

# SYMONS'S

## MONTHLY

# METEOROLOGICAL MAGAZINE.

CCCXX.]

SEPTEMBER, 1892.

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### THE WELSH EARTHQUAKE OF AUGUST 18TH.

WE have been favoured by several of our correspondents with notices of the above, but we see in *Nature* that C. Davison, Esq., M.A., of 38, Charlotte Road, Birmingham, who is the secretary of the British Association Committee on Earth Tremors, is preparing a report upon it, and we shall, therefore, place in his hands all the information we have received and collected, and we invite all who can to render him all possible assistance.

This, however, need not prevent our giving a few details.

*Area.*—The shock was felt over the South-East of Ireland, the whole of Wales, in Cornwall as far as Penzance, in Herefordshire and in Worcestershire.

*Time.*—As is usual the records are very unsatisfactory; they range between 0.15 a.m. and 0.35 a.m. The most numerous records are 0.30 a.m., but 0.25 a.m. was often given. As regards the 0.30 a.m. its frequency arises from the habitual lack of precision, and 0.30 a.m. implies some time between 0.20 and 0.40 a.m. There is, we think, little doubt that the time recorded by Mr. E. P. Phillips, of Haverfordwest, is correct, or within one minute. He did not merely trust his own watch, but checked it by the clock at the telegraph office, and reported 0.24 a.m. The following are fairly consistent:—

	A.M.		A.M.
Carmarthen, Whitland .....	0.23	Carmarthen, Carmarthen .....	0.25
Pembroke, Haverfordwest .....	0.23	Cardigan, Cardigan .....	0.25
" " .....	0.24	Dublin, Greystones .....	0.25
" " .....	0.25	Pembroke, Broad Haven.....	0.26
" Milford ... ..	0.25	" Tenby .....	0.27
Hereford, Hereford .....	0.25	Wexford, Inch .....	0.28
Devon, Ilfracombe .....	0.25	Flint, Rhyl.....	0.30
Glamorgan, Cardiff .....	0.25		

There was a less violent shock about 1.39 a.m. on the same day—*i.e.*, 1¼ hours afterwards.

*Structural damage.*—This was quite insignificant; one chimney was thrown down at Haverfordwest Workhouse, some plaster was

cracked at Pembroke Dock, and some windows were broken near Llanstephan.

This being the case, our readers may think that to collect information about it is "much ado about nothing." We do not think so. Much information respecting the effects of earthquakes and the areas over which they are most prevalent has been collected during the last half century, but we are as far as ever from knowing when to expect them. And though anybody can understand that if sea water penetrates into crevasses in red hot rocks a very considerable explosion will result, no one has yet explained why that explosion occurs so rarely. So that there is great room for discovery in this matter.

It has often struck us as strange that scarcely anyone seems to study the records of the numerous self-recording tide gauges, except with the view to the improvement of the constants. Surely a study of their irregularities would amply repay the labour. There are dozens of these costly and beautiful instruments at work, and yet (except *re* Krakatoa) we never heard of a meteorologist or seismologist devoting himself to the study of their records.

The relation between thunderstorms, tidal disturbances and barometric oscillations has not been worked out; and whether or not these are further connected with such slight earthquakes as that of August 18th can neither be affirmed nor denied. As contributions towards it we draw attention to the remarks on page 127 from our Babbacombe observer, and we print the following notes. If anyone is inclined to investigate the subject we will lend all the aid in our power, and can give references to some very queer "coincidences," if nothing else, during the last 30 or 40 years. Even as regards August 18th there are several useful letters in the *Standard*, and even as far from the centre of disturbance as London some curious irregularities in the barometric curve.

#### NOTES AS TO THE EARTHQUAKE IN DEVON, CORNWALL, AND SOUTH WALES, AUGUST 18TH, 1892, 12.30 A.M.

*Friday, August 12th.*—Fine aurora, 7–9 p.m., reported from Gloucester. Telegraph instruments much disturbed by earth currents. Aurora also seen at Highgate.

*Monday, August 15th* (9 p.m.).—Bright meteor seen at the Lizard by one of my party.

*Wednesday, August 17th.*—At Fowey. Morning brilliantly cloudless, wind S.W. Sun oppressively hot, so much so that it was impossible to remain any length of time exposed, even on the water. At 3 p.m. the "Noah's Ark" formed across the sky from S.W. to N.E., the form very perfect, the bands of cloud unusually wide and dense, but sharp. This continued till 4 p.m., and then dispersed.

Travelling later to Plymouth, all distant views appeared to me remarkably sharp and clear. Fine night, rather cold; wind S.

I was afterwards informed by the captain of the "Dartmouth

Castle" (plying on the Dart between Dartmouth and Totnes), that on his arrival at Totnes on this (Wednesday) afternoon, about 1 p.m., when it should have been high water, the tide was almost out, and it came in afterwards late.

*Thursday, August 18th*—Earthquake at 12.30 a.m. I felt nothing of this at Plymouth, and if felt there at all, must have been slight. The first I heard of it was at Princetown on the following morning.

10–11 a.m. A severe thunderstorm, with heavy rain, passed over Plymouth from the sea, travelling N.

On this (Thursday) afternoon the Dart was again disturbed. I was subsequently informed by a member of the committee of the Totnes Regatta (which took place this day) that high water being due about 2 p.m., the tide ceased to flow, and began to ebb before 1 p.m., so much so that it was feared the regatta would be stopped. About 2 p.m. he was on Totnes Bridge, and saw a wave about a foot high coming up the river and sweeping along and over the banks. After this passed, the tide continued to flow, and high water was reached about 3 p.m., or about an hour late.

This phenomenon was not observed on the Thursday by the captain of the "Dartmouth Castle," for he was lower down the river at the time; but he was informed by a man fishing up one of the creeks that he had heard the rush of the water on the rocks a mile away.

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I have long held the belief that earthquakes are of three classes, or, rather, due to three distinct causes:—

- (a) Those which are due to volcanic disturbance, and are connected with the eruptive action of volcanoes, whether actually accompanied by an eruption or not.
- (b) Those which are due to the contraction, crushing or slipping of the rocks forming the earth's crust, resulting, it may be, in faults of greater or less magnitude, but not arising from volcanic disturbance.
- (c) Those which are due to a disturbance of the electrical and magnetic equilibrium of the earth producing an irregular tension on various portions of the crust. The cause of such disturbances may be very complex; it may be due entirely to agencies within the sphere of the earth and its atmosphere, or to meteoric causes. In this relation I have frequently observed that earthquakes occur at a time when meteors are frequent. For instance, during the great series of the Charleston earthquakes some autumns ago I nightly observed numerous meteors of unusual brilliancy, and at the same time there were constant thunderstorms over England and France.

I am induced to think that the phenomena I have mentioned point to the earthquake of August 18th being one of the third class.

JAMES WOOD, M.A., F.G.S.,

*August 30th, 1892.*

## THE BRITISH ASSOCIATION AT EDINBURGH.

*(Continued from page 101).*

## THE EFFECTS OF RAINFALL IN THE ISLAND OF FORMOSA.

Mr. John Thomson said that the island afforded a striking example of the work of rain in altering the surface of the land, building up plains seawards, and ultimately fitting them for tillage, and for the support of an increasing population. After giving some particulars as to the geographical position and configuration of the island of Formosa, ocean currents, temperature and prevailing winds, Mr. Thomson said that on the eastern side of the island the rain descended in torrential streams and cataracts through chasms and gorges to the ocean. The eastern side presented a rocky front to the sea. The denudation of the mountains by erosion and its effects could hardly be traced on that side of the island, as the detritus was deposited in the deep sea adjoining the cliffs. On the west of the central chain, where the gradient was more gentle, they found an extensive plain, part of which had been built up within the historic era by the detritus washed down from the mountains, and the major part in a similar manner during the carboniferous period. Evidence of how the change had been accomplished existed in the table-lands and spurs of the central range, about fifteen miles inland from Taiwau, in the manner in which these lower "no man's lands" (so named by the Chinese), were cut up and demolished by the drainage of the lofty chain, chasms cut out by torrents during the rainy season, vast funnel-shaped pits where the land had fallen in undermined by water, broad river beds cut deep into the table-lands, their banks strewn with rounded and polished boulders of gigantic proportions that had been driven from inaccessible heights and rounded on their downward course to the plain. The greater part of the plain was "an alluvium," a rich loam derived partly from the shales of the central mountains, partly from the sandstones south, and partly from the limestone hills which reached here and there above the level of the lowland. Thus they saw within the narrow compass of the island of Formosa, rainfall and its results, year by year adding to the habitable plain, and creating extensive shoals between the island and mainland.

## DANGER FROM LIGHTNING.

Mr. W. H. Preece read a paper on the "Destruction of Lightning Protectors by recent Municipal Legislation." He said that in this country the immunity of private houses from being struck by lightning was very marked, and was considered to be due to the fact that the lead on the roofs and the iron stack-pipes which drained the roofs, connected as they were, formed an admirable lightning protector. Householders were now, however, required to cut off the direct communication of these pipes with the drains, and to leave an air-space between the end of the pipe and the grating of the drain. The result was that the electrical conduction of the pipe was broken, the stack-pipe ceasing to be a lightning protector, the houses were left exposed to the dangers of atmospheric electricity. The remedy was very simple. The pipe need not be entirely cut away. Three-fourths of its circular section might be removed for the distance required, and one-fourth might be left to maintain the old electrical connection; or, if the separation had been effected, then the

stack-pipe should be connected with the drain by a wire or rod, so as to restore the path of the charge to earth. Householders were also, by the same legislation, now compelled to put up pipes to ventilate their soil pipes, erecting above the roof a metal tube forming a permanent object exposed to the atmospheric charge, and terminating frequently in an earthenware pipe which was entirely disconnected from earth. Hence it was liable to be struck by lightning as it offered no means of escape. That should be connected with the earth through the stack-pipes.

Professor Reynolds asked if the whole blame rested with the authorities, or whether the sanitary engineers only recommended the detaching the pipes from the drains?

Mr. Preece said that he did not know where the blame rested. In reply to another question, Mr. Preece said that they might take it from him that if some means were not taken to protect the stack-pipes from atmospheric electricity, injury was sure to occur, which could only be prevented by completing the electrical connection.

#### REPORT OF THE EARTH TREMOR COMMITTEE.

This was read by Mr. C. Davison, Secretary to the Committee.

During the past year the attention of the Committee has been directed to ascertaining what instruments have been devised in all countries suitable for the work with which your Committee is charged. They believe that the list is now nearly complete, and in their next report they propose to fully describe and illustrate these devices, as they are sure that such a collection of descriptions would be extremely useful.

This list will certainly contain the following instruments, and probably others of a simpler and less expensive character :—

1. The *Nadirane*. Erected by M. Wolf in the Observatory of Paris.
2. The *Pendulum with double-suspension mirror*. Employed by Messrs. G. H. and H. Darwin, at Cambridge, in their attempt to determine the lunar disturbance of gravity.
3. The *Tromometer*. Used by P. Bertelli at Florence, and by other observers in Italy and Switzerland.
4. The *Tremor Recorder* of Professor Milne. Used by him in Japan.

Mr. Horace Darwin has recently invented another form of pendulum, smaller and less delicate than the one referred to above. This instrument has been made by the Cambridge Scientific Instrument Company, and Mr. Darwin has generously offered to place it temporarily at the disposal of the Committee. Experiments will be made with it shortly, an account of which the Committee hope to give in their next report.

The Committee request that they be re-appointed, with the addition of Prof. C. G. Knott, Mr. Horace Darwin and Prof. J. H. Poynting.

#### SPIDERS AS WEATHER PROPHETS.

The title of the paper to be read by the Rev. H. C. M'Cook, of Philadelphia, was announced as "On the Social Habits of Spiders," but we have changed it to one which seems more appropriate.

The author said that the opinion was widely disseminated that spiders had the power to foretell weather changes. The notion had indeed been enter-

tained as far back as the time of Pliny. The opinion in England was expressed by the Rev. J. G. Wood in his charming book, "Homes without Hands," where he stated that spiders never troubled themselves to make webs when a storm was brewing. Again, many farmers in America believed that when spider webs appeared on the grass the weather would be fine. Mr. M'Cook also referred to the romantic incident related of Disjonval, an Adjutant-General in the Dutch service, who was imprisoned by the Stadtholder of Holland, and during his eight years of imprisonment studied the habits of spiders so accurately that he was able to tell ten or twelve days in advance the approach of clear or stormy weather. When the French troops entered Holland in 1794, their approach was arrested by the thawing of the canals. When they were about to leave the country Disjonval sent their General word that there would be a hard frost. The General advanced, and the prediction was realised. The country was occupied, and Disjonval was freed. Independent of a number of inconsistencies, the author was of opinion that the little incident was but a fairy tale, and considered that any person could have predicted that a frost would have followed. He proceeded to give the evidence derived from his own observations on the subject. His method was to make observations in various parts of the country, and secondly to colonise various species of the ordinary weaver spiders found on the shrubbery and vines on his own manse yard. He quoted these observations extending over a period of five or six years, the result of which showed that spiders have not the power to prognosticate the weather. They were found in the early morning spinning their webs when the day following was rainy and stormy. The observations were made in couples and triplets, so that there could not arise the doubt that they were predicting for the following day, for his observations showed that the day following was also bad. Further, the spiders remained on the webs during heavy storms, many of them taking no notice of the rain. He gave one observation he had made in England at Manchester during the meeting of the British Association. There were the usual excursions on Saturday, and the day preceding was rainy, and the weather on the Saturday was alternately sunshine and stormy. While walking through the policies of Tatton Hall he observed that the spiders had everywhere woven innumerable webs. In conclusion, he ventured the opinion that the popular tradition that the weather could be predicted by the actions of the spiders was without any basis in fact. His observations did not apply to all spiders, but specially to the ordinary weavers.

#### REPORT OF THE COMMITTEE ON SOLAR RADIATION.

This was read by Sir George Stokes, who described the various forms of actinometer in use for measuring the intensity of solar radiation. He classified these into two forms—namely, statical, in which the constant temperature of a thermometer exposed to the sun was recorded; and dynamical actinometers, whose thermometer was exposed intermittently and read at regular intervals. Some results obtained by a new dynamical actinometer of the late Professor Balfour Stewart were then discussed.

#### YORK WEATHER, 1841 to 1890.

This paper, by Mr. J. E. Clark, has been printed, and we hope ere long to notice it among our Reviews.

## REPORT OF COMMITTEE ON SEISMOLOGICAL PHENOMENA OF JAPAN.

In the absence of Professor Milne, this was read by Dr. C. G. Knott. The most interesting feature was a description of the severe earthquake which occurred recently, some results of which were shown by means of engravings from photographs. Among the results may be mentioned the depression of a valley by about 19 ft. and for a distance of 30 miles, thus forming a great geological fault; also the destruction of mills, bridges, and towns, and the curving of a railway line running along an embankment and bridge in the path of the earthquake. Incidentally Dr. Knott mentioned that, in many cases of earthquake, oil was overturned, and by catching fire did more damage than the earthquake itself. In the recent earthquake, however, the damage by fire was comparatively slight.

## THE IMPURITIES OF TOWN AIR.

Dr. G. H. Bailey, of Manchester, said that during the past twelve months the Air Analysis Committee of Manchester, in conjunction with the Royal Horticultural Society, had been engaged on the analysis of the air of large towns. Much information as to the carbonic acid in the air having been collected by previous observers it had been thought desirable to devote especial attention to sulphurous acid and organic matter. Since the object was not merely to collect data, but to lay the foundations of what may be termed chemical meteorology, the atmospheric conditions prevailing at the time of the observation had been noted. From the results of several hundreds of analyses carefully conducted in London, Manchester, and Liverpool, the following conclusions had been drawn :—(1) That in clear breezy weather the amount of sulphurous acid is less than 1 milligramme per 100 cubic feet of air; (2) that in anticyclonic periods it rises very considerably, and in times of fog, maxima of 34 and 50 milligrammes have been recorded for the worst districts of Manchester and London respectively; (3) that wherever an open space or a less densely populated area occurs, there is a very marked diminution of the amount of impurities in the air; (4) that an increase in the amount of sulphurous acid is accompanied by at least as large an increase in the amount of organic impurities in the air; and (5) that smoke, promoting as it does the formation of fog, and preventing free diffusion into the upper stratum of the air, must be regarded as the principal cause of the impure state of the atmosphere in large towns.

## THE BEN NEVIS OBSERVATIONS.

Lord M'Laren submitted the report of the committee appointed for the purpose of co-operating with the Scottish Meteorological Council. It stated that during the past year the hourly observations by night and by day had been made without interruption by Mr. Omond and the assistants, and that at the low level observatory at Fort William in connection with the Meteorological Council, the continuous registration and other observations had been also successfully carried out. The maximum temperature for the year at the top was 64°·9 in June. The minimum temperature was 5°·6 in March. This gave the unusually large range of 59°·3 of temperature for the year at the top

of the Ben, being nearly  $10^{\circ}$  larger than the previous year. The mean temperature for the year 1891 at Fort William was  $47^{\circ}$ , being a fifth of a degree lower than the mean of previous years. The mean temperature at the top of the mountain was  $31^{\circ}3$ , or three-tenths of a degree above the average of the year. This excess of annual temperature held good at insular situations from Barra Head to Islay. The sunshine recorder at Fort William showed 1,220 hours, but that on the Ben showed only 908 hours out of a possible 4,470 hours; in 1890 the number was even smaller, only 591 hours. The rainfall for the year was 178.02 inches; in 1890 it was 198.24 inches. At Fort William it was 78.81 inches, nearly 100 inches less than on the top of the mountain. On 106 days the rainfall was *nil* or less than 100th of an inch, there being only one fair day in August, but the unusually large number of 19 fair days were reported in April, and 18 in June.

On the suggestion of Mr. J. Y. Buchanan, a systematic series of observations had been instituted, having for their object a careful record of the height above sea level of the lower surface of clouds that from time to time covered the face of the mountain facing Fort William. The importance of these observations would be recognised when it was remembered that during a large portion of the year the Observatory was enveloped with a completely saturated atmosphere.

Steps had been taken to make the observation of dust particles in the atmosphere part of the regular work of the Observatory. The observations already taken showed that dry thick fog contained a great amount of dust, but thin wet mist very little. It was when a thin dry mist enveloped the mountain that the lowest values were observed, and the all-important observation had been made, after consulting the daily weather maps of Europe, at the time when the winds differed in direction  $90^{\circ}$  degrees or more from the winds then prevailing near the sea level. In other words, the drizzling and practically dustless winds blew out from a shallow cyclone, overspreading that part of Europe at the time.

The scholarship placed at the disposal of the directors of the Observatory by the Commissioners of the 1851 Exhibition was to be devoted to observations on the hygrometry of the atmosphere at the two observatories.

During the past year Mr. Omond had been engaged in an inquiry into the relations of the Ben Nevis high and low level observatories to the cyclones and anti-cyclones, or the weather changes of the British Isles; Dr. Buchan was investigating the observations at the two observatories during February and September, 1891, in their relation to changes of weather; and Mr. Mossman had been discussing the observations made by Mr. Wragge in 1882.

The President moved a vote of thanks to the committee conducting the work at Ben Nevis.

#### MISCELLANEOUS COMMUNICATIONS.

Mr. J. Y. Buchanan, Edinburgh, communicated to the section the results of a number of observations he had made with the view of determining the density, temperature, and motion of the waters of the gulf of Guinea. Colonel Tanner, of the Ordnance Survey Department, read a paper on the subjects of photography as a means of surveying, in which he expressed himself of opinion that photography might be employed with advantage in the surveying of highly mountainous tracts.

# THE HEIGHTS OF AURORAS.

*To the Editor of the Meteorological Magazine.*

SIR,—It is to be regretted that no even moderately systematic attempt to calculate the heights of auroras has been made in this country for a long time past. An effort is being made by Dr. Veeder in the United States, and I would suggest that observations should be made on the lines proposed in my letter, which appeared in your vol. vi., pp. 223, 224, to which might be added :—

“Observers should state with what degree of accuracy they know the time, and if they are doubtful as to the exact time, they should extend their observations sufficiently to be sure they *include* the precise hour and half-hour.”

Probably Dr. Veeder would undertake the discussion of European observations—failing anyone here to do so. Any I may make I purpose submitting to him, and I should have pleasure in forwarding others that may be made and sent to me here.

T. W. BACKHOUSE.

*Sunderland, August 26th, 1892.*

# A WET AUGUST.

*To the Editor of the Meteorological Magazine.*

SIR,—Among those who never visit Ireland, and who neglect to read the *Meteorological Magazine*, there is a general belief that it rains incessantly in this much maligned island.

During the first six months of this year the rainfall here was only 10·90 inches, but this amount has been exceeded by the fall of 11·37 in. during the past two months—viz. : 3·57 in. in July, and 7·80 in. (a “record”) on 24 days of August.

		in.			in.
August	1.....	·02	.....	Forward.....	5·30
„	2.....	—	.....	August 18.....	·01
„	3.....	—	.....	„ 19.....	—
„	4.....	—	.....	„ 20.....	·01
„	5.....	·05	.....	„ 21.....	·03
„	6.....	·19	.....	„ 22.....	·46
„	7...	1·09	.....	„ 23.....	·96
„	8.....	—	.....	„ 24.....	·22
„	9.....	—	.....	„ 25.....	·01
„	10.....	·04	.....	„ 26.....	·09
„	11.....	·05	.....	„ 27.....	—
„	12.....	·87	.....	„ 28.....	·08
„	13.....	·17	.....	„ 29.....	·19
„	14.....	1·42	.....	„ 30.....	·39
„	15.....	·41	.....	„ 31.....	·05
„	16.....	·38	.....		
„	17.....	·61	.....		
		5·30	.....		

Yours faithfully,  
F. FRASER.

*Hazelfort, Shinrone, Tipperary.*

## THE GREAT HEAT IN AUGUST, 1892.

ABRIDGED AND TRANSLATED FROM "CIEL ET TERRE."

OUR readers know our strong objection to duplicate work, and, therefore, will not be surprised that, instead of ourselves investigating the distribution of the exceptional heat in the middle of August, we at once accept the summary given by M. Lancaster in *Ciel et Terre*, and refer those of our readers, who are not regular readers of that excellent journal to it for full details, giving here only the salient features.

Had it not been for telegraphs and newspapers, English people would have thought that the heading must be wrong, for in this country the heat has not been at all exceptional.

As a general classification M. Lancaster seems to put the districts as follows :—

Exceptionally hot.	Average.	Below average.
France, Central.	Algeria .....	British Isles.
„ West ...	Italy.....	Holland.
„ North ...	Spain .....	Germany, East.
Belgium.....	France, South-East ...	Norway.
Germany, South		

Referring our readers to M. Lancaster's article for the details for 35 stations for each day from August 15th to 19th, we quote only records of 100° F. or upwards !

North Africa...	Tunis .....	102°·2 on 19th
Spain .....	Madrid .....	104°·9 on 15th
Italy .....	Florence .....	100°·4 on 18th
Austria .....	Buda Pesth ...	100°·4 on 18th
France .....	Biarritz .....	107°·6 on 16th, and 104°·0 on 17th
„ .....	Bordeaux .....	107°·4 on 16th, and 104°·4 on 17th

When we mention that even at Biskra, which is so far inland in Africa that it may be fairly described as in the desert of Sahara, the maximum was only 96°·8, the exceptional character of the above entries will be fully realized.

REPORT ON THE GREAT RAINFALL IN EAST CLARE  
ON THE 2ND OF JULY, 1892.

AN unparalleled fall of rain took place in East Clare on the 2nd July, 1892. The rain fell at various times during the day and night, but the largest part fell between 1 p.m. and 3.30 p.m. The amount of rain recorded for the 24 hours, ending at 9 a.m. on the 3rd, was as follows :—

Kilkishen Glebe (Canon Lloyd) .....	1·17 inches
Hurdlestown (Capt. Bentley) .....	2·12 „
Ross (John Digan, Esq.) .....	1·23 „

It will be seen that the great bulk of the rain fell in the mountain

district round Hurdlestown; 2·12 inches being the largest fall in 24 hours on record there, during 7 years observations.

*Floods.*—This fall of rain caused (in the barony of Lower Tulla) the greatest floods remembered. The water ran down the mountain sides in torrents, and caused very considerable damage to the roads and bridges, some of which may be mentioned.

*The Ballymacdonnell River.*—This river, which drains the north slope of the Kilbane Mountains, is at all times liable to very sudden and severe floods. When in its normal condition, it contains but little water, and may be forded at any point; but when much rain falls on the mountains, it becomes a raging torrent nearly 40 yards wide. The high road from Broadford to Scariff crosses it by a bridge of two arches, which was designed by, and built in 1845, under the superintendence of, Mr. John Hill, M. Inst., E.C. During the ten years previous to that date, seven or eight bridges had been built in the same place, and had been all carried away by floods. The flood on the evening of the 2nd of July was the largest seen in the river since the last bridge was carried away in 1845. It did the present structure no damage, but completely filled up the north arch with sand and large stones. Much injury was done to the low lands on the banks of the river, some small fields of potatoes being carried clean away.

*The Crean Stream.*—This is a very small stream, and during the summer months it is very often quite dry, but after the rain on the 2nd of July it contained a very severe flood. The flood in it was so great that it moved a large stone in the bed of the stream some distance. I measured this stone, and found its weight to be nearly 7 tons.

*The Cloughera River.*—This river was also much flooded. Half of one arch of Cloughera-bridge was carried away, and considerable damage was done to the structure.

*The Hurdlestown Stream.*—This is a small stream often quite dry in summer, but it contained the largest flood on record on the 2nd of July. The flood moved many large rocks in the bed of the stream, some being smashed in pieces by the force with which they struck against each other.

*The Roads.*—The roads in this district nearly all sustained much damage, in many cases the broken stones on the surface being washed away and the "crust" was broken through in many instances.

No person living here remembers a greater fall of rain, or more severe floods.

H. A. BENTLEY, CAPTN.

*Hurdlestown, Broadford, Co. Clare, 30th Aug., 1892.*

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, FEBRUARY, 1892.

STATIONS.  (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
	°		°		°	°	°	0-100	°	°	inches		
England, London .....	53·0	7	17·5	17	44·7	33·9	35·9	89	86·1	12·2	1·62	17	6·9
Malta.....	68·2	19	45·0	5	61·6	51·8	50·5	86	123·4	39·0	1·18	10	5·7
<i>Cape of Good Hope</i> ...	89·9	10	48·1	14	78·5	57·9	...	...	...	...	·16	1	2·5
<i>Mauritius</i> .....	85·4	23a	71·1	20	83·2	75·2	72·2	81	138·7	66·2	13·86	21	7·6
Calcutta .....	90·7	27	52·2	17	84·7	61·6	59·0	65	143·7	44·4	·04	1	1·8
Bombay .....	88·2	2	66·0	15	84·8	71·6	65·7	66	135·2	51·0	·00	0	0·6
Ceylon, Colombo ...	91·8	2	71·3	...	87·1	73·6	71·1	77	151·5	65·0	5·32	12	4·7
<i>Melbourne</i> .....	96·5	22	47·1	27	77·1	56·5	54·6	67	147·0	39·9	·60	4	4·7
<i>Adelaide</i> .....	107·6	18	51·5	26	85·8	61·3	51·7	47	164·4	42·6	·23	5	3·4
<i>Tasmania, Hobart</i> .....	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>Wellington</i> .....	76·0	5c	47·0	1	70·6	55·1	54·9	79	130·0	40·0	4·20	9	4·5
<i>Auckland</i> .....	80·5	1	55·0	8	73·3	60·0	60·5	81	143·0	50·0	2·64	13	5·2
Jamaica, Kingston.....	87·7	15	63·0	2	84·8	66·6	64·2	70	...	...	·34	4	4·3
Trinidad .....	92·0	13	65·0	16	88·2	69·2	68·6	72	156·0	56·0	2·19	7	...
Toronto .....	39·1	22	— 6·2	13	31·0	17·5	22·8	85	...	—11·0	2·27	15	7·0
New Brunswick, Fredericton .....	42·9	26	— 7·7	28	29·5	10·5	14·5	70	...	...	2·45	12	7·0
Manitoba, Winnipeg ...	34·6	22	—39·9	18	11·6	—11·9	...	...	...	...	·60	9	5·0
British Columbia, Esquimalt .....	59·9	28	29·0	6	47·5	35·4	40·0	95	...	...	·80	19	7·0
a And 24.                      b And 10, 18.                      c And 23.													

## REMARKS.

MALTA.—Mean temp. 55°·9. Mean hourly velocity of wind 12 miles. The sea temp. rose from 58°·6 to 61°·0. L seen on 23rd. R for the winter 34 per cent. below average. J. SCOLES, S.J.

Mauritius.—Mean temp. of air 0°·6, of dew point 2°·1, and total R 7·34 in. above, their respective averages. Mean hourly velocity of wind 13·0 miles, or 1·7 above average; extremes, 47·5 miles on 12th and 1·9 miles on the 16th; prevailing direction E. to E. by N. T and L on 16th and 27th, and L on 25th and 26th. Two cyclones passed N., N.W., and W. of the island, one from the 11th to the 14th, and one from the 24th to the 28th, C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—TSS occurred on the 11th, 13th, 15th, 25th, 27th, and 28th. L only was seen on the 16th, 19th, and 22nd. J. C. H. CLARKE, Lt.-Col. R.E.

Melbourne.—Mean temp. of air 0°·4, of dew point 1°·3, and humidity 1, above; mean amount of cloud 0·6 and total R 1·28 in. below, their respective averages. Prevailing winds S. and S.W., strong on 4 days. Heavy dew on 12 days. L on 3 days. Dense fog on the morning of the 19th. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean barometer ·057 in. above, and mean temp. 0°·1 and total R ·44 in. below, the 35 years average. The shade max., 107°·6, is the highest recorded in February since 1879. The month was very dry all over the colony, particularly in S. and S.E. C. TODD, F.R.S.

Wellington.—Generally fine weather, with showers at intervals; heavy R in early part, 2·43 in. falling on the 6th. Prevailing N.W. wind, strong on 7 days. Earthquakes on 14th, 11.20 p.m., smart; on 28th very slight at night. R. B. GORE.

Auckland.—Showery at the commencement and middle of the month, otherwise fine and dry, with light, variable winds. R and mean temp. both slightly below the average of 25 years; barometric pressure a little above. T. F. CHEESEMAN.

SUPPLEMENTARY TABLE OF RAINFALL,  
AUGUST, 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.	3·38	XI.	Rhayader, Nantgwillt..	3·64
„	Birchington, Thor .....	4·42	„	Corwen, Rhug .....	4·18
„	Brighton, Prestonville Rd	2·86	„	Carnarvon, Cocksidia ...	5·92
„	Hailsham .....	3·70	„	I. of Man, Douglas .....	6·54
„	Ryde, Thornbrough .....	2·69	XII.	Stoneykirk, Ardwell Ho.	7·01
„	Alton, Ashdell .....	4·57	„	New Galloway, Glenlee	8·07
III.	Oxford, Magdalen Col...	2·91	„	Melrose, Abbey Gate ...	4·11
„	Banbury, Bloxham .....	2·58	XIII.	N. Esk Res. [Penicuik]	4·90
„	Northampton, Sedgebrook	2·04	„	Edinburgh, Blacket Pl..	4·80
„	Cambridge, Fulbourne..	...	XIV.	Glasgow, Queen's Park.	6·13
„	Wisbech, Bank House..	2·17	XV.	Islay, Gruinart School..	4·21
IV.	Southend .....	2·64	XVI.	Dollar .....	7·40
„	Harlow, Sheering .....	3·48	„	Balquhider, Stronvar..	10·80
„	Rendlesham Hall .....	4·75	„	Coupar Angus Station..	3·99
„	Diss .....	2·86	„	Dunkeld, Inver Braan..	4·88
„	Swaffham .....	2·33	„	Dalnaspidal H.R.S. ...	7·60
V.	Salisbury, Alderbury...	3·68	XVII.	Keith H.R.S. ....	3·97
„	Bishop's Cannings .....	4·37	„	Forres H.R.S. ....	2·50
„	Blandford, Whatcombe.	3·98	XVIII.	Fearn, Lower Pitkerrie.	2·62
„	Ashburton, Holne Vic. ...	5·49	„	Loch Shiel, Glenaladale	9·61
„	Okehampton, Oaklands.	4·19	„	N. Uist, Loch Maddy ...	3·64
„	Hartland Abbey .....	4·70	„	Invergarry .....	7·11
„	Lynmouth, Glenthorne.	4·95	„	Aviemore H.R.S. ....	4·35
„	Probus, Lamelcyn .....	4·63	„	Loch Ness, Drumnadrochit	3·90
„	Wincanton, Stowell Rec.	4·52	XIX.	Lairg H.R.S. ....	...
„	Weston-super-Mare .....	3·96	„	Scourie .....	5·82
VI.	Bristol, Clifton .....	...	„	Watten H.R.S. ....	2·08
„	Ross, The Graig .....	2·67	XX.	Dunmanway, Coolkelure	9·96
„	Wem, Clive Vicarage ...	1·97	„	Fermoy, Gas Works ...	7·26
„	Cheadle, The Heath Ho.	2·87	„	Killarney, Woodlawn ...	10·24
„	Worcester, Diglis Lock	2·66	„	Tipperary, Henry Street	6·45
„	Coventry, Coundon .....	2·65	„	Limerick, Kilcornan ...	5·01
VII.	Ketton Hall [Stamford]	1·52	„	Ennis .....	6·52
„	Grantham, Stainby .....	1·83	„	Miltown Malbay .....	7·56
„	Horncastle, Bucknall ...	1·26	XXI.	Gorey, Courtown House	4·65
„	Worksop, Hodsck Priory	1·79	„	Mullingar, Belvedere ...	7·56
VIII.	Neston, Hinderton .....	3·74	„	Athlone, Twyford .....	7·06
„	Knutsford, Heathside...	3·52	„	Longford, Currygrane...	7·61
„	Lancaster .....	...	XXII.	Galway, Queen's Coll...	7·34
„	Broughton-in-Furness..	10·41	„	Crossmolina, Enniscoe..	6·46
IX.	Ripon, Mickley .....	3·87	„	Collooney, Markree Obs.	6·06
„	Scarborough, West Bank	2·31	„	Ballinamore, Lawderdale	...
„	East Layton [Darlington]	4·01	XXIII.	Lough Sheelin, Arley ..	7·69
„	Middleton, Mickleton..	4·39	„	Warrenpoint .....	7·48
X.	Haltwhistle, Unthank..	4·89	„	Seaforde .....	6·06
„	Bamburgh .....	3·50	„	Belfast, Springfield .....	5·81
„	Newton Reigny .....	6·63	„	Bushmills, Dundarave...	3·78
XI.	Llanfrechfa Grange .....	4·18	„	Stewartstown .....	6·55
„	Llandovery .....	4·32	„	Buncrana .....	4·61
„	Castle Malgwyn .....	3·06	„	Lough Swilly, Carrablagh	4·36
„	Builth, Abergwessin Vic.	5·22			

AUGUST, 1892.

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 1880-9.	Greatest Fall in 24 hours		Max.		Min.		In shade.	On grass.		
				Dpth	Date			Deg.	Date.			Deg.	Date.
		inches.	inches.	in.				Deg.	Date	Deg.	Date.		
I.	London (Camden Square) ...	3·06	+ 1·18	1·71	27	17		82·1	17	43·1	11	0	0
II.	Maidstone (Hunton Court)...	3·11	+ 1·42	·66	19	16		...	...	...	...	...	...
III.	Strathfield Turgiss .....	3·82	+ 2·11	1·85	27	18		79·3	17	37·2	5	0	0
IV.	Hitchin .....	2·51	+ ·69	·99	27	13		79·0	17b	44·0	10	0	...
V.	Winslow (Addington) .....	2·39	+ ·42	·82	27	12		81·0	17	37·0	11	0	0
VI.	Bury St. Edmunds (Westley)	2·77	+ ·57	·74	27	14		76·0	17	46·0	11	0	...
VII.	Norwich (Cossey) .....	2·34	...	·90	27	14		81·0	18	...	...	...	...
VIII.	Weymouth (Langton Herring)	2·67	+ ·74	1·33	27	12		73·0	17	45·0	10	0	...
IX.	Torquay, Babbacombe ...	3·53	+ 1·55	1·75	27	15		76·2	17	43·6	11	0	0
X.	Bodmin (Fore Street) .....	4·76	+ 1·91	1·79	27	22		...	...	...	...	...	...
XI.	Stroud (Upfield) .....	3·07	+ ·98	·91	27	19		70·0	1	45·0	10	0	...
XII.	Church Stretton (Woolstaston)	2·40	— ·36	·61	23	20		74·0	22	42·5	10	0	0
XIII.	Tenbury (Orleton) .....	3·55	+ 1·43	·83	27	18		76·5	17	36·6	11	0	0
XIV.	Leicester (Barkby) .....	1·41	— 1·03	·43	27	12		82·0	23	35·0	4	0	0
XV.	Boston .....	1·93	— ·19	·40	24	10		88·0	23	42·0	11	0	0
XVI.	Hesley Hall [Tickhill] .....	2·12	— ·04	·96	29	13		81·0	23	42·0	11	0	0
XVII.	Manchester (Plymouth Grove)	4·94	+ 1·85	1·03	23	18		80·0	23	41·0	9	0	0
XVIII.	Wetherby (Ribston Hall) ..	2·84	+ ·50	·78	29	9		...	...	...	...	...	...
XIX.	Skipton (Arnccliffe) .....	7·89	+ 3·56	1·87	31	14		78·0	23	42·0	20	0	0
XX.	Hull (Pearson Park) .....	2·85	+ ·21	1·16	29	13		81·0	23	44·0	11	0	0
XXI.	Newcastle (Town Moor) .....	3·60	+ ·89	·70	7	16		...	...	...	...	...	...
XXII.	Borrowdale (Seathwaite) .....	15·57	+ 7·12	2·70	26	23		...	...	...	...	...	...
XXIII.	Cardiff (Ely) .....	4·78	+ 1·17	1·61	27	14		...	...	...	...	...	...
XXIV.	Haverfordwest .....	3·15	— ·03	·96	29	21		72·6	24	40·1	11	0	0
XXV.	Aberystwith, Gogerddan .....	3·13	...	·74	29	16		79·0	22	36·0	9	0	...
XXVI.	Llandudno .....	3·04	+ ·68	·81	29	18		...	...	...	...	...	...
XXVII.	Cargen [Dumfries] .....	7·33	+ 4·34	1·98	29	17		75·8	23	35·4	10	0	...
XXVIII.	Jedburgh (Sunnyside) .....	3·75	+ 1·51	·47	29	16		73·0	23	35·0	10	0	...
XXIX.	Old Cumnock .....	6·08	+ 2·66	1·04	29	25		...	...	...	...	...	...
XXX.	Lochgilhead (Kilmory) .....	5·21	+ ·65	·62	29	26		...	...	28·0	28	3	...
XXXI.	Oban (Craigvarren) .....	4·42	...	·69	14	22		68·0	1, 21	40·0	9	0	0
XXXII.	Mull (Quinish) .....	5·12	+ ·97	·74	24	23		...	...	...	...	...	...
XXXIII.	Loch Leven Sluices .....	5·20	+ 2·26	1·00	30a	13		...	...	...	...	...	...
XXXIV.	Dundee (Eastern Necropolis)	5·95	+ 3·38	1·75	29	21		73·3	22	38·1	29	0	...
XXXV.	Braemar .....	3·76	+ ·43	·87	29	24		71·0	23	32·0	10	1	3
XXXVI.	Aberdeen (Cranford) .....	3·86	...	·90	30	18		70·0	10	34·0	9	0	...
XXXVII.	Strome Ferry .....	6·25	+ 1·58	·71	26	25		...	...	...	...	...	...
XXXVIII.	Cawdor [Nairn] .....	3·20	+ ·95	1·24	30	23		...	...	...	...	...	...
XXXIX.	Dunrobin .....	2·73	+ ·33	·71	18	16		69·0	21	42·0	10	0	...
XL.	S. Ronaldsay (Roeberry) .....	3·68	+ 1·12	·81	14	20		66·0	22	42·0	2	0	...
XLI.	Darrynane Abbey .....	8·21	...	·90	12	26		...	...	...	...	...	...
XLII.	Waterford (Brook Lodge) ..	4·74	+ 1·32	1·00	28	21		71·5	1	41·0	10	0	...
XLIII.	O'Briensbridge (Ross) .....	6·08	...	1·17	7	20		73·0	1c	47·0	10	0	...
XLIV.	Carlow (Browne's Hill) .....	4·25	+ 1·28	·99	16	20		...	...	...	...	...	...
XLV.	Dublin (Fitz William Square)	3·56	+ 1·04	1·31	16	22		70·0	11d	43·0	10	0	0
XLVI.	Ballinasloe .....	6·50	+ 3·32	1·41	7	20		67·0	11c	44·0	9	0	...
XLVII.	Clifden (Kylemore) .....	9·05	...	1·34	12	23		...	...	...	...	...	...
XLVIII.	Waringstown .....	5·68	+ 2·57	1·12	7	20		76·0	23	45·0	28	0	0
XLIX.	Londonderry (Creggan Res.)	4·41	+ ·29	·77	7	26		...	...	...	...	...	...
L.	Omagh (Edenfel) .....	4·83	+ 1·34	·80	7b	23		69·0	17c	33·0	6	0	0

a And 31. b And 23. c And 21. d And 13.

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

# METEOROLOGICAL NOTES ON AUGUST, 1892.

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.

STRATHFIELD TURGISS.—On the whole a fair, warm month, but stormy towards the close. A heavy TS “circled” this station on the 24th, but did not develop here. TS on 18th; heavy gale on the 30th; very heavy R on the 27th.

ADDINGTON.—A fine month; very little R until after the 26th, when there was a downpour. The nights of the 5th and 11th very cold; min. on grass, 35° and 34°. Wind very rough on 29th and 30th. On the 18th and 23rd distant T and much L at night. The total R since 1st January, 10·95 in., is the least yet recorded during any corresponding period.

BURY ST. EDMUNDS, WESTLEY.—First half of the month seasonable; latter half much R, with high temp. TSS on 18th and 24th; T on 25th.

LANGTON HERRING.—Mean temp. very near the average. T and L on 18th and 23rd. Very high wind on 1st and 30th. Fog on 17th. The R for the eight months of this year (12·07 in.) is 4·57 in. below the average.

TORQUAY, BABBACOMBE.—A warm, variable month, with R fall above, Bar. and wet days exactly, and solar radiation below, the mean. No R was gauged in the first 7 days; only ·01 in. (on July 29th) in 19 days (July 20th to August 7th), and only 10·22 in. on 90 days in the long drought of 239 days, from January 12th to August 26th. On 27th 1·75 in. fell, the greatest in any day since November 12th, 1888. Shade max. rose to or above 70° on 14 days. Mean solar radiation, 51°·8, the lowest observed in August. A remarkable series of small Bar. waves (·01 to ·03 in.), 1 to 3 per hour, occurred from 8 p.m. 17th to 8 p.m. 18th, tidal waves or “bores” were felt in rivers Tamar, Yealm, and Exe, in the first 10 hours of—and TSS in English Channel throughout—this time, and earthquake in Devon, &c.—felt 2 miles N. of here—at 0.30 a.m. 18th. Gales on 3 days; T on 18th and 23rd; L on 18th, 22nd, and 23rd, and solar halos on 6 days; fog on 5 days. Parhelia on 10th; aurora borealis on 12th. Good harvest, mostly secured by 26th; heavy R following, did great good to burnt up pastures and roots.

BODMIN.—A large number of rainy days; chiefly very hot and sunny, except from the 27th, then colder and very wet, especially on that day, when 1·79 in. fell. The shock of an earthquake was felt here on the 18th at 0.30 a.m. A splendid month for the harvest, which is nearly completed in this district; crops generally good.

STROUD, UPFIELD.—On the 23rd, T and L from 7 to 8 p.m., very severe in the N. and S., but not heavy here. S.W. gale on 29th and 30th. Earthquake shock felt at 0.30 a.m. on 18th.

WOOLSTASTON.—A fine month till the last week, which was cold and showery. A severe storm of T and L on the 23rd. A shock of earthquake was very distinctly felt here at 0.30 a.m. (exactly) on the 18th. Mean temp. of month, 58°·9.

TENBURY, ORLETON.—Fairly warm, but no really hot days, though the max. reached 70° on 15 occasions. Great TS on 23rd; after the storm had passed over, 21 flashes of L were counted in a minute, and during the height of the storm their frequency was greater. T and L on 30th. Also aurora on 12th.

LEICESTER, BARKBY.—A variable month; deficiency of water; little or no fruit about here; corn harvest began on 12th. L on the 26th and 29th.

MANCHESTER, PLYMOUTH GROVE.—The first 12 days were on the whole bright and sunny. Summer weather prevailed from the 19th to 24th. The last week was cold and unsettled. A severe TS on the 23rd. Mean temp. 59°·5.

HULL, PEARSON PARK.—T was heard on the 24th; L seen on the 13th; aurora borealis on the 12th; TS on the 29th.

## WALES.

HAVERFORDWEST.—Although some rain fell on 21 days, the month was remarkable for its warm character and amount of bright sunshine. The rain fell principally at night or during the early morning, and everything went well until the 29th, when a sudden change of weather with rapid fall of the barometer took place. The month ended stormy and wet; nearly half the R fall of the month occurring during the last three days. If it continues the crops will suffer serious damage. On the 29th and 30th a heavy gale blew from S.S.W. to N.W.; temperature reached 70° on only three days.

## SCOTLAND.

CARGEN.—With the exception of three or four warm days between the 21st and 25th, the temp. of the month has been low and ungenial. For the whole month the temp. is 1°·2 below the average. The R fall has been excessive; on the 7th 1·58 in. was registered, and on the 30th 1·98 in., but the R fall for the past eight months (24·75 in.) is still 1·29 in. below the average for the period. The very heavy falls of R have done much damage to the corn crops, and will render harvesting operations very difficult. TSS were experienced on the 12th and 30th.

JEDBURGH, SUNNYSIDE.—The weather has been generally very wet. The temp. on the whole has been high, especially during the third week, which advanced all sorts of crops greatly. The hay has been well got in and is a good crop; the cereals are fully an average crop; the turnips are good; potatoes very good. Corn-cutting will not be general for a fortnight. Health of county good.

OBAN, CRAIGVARREN.—Temp. below the average. Crops backward, but the yield of hay good.

ABERDEEN.—A cold and cheerless month, little sunshine. Winds N. and N.E.

## IRELAND.

DARRYNANE ABBEY.—Very wet and cold for the season. Harvest very backward and potatoes much diseased.

WATERFORD, BROOK LODGE.—R fall nearly an inch above the average. Very broken weather all the month. T on the 13th, 23rd and 29th. Gale from S.W. on 14th. Earthquake shock about 0.5 a.m. on 18th.

O'BRIENSBRIDGE, ROSS.—Weather generally unfavourable to harvesting; injury to crops by floods in mountain districts and low-lying lands. T frequent during the month, especially on the 30th. Gales from S. and S.W., some lasting over 48 hours. Mean temp. 60°·0.

DUBLIN.—August was characterised by heavy rains, but much less unfavourable than it had proved in each of the three preceding years. The rains were never continuous, and fine, bright intervals were often enjoyed. The mean temp. was 60°·0, or 0°·3 above the average. High winds were noted on 12 days, and attained the force of a gale on the 1st and 14th; TS on the 18th; T heard on the 13th; L was seen on 22nd and 23rd; solar halos were seen on the 10th, 17th and 19th; fog on 22nd. Shock of earthquake felt in Dublin, Kildare, Wicklow and Wexford in the early morning of the 18th.

EDENFEL.—Although the rainfall was above the average and rather persistent, much of it fell at night, and with fresh, often bright, days the month was neither unpleasant nor unfavourable.