was director, indeed almost creator, of the Royal Meteorological Institute of the Netherlands. In 1883 a new island, discovered by the Dutch Meteorological Expedition, in 70° 25' 28' N., was named after him as Buys-Ballot's Island, and in 1887, on giving up his professorial duties, a sort of International banquet was given in his honour, and he was presented with a gold medal specially struck to commemorate the event. Dr. Ballot's earliest scientific papers were upon chemistry and physics, but for forty years nearly all his time and thought has been devoted to meteorology, and his contributions have appeared not only in Dutch, but in German, French, and English.

* No table deals with such a case.

SALT HAILSTONES.

To the Editor of the Meteorological Magazine.

SIR,—Calling back attention to page 169 of Vol. 24, I beg to say, that after an exceedingly stormy night, I, on the morning of the 19th January, observed on the window panes a slight film, which I tasted and found pretty salt, as did my niece. The coast of Ayrshire, about 30 miles off, is the nearest sea the salt could have come from, but as the wind was nearly south it may have come from the Bay of Luce in the Solway, more than twice that distance. In either case it had to cross the range of hills dividing Ayrshire from Clydesdale, where it would be projected upwards to a considerable altitude before it found a final resting at Cambuslang, 150 feet above the sea level. I do not know if there was hail during the night (min. temp. 36° Bar. below 29 inches) but during the forenoon of the 19th sleety showers fell at intervals. 0·18 inch of rain fell during the 24 hours previous to 9 a.m., with much lightning from 7 to 9 p.m.; 0·97 inch of rain in the following 24 hours, with some hail.

HENRY MUIRHEAD.

THE ANEMOMETER ON THE EIFFEL TOWER.

To the Editor of the Meteorological Magazine.

SIR,—At page 182, Vol. 24, you say:—"On the tower top the wind is, on the average, much stronger than below, which is, of course, readily explained by the absence of retardation by friction against trees and buildings, but what is not so easily explained is the further fact that the times of maximum and of minimum are almost reversed."

I should like to offer a suggestion in reference to the time-reversal of velocities.

Whatever may be the agencies by which the equilibrium of the atmosphere gets disturbed, air where dense is gravitationally compelled to move towards neighbouring localities, where the air is more rarified and therefore lighter (not *depressed* as our meteorological authorities teach the general public day-after-day). In the day-time the sun heats the ground, the warmed ground heats the contiguous air rarifying it. The cooler, denser air from whatever quarter, say, at times in summer from the Atlantic, flows towards Central Europe, to displace the rarified air. Hence arises increased surface velocity, which reaches a maximum shortly after midday, and declines as the influence of the sun declines, till its speed nearly reaches its minimum shortly after midnight, and so remains with little change till about 5 a.m., before which the ground will have reached its coolest. Then as daylight again induces rarefaction the daily course goes on as before.

I suppose that this is acknowledged as the cause of the alternation

“below.” In reference to the reversal of time “above,” I offer the following explanation:—

The friction of trees, &c., is held to be the reason for the relatively less velocity below. Well, during the heat of the day the lower rarified air is compelled to ascend in consequence of its own expansion, and its displacement by denser air. The uprising columns or strata will act on the higher current much in the same fashion as the trees do below, obstructing and lessening its velocity by friction. Whereas there being but little uprisal during the cooler hours of the night the obstructiou will, of course, be much less.

HENRY MUIRHEAD, LL.D.

Cambuslang, January 20th.

ON THE IMPORTANCE OF CIRRUS CLOUDS, IN FORE-TELLING THE CHANGES OF THE WEATHER.

To the Editor of the Meteorological Magazine.

SIR,—Can you find a corner in the *Met. Mag.* for the following notes?

I recollect when only a lad an old shepherd telling me we were going to have a thaw within 48 hours, it having been a long continued frost. On enquiring how he knew, he directed me to look up to the westward, where the sky was streaked with cirrus clouds *pointing from north to south*, and sure enough the thaw came as prophesied. I have never forgotten the above incident, and from life-long observations have found the rule nearly always to come true. The reason for it being that cirrus clouds appearing in the western horizon and laying from *north to south* foretell a change in the wind to the west or south-west; and south-west winds in our district almost invariably bring warmer weather.

I have noticed the opposite, viz., when cirrus clouds form on the northern horizon, and point from *west to east*, we are going to have a change in the wind to the north, with colder weather. These changes can often be foretold long before the barometer has given notice of a change.

I find the only exception to being sure of a thaw on noticing the cirrus in the west, is in the late spring time, when our east winds are so prevalent, when probably they are too strong for the western current to assert itself sufficiently.—Yours truly,

AMOS MITCHELL.

Wolsingham, Darlington.

A NEW APPLICATION OF PHOTOGRAPHY.

Photography, according to a foreign scientific journal, is about to be put to a new use in meteorological work. The determination of the temperature of the air at different heights is an important factor

in meteorological investigations, and, as our readers may easily imagine, is a difficult problem to undertake, but the following outline of the new method suggests that something feasible has been designed. Herr Siegsfeld uses a thermometer which, by closure of an electric circuit when certain temperatures are reached, gives a light signal. Small balloons, each containing such a thermometer, will be sent up at night, and the light will affect photographically a so-called *photo-theodolite*, while the height then attained will be indicated in a mechanical way. It is hoped that this new method will enable more exact formulæ for decrease of temperature with height to be obtained.—*British Journal of Photography*.

[There may be more in this scheme than is explained, as it stands it seems to us hopelessly wild.—ED. *M.M.*]

THE NEW AVERAGE ADOPTED IN THE GENERAL TABLE.

There are two conflicting interests, between which it is necessary to decide, in compiling such a table as that on p. 14. There are more than two—there are half-a-dozen, but of only two need I write now, viz., completeness and continuity. It is evidently desirable that the column giving the difference between the fall of rain in (say) January and the average in January, should be given for as many stations as possible; this I call completeness. It is also desirable that the average be that of a period long enough to give a trustworthy average. Moreover, it would not be at all uniform or satisfactory to take averages of different periods. Some of the records go back only 6 or 7 years, others to nearly the beginning of the century. When commencing this magazine, just 25 years since, I was obliged to be content with the average of the six years, 1860-5, and it was used until I had that for 1870-9, and was obliged to adopt it, because so few stations went back to 1860. It may be said, why change from 1870-79? or why not take the 20 years, 1870-89? To this I reply, because by adopting 1880-89 I can give the average for 45 stations out of 50, while by using either 1870-9 or 1870-89 I should have had a much smaller proportion, certainly less than 40 out of the 50, and as I have said over and over again in *British Rainfall* the excessive fall of rain in 1872 rendered the fall in that decade above the true average.

G. J. SYMONS.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JULY, 1889.

STATIONS. <i>(Those in italics are South of the Equator.)</i>	Absolute.				Average.				Absolute.		Total Rain.		Aver. Cloud.	
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.		
	Temp.	Date.	Temp.	Date.										
England, London	80·9	5	46·1	19	71·0	54·0	52·1	73	126·3	41·4	inches	2·64	17	6·8
Malta	104·1	20	63·3	4	86·7	69·6	64·9	67	158·8	56·6	0·00	0	0	0·9
<i>Cape of Good Hope</i>	77·0	30	38·4	...	62·5	46·0	...	...	...	...	3·31	9	5·7	
<i>Mauritius</i>	76·4	19	58·4	6	74·3	64·8	60·9	76	123·5	48·6	2·21	17	5·6	
Calcutta	92·4	13	74·8	3	88·8	78·7	79·5	86	159·3	75·1	11·99	22	7·0	
Bombay	88·1	1	75·7	11	84·8	77·9	77·0	87	145·7	74·8	30·45	27	8·6	
Ceylon, Colombo	86·0	22	73·0	19	84·4	76·6	72·2	78	146·8	70·6	7·43	24	7·5	
<i>Melbourne</i>	62·1	31	31·3	12	55·4	40·6	42·1	81	110·4	23·5	1·64	8	6·4	
<i>Adelaide</i>	65·9	30	36·3	19	57·8	43·2	43·9	79	119·0	29·0	1·21	14	5·3	
<i>Wellington</i>	58·5	1, 24	33·0	17	53·4	40·5	39·5	76	108·0	23·0	3·15	16	4·2	
<i>Auckland</i>	65·0	25	40·0	8	57·7	46·5	45·9	80	118·0	30·0	4·38	22	6·7	
Jamaica, Kingston	94·3	28	71·9	8	90·0	73·9	73·7	77	...	...	·85	...	...
Trinidad	94·5	8	64·0	7	86·6	72·6	72·9	82	156·5	...	12·14	27	...	
Toronto	88·7	8	47·7	25	78·4	59·9	60·6	75	...	41·0	3·26	13	4·5	
New Brunswick, Fredericton	84·7	1	45·0	27	74·3	55·0	56·7	71	...	...	1·26	12	5·5	
Manitoba, Winnipeg ...	92·8	17	40·3	13	75·3	52·0	55·7	73	...	...	2·38	14	5·1	
British Columbia, Victoria	85·0	8, 9	40·0	2	73·2	48·2	...	...	...	...	·00	0	...	

REMARKS, JULY, 1889.

MALTA.—Mean temp. 76°·9; mean hourly velocity of wind 7·7 miles. The sea temp. rose from 74°·8 to 81°·5. J. SCOLES.

Mauritius.—Mean temp. of air 0°·4, of dew point 1°·6, and R·04 in. above their respective averages. Mean hourly velocity of wind 10·3 miles, or 1·8 below average; extremes 26·5 on 1st and 1·9 on 27th. Prevailing direction E.S.E.

C. MELDRUM, F.R.S.

COLOMBO.—TSS occurred on 13th and 14th; L only was seen on the 15th and 23rd.

J. C. H. CLARKE, LIBUT.-COL. R.E.

Melbourne.—Mean temp. of air 0°·2, of dew point 0°·7, humidity 1, and mean amount of cloud 0·1, above average; R·08 in. below average. Prevailing wind N. and N.E.; strong on 4 days. Heavy dew on 9 days; dense fog on 10 days; hoar frost on 6 days; lunar halos on 5th and 10th.

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

Adelaide.—Barometer unusually high, the mean (30·274) being one-tenth above the average of 32 years. Mean temp. 1°·2 below average; R half the average, although the total fall for the first seven months of the year is greater than any previously recorded.

C. TODD, F.R.S.

Wellington.—The first few days were fine, with fresh N.W. wind; from 5th to 14th it was showery, with S.E. and S.W. winds. The remainder of the month was generally fine, with moderate wind, chiefly N.W. S on hills on 14th; H on 7th; fog on 4 days. Mean temp. 0°·7 below the average. Rainfall half the average.

R. B. GORE.

Auckland.—The early and middle parts of the month were showery and unsettled, with N.W. to S.W. winds; the close comparatively fine, with E. or N.E. winds. Mean temp. close to the average; rainfall slightly below the average.

T. F. CHEESEMAN.

SUPPLEMENTARY TABLE OF RAINFALL,
JANUARY, 1890.

[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.	3·70	XI.	Castle Malgwyn	7·49
„	Margate, Birchington...	1·98	„	Builth(LlanwrtydWells)	10·61
„	Littlehampton	2·83	„	Rhayader, Nantgwillt..	11·44
„	Hailsham	3·44	„	Carno, Tybrith	9·39
„	Ryde, Thornbrough	4·71	„	Corwen, Rhug	6·09
„	Alton, Ashdell.....	4·49	„	I. of Man, Douglas	4·52
III.	Oxford, Magdalen Col..	1·86	XII.	Stoneykirk, ArdwellHo.	3·62
„	Banbury, Bloxham	2·70	„	New Galloway, Glenlee	8·25
„	Northampton	2·21	„	Melrose, Abbey Gate...	3·96
„	Cambridge .....	...	XIII.	N. Esk Res. [Penicuick]	5·35
„	Wisbech, Bank House..	2·15	XIV.	Ballantrae, Glendrishaig	4·96
IV.	Southend	1·73	„	Glasgow, Queen's Park.	6·14
„	Harlow, Sheering	1·78	XV.	Islay, Gruinart School..	7·65
„	Rendlesham Hall	1·92	XVI.	Dollar.....	5·65
„	Diss	2·16	„	Balquhider, Stronvar..	18·40
„	Swaffham	2·59	„	Dunkeld, Inver Braan..	9·23
V.	Salisbury, Alderbury...	4·07	„	Dalnaspidal H.R.S.	15·17
„	Warminster .....	...	„	Arbroath Cemetery.....	2·52
„	Bishop's Cannings	3·05	XVII.	Keith H.R.S.	2·25
„	Ashburton, Holne Vic..	11·99	„	Forres H.R.S.	2·54
„	Hatherleigh, Winsford.	3·56	XVIII.	Fearn, Lower Pitkerrie.	3·37
„	Lynmouth, Glenthorne.	7·64	„	Loch Shiel, Glenaladale	19·51
„	Probus, Lamellyn	4·99	„	N. Uist. Loch Maddy ...	10·77
„	Launceston, S. Petherwin	6·42	„	Invergarry	16·36
„	Wincanton, Stowell Rec.	3·38	„	Aviemore H.R.S.	4·69
„	Taunton, Lydeard Ho...	3·31	„	Loch Ness, Drumnadrochit	7·22
„	Wells, Westbur,	2·85	XIX.	Lairg H.R.S. ....	...
VI.	Bristol, Clifton	3·90	„	Scourie	6·76
„	Ross	3·61	„	Watten H.R.S.	1·66
„	Wem, Clive Vicarage ...	3·59	XX.	Dunmanway, Coolkelure	11·61
„	Cheadle, The Heath Ho.	3·75	„	Fermoy, Gas Works ...	5·18
„	Worcester, Diglis Lock	2·55	„	Tipperary, Henry Street	4·67
„	Coventry, Coundon	3·27	„	Limerick, Kilcornan ...	5·85
VII.	Ketton Hall [Stamford]	2·02	„	Miltown Malbay.....	6·61
„	Grantham, Stainby	2·31	XXI.	Gorey, Courtown House	4·28
„	Horncastle, Bucknall ...	2·52	„	Navan, Balrath	2·59
„	Mansfield	4·26	„	Mullingar, Belvedere...	5·18
VIII.	Neston, Hinderton	2·46	„	Athlone, Twyford	4·66
„	Knutsford, Heathside ...	3·20	„	Longford, Currygrane...	4·52
„	Lancaster, South Road.	6·66	XXII.	Galway, Queen's Coll...	5·88
„	Broughton-in-Furness ..	8·87	„	Clifden, Kylemore	8·37
IX.	Wakefield Prison	2·57	„	Crossmolina, Enniscoe..	8·86
„	Ripon, Mickley	4·77	„	Collooney, Markree Obs.	5·07
„	Scarborough, WestBank	2·04	„	Ballinamore, Lawderdale	...
„	EastLayton[Darlington]	2·85	XXIII.	Warrenpoint	3·44
„	Middleton, Mickleton..	4·05	„	Seaforde	3·60
X.	Haltwhistle, Unthank..	3·80	„	Belfast, New Barnsley..	3·57
„	Shap, Copy Hill	12·47	„	Bushmills, Dundarave...	4·36
XI.	Llanfrechfa Grange	6·71	„	Stewartstown	3·86
„	Llandoverly	7·99	„	Buncrana	4·60

JANUARY, 1890.

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. 1880-9	Greatest Fall in 24 hours.		Max.		Min.		In shade.	On grass.		
				Dpth	Date			Deg	Dat				
I.	London (Camden Square) ...	inches 2·46	+	·84	·35	27	21	55·6	25	26·1	2	4	11
II.	Maidstone (Hunton Court)...	2·34	+	·79	·49	28	22	...	...	...	...	...	...
III.	Strathfield Turgiss	3·11	+	1·30	·41	27	25	54·1	7	20·8	2	5	18
III.	Hitchin	2·29	+	·75	·39	27	20	54·0	9	23·0	1	6	...
IV.	Winslow (Addington)	2·16	+	·35	·41	27	23	55·0	7, 25	16·0	2	9	17
IV.	Bury St. Edmunds (Westley)	2·14	+	·67	·30	27	19	...	...	...	...	...	...
V.	Norwich (Cossey)	2·41	+	·92	·38	28	18	...	...	...	...	...	...
V.	Weymouth(LangtonHerring)	3·71	+	1·37	·48	27	25	54·0	25	25·0	2	4	...
VI.	Barnstaple	3·28	+	·26	·50	27	23	56·0	25	30·0	3	...	...
VI.	Bodmin (Fore Street)	7·44	+	3·43	·73	4, 21	28	...	...	...	...	...	...
VI.	Stroud (Upfield)	3·19	+	·99	·38	25	20	56·0	6, 9	21·0	1	5	...
VI.	ChurchStretton(Woolstaston)	4·66	+	2·50	·92	21	27	53·0	6, 31	20·5	3	10	17
VI.	Tenbury (Orleton)	3·38	+	1·24	·53	21	23	55·2	6	19·0	2	10	14
VII.	Leicester (Barkby)	2·38	...	...	·62	26	25	56·0	25	16·0	1	13	20
VII.	Boston	1·74	+	·35	·60	28	16	55·0	25	23·0	2	11	...
VII.	Hesley Hall [Tickhill].....	2·39	+	·62	·63	26	19	55·0	6a	21·0	3	10	...
VIII.	Manchester(PlymouthGrove)	3·30	+	·84	·85	26	24	55·0	6	29·0	1, 29	5	12
IX.	Wetherby (Ribston Hall) ...	2·59	+	·70	·64	22	14	...	...	...	...	...	...
IX.	Skipton (Arncliffe)	10·65	+	5·00	1·29	21	29	...	...	...	...	...	...
IX.	Hull (People's Park)	2·36	+	·59	·37	26	19	...	...	...	...	...	...
X.	North Shields	1·87	+	·28	·38	8	17	57·0	7	21·0	3	11	11
X.	Borrowdale (Seathwaite).....	21·80	+	9·62	2·70	21	27	...	...	...	...	...	...
XI.	Cardiff (Ely)	5·89	+	2·68	·80	26	24	...	...	...	...	...	...
XI.	Haverfordwest	6·54	+	2·12	·98	21	24	52·0	6, 7	22·8	1	2	4
XI.	Plinlimmon (Cwmsymlog) ...	7·49	...	...	1·42	21	26	...	...	...	...	...	...
XI.	Llandudno	3·68	+	1·40	1·03	21	24	57·8	7	32·5	28	...	...
XII.	Cargen [Dumfries]	6·29	+	2·52	·90	21	22	53·6	31	26·8	3	7	...
XII.	Jedburgh (Sunnyside)	2·56	+	·84	·36	22	18	54·0	6	26·0	20	12	...
XIV.	Old Cumnock	6·26	+	2·27	·58	4	28	51·0	25	23·0	23	6	...
XV.	Lochgilphead (Kilmory).....	11·57	+	5·43	1·13	19	30	...	...	...	...	...	...
XV.	Oban (Craigvarren)	8·86	...	...	·80	23	30	54·0	16	31·0	23	2	...
XV.	Mull (Quinish)	10·05	+	4·38	1·03	18	28	...	...	...	...	...	...
XVI.	Loch Leven Sluices	5·70	+	2·80	1·20	20	17	...	...	...	...	...	...
XVI.	Dundee (Eastern Necropolis)	2·40	+	·43	·35	9	15	53·1	7	24·0	23	6	...
XVII.	Braemar	8·12	+	5·43	1·51	17	24	51·7	7	14·6	23	9	14
XVII.	Aberdeen (Cranford)	2·83	...	...	·54	9	24	54·0	31	19·0	23	9	...
XVIII.	Strome Ferry	13·55	+	7·56	1·20	25	30	...	...	...	...	...	...
XVIII.	Culloden	3·39	+	1·77	1·11	20	9	55·0	16	27·0	23	6	24
XIX.	Dunrobin .....	...	...	...	...	...	...	...	...	...	...	...	...
XIX.	S. Ronaldsay (Roeberry).....	3·24	+	·29	·67	24	19	50·0	30	31·0	23	5	...
XX.	Cork (Blackrock).....	6·13	+	1·53	·83	17	26	54·0	9, 31	27·0	28	5	...
XX.	Dromore Castle	6·87	+	·80	·90	4	22	54·0	16	26·0	28	...	...
XX.	Waterford (Brook Lodge) ...	5·94	+	2·38	1·12	21	22	54·0	18	29·0	29	3	...
XX.	O'Briensbridge (Ross)	5·50	...	...	·98	26	25	54·0	11	28·0	29	7	...
XXI.	Carlow (Brown's Hill) .....	...	...	...	...	...	...	...	...	...	...	...	...
XXI.	Dublin (FitzWilliam Square)	2·98	+	1·12	·84	26	21	56·8	16	31·1	29	1	14
XXII.	Ballinasloe	6·08	+	3·00	·95	26	28	50·0	11	24·0	29	16	...
XXIII.	Waringstown	3·56	+	·91	·50	6	23	55·0	11b	27·0	22	c	10
XXIII.	Londonderry (Creggan Res.)	4·31	+	·89	·47	14	26	...	...	...	...	...	...
XXIII.	Omagh (Edenfel)	4·70	+	1·68	·71	9	28	54·0	16	30·0	22	c	7

a And 7, 9, 25. b And 16. c And 28.

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

METEOROLOGICAL NOTES ON JANUARY, 1890.

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 very mild month; thermometer at times very high, but on the whole wet, with only six days on which R did not fall.

HITCHIN.—The highest mean temperature on record, $42^{\circ}\cdot 1$, the average for 40 years being $35^{\circ}\cdot 8$.

ADDINGTON.—The month opened with sharp frost, lasting two days. On the 2nd, dense fog; 3rd, heavy rime; the rest of the month remarkably open and mild. The max. shade temp. was 50° or above on 15 days, and 55° was reached on two occasions. Wind often very high, R falling frequently, that of the 26th and 27th causing a large flood. From 3.30 to 4 p.m. on the 29th three mock suns were seen, the right and left ones very distinct; the upper one was not so bright.

BURY ST. EDMUNDS, WESTLEY.—The month has been very mild, and vegetation is much more forward than usual.

LANGTON HERRING.—On 17 days the temp. rose to 50° or above. On the 25th the temp. was 50° at 9 a.m. and rose to 54° in the day, the highest January temp. for 19 years. A great storm occurred on the 22nd and 23rd. T on 19th and 23rd, L on the 21st, three mock suns on the 29th. A mild, wet month has brought vegetation very forward.

BODMEN, FORE STREET.—A very wet and stormy month, but very mild.

STROUD, UPFIELD.—Gales on many days. From the 17th to the 22nd (both inclusive) the air was very electrical, storm clouds about, going in different directions. Flakes of S on the 20th and 28th; hail on 21st; on the 26th a strong S.W. gale.

WOOLSTASTON.—The early part of the month was very warm, the nights being exceptionally so. Gales and wild, stormy weather commencing on the 14th marked the latter half of the month till the 27th, when S fell heavily. Mean temp. $40^{\circ}\cdot 9$.

ORLETON.—Severe frost on the first four days of the month, accompanied for three days by a dense fog and rime. A thaw with R then set in, and the remainder of the month till the 28th was very changeable and stormy, with great and sudden fluctuations in pressure, accompanied by strong gales of wind. There were a few fine, warm days and several frosty nights. On the night of the 26th and 27th a wet snow fell, which covered the valley 2 in. in depth and was 3 in. deep on the hills. The last three days of the month were dry and cloudy. The mean temp. was $4^{\circ}\cdot 5$ above the average of the last 29 years. Distant L was seen on the night of the 20th.

LEICESTER, BARKBY.—On the 29th, from 2.55 p.m. to 3.35 p.m., was seen the beauteous and remarkable phenomenon of Parhelia or mock suns, with their attendant circles of coloured light. The mock suns, about 45° apart, had strong prismatic tints, the red being on the sides from the sun and the blue on the inner or nearest sides in each case, but without the intermediate shades. The arch which passed through them and over the sun (at its centre) was $\cdot 7$ of a full circle coming on each side below the mock sun, strong rays of light also stretching horizontally through them. The sun itself was blurred, the rays of light representing two cones with their bases together and their apices pointing vertically one upwards and one downwards. Another inverted arch half a circle in extent touched and rested on the arch already described; and in the zenith yet another inverted arch of half a circle, very clear and sharp, was seen, with prismatic tints on a blue sky.

MANCHESTER, PLYMOUTH GROVE.—The mean temp. was $42^{\circ}\cdot 8$, the highest January temp. for the last 22 years, with the exception of 1875 and 1884; the mean temp. for January in each of those years was 43° . No dense fog during the month. Snow and sleet on the 28th. The weather upon the whole was

mild, damp, and foggy, with drizzling R. The storms at the end of the month not much felt here.

HULL.—The weather generally was wet, dull, and often stormy.

WALES.

HAVERFORDWEST.—Very mild, stormy, and wet, only 7 days without R. The month commenced with severe frost, which, however, was evanescent. Storms of great violence were frequent throughout the month. Heavy T and L at times, notably so on the 18th, accompanied by a whirlwind, which cut a lane through some gigantic beech trees in Picton Woods, snapping some, uprooting others, and some were carried a distance of 100 yards into a neighbouring field. Heavy squalls of R, H, T and L again on the 24th, during which the lightning struck at a place called Hook, exploding with a loud noise, and creating great alarm. Heavy floods, with very high tide, on the morning of the 22nd; none equal to it since January, 1868.

SCOTLAND.

CARGEN.—Very stormy, mild, and unsettled, the mean temp. being nearly 4° above the average. Vegetation is unusually far advanced. The sudden fluctuations both in the thermometer and barometer have been very marked. The somewhat unusual occurrence of the night temp. being higher than the day was observed several times during the month; the most marked instance was on the 12th, the max. day temp. being 45°, the thermometer between 11.30 p.m. and midnight standing at 51° 8.

JEDBURGH.—The temp. generally has been high, with squally winds, on several occasions almost a gale. Spring flowers are far advanced.

OBAN, CRAIGVARREN.—A wild, wet month, with high temperature. The gales of the 18th and 25th were of hurricane force, and accompanied with T and L. Growth continued apace, and spring flowers were in bloom throughout. T and L, and H on the 5th, 12th, and 18th.

MULL, QUINISH.—Very wet and stormy. T and L on 5th, 13th, 18th, 21st, and 25th. Fearful gales from S.W. on 18th and 25th.

CULLODEN.—Particularly fine, and many days very mild, neither ice nor S.

IRELAND.

CORK.—Dulness, with almost constant drizzling R, has characterised the month, which had only 5 days without R.

DROMORE.—Month very stormy, but weather very open. Vegetation still going on.

WATERFORD.—T on the 5th and 23rd, H on the 17th, 18th and 21st, L on the 18th, 19th, and 21st, S on the 22nd, S.W. gale on the 25th.

O'BRIENSBRIDGE, ROSS.—T and L frequent in the early days of the month, indicating the approach of bad weather; a marked fall of temp. about the 17th, followed by violent gales of wind, heavy R and sleet, S and H.

DUBLIN.—A tempestuous, mild, and rainy month; rough southerly to westerly winds, frequently freshening into strong gales. Eleven gales were recorded here, some of them being downright tempests. On several occasions T and L accompanied the storms. The mean temp. was much above the average. A solar halo seen on the 29th; lunar halos were seen on the 7th and 27th. Fogs on the 1st, 2nd and 27th. H on 3 days, S or sleet on 5 days. Temp. exceeding 50° in the screen on 17 days, compared with 8 days in January, 1889, while it fell below 32° in the screen on only one night.

BALLINASLOE.—Wet and stormy, with high floods and violent gales.

WARINGSTOWN.—Very mild, with frequent high winds; grass in pastures growing almost as fast as in summer.

OMAGH, EDENFEL.—The R and temp. were both considerably above the January mean. From the 18th to the 26th a succession of strong gales, backing from S.E. to N.W., swept over the district, frequently accompanied by sleet and S. The end of the month was dull and mild.