



WATERSPOUT AS SEEN OFF RYDE PIER, AUGUST 21ST, 1878.

SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CLII.]

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THE BRITISH ASSOCIATION AT DUBLIN.

ALTHOUGH taken generally the meeting was a great success, we cannot regard it as such in its meteorological features, and this applies both to the actual weather during the meeting, and to the communications upon meteorology. Of the latter there were only nine, of which the following are the titles :—

- Prof. Everett*, Report of the Committee on Underground Temperature.
Prof. G. Forbes, Report of the Committee on Atmospheric Electricity.
James Glaisher, F.R.S., Report of the Committee on Luminous Meteors.
G. J. Symons, F.R.S., On the Rainfall of Ireland.
S. P. Thompson, On certain Phenomena accompanying Rainbows.
W. Morris, On the Temperature of the Earth within.
C. Meldrum, F.R.S., On Sunspots and Rainfall.
R. Anderson, On Lightning Conductors.
Prof. Henry Hennessy, F.R.S., On the Climate of the British Islands.

There were a considerable number of meteorologists and meteorological observers present, the following being among the names :—

Ashe, I., M.D.	Dundrum.	Lloyd, Rev. H.D.D., F.R.S.	Dublin.
Barrington, R. M.	Fassaroe.	M'Cullough, D.M., M.D.	Abergavenny.
Brooke, C., F.R.S.	London.	Manning, R., C.E.	Dublin.
Browne, R. Clayton, D.L.	Carlow.	Moffat, T., M.D.	Hawarden.
Cosgrave, H. A.	Dublin.	Moore, Dr.	Glasnevin.
Copeland, R., F.R.D. ...	Dunecht, Aberdeen	Muirhead, Dr. H.	Cambuslang.
Eason, C.	Rathgar.	Perry, Rev. S. J., F.R.S.	Stonyhurst.
Elliot, Sir Walter, F.R.S.	Wolfelee.	Parsons, The Hon. R.C.	London.
Elliot, R.	Hawick.	Pengelly, W., F.R.S. ...	Torquay.
Enniskillen, The Earl		Rawson, Sir R. W.	West Drayton.
of, F.R.S.	Florence Court	Rosse, The Earl of, F.R.S.	Parsonstown.
Erck, W. S.	Bray.	Scott, Prof. A. W.	Lampeter.
Everett, Prof. J. D. ...	Belfast.	Smith, Prof. H.J., F.R.S.	Oxford.
Evans, J., F.R.S.	Nash Mills.	Smyth, J. jun., C.E. ...	Banbridge.
Gilchrist, J. M.D.	Dumfries.	Stokes, Rev. T. G.	Achnacloy, Tyrone
Glaisher, J., F.R.S.	Blackheath.	Symons, G. J., F.R.S. ...	London.
Houghton, Rev. Prof. S.		Talmage, C. G.	Leyton.
F.R.S.	Dublin.	Verney, E.H., Capt. R.N.	Rhianva, Bangor.
Hennessy, Prof., F.R.S.	Blackrock.	Waller, G. A.	Dublin.
Herschel, Prof. A. S. ...	Newcastle-on-Tyne	Wilson, Major C. W.,	
Hudson, H., M.D.	Glenville.	C.B., R.E., F.R.S.	Dublin.
Jackson, M.	Ramsgate.	Wilson, W. E.	Streets, Rathowen.
Kinahan, E.	Dublin.	Yonge, Rev. D.	Newton Ferrers.

No meteorological breakfast was held, for two reasons—(1) because the Monday morning upon which it has hitherto taken place was

already occupied by the breakfast at the Zoological Gardens ; and (2) because there were so few meteorological papers as to be insufficient to occupy the meteorological Monday.

REPORT OF THE COMMITTEE ON LUMINOUS METEORS.

Mr. James Glaisher, F.R.S., read this report, which consisted of (1) an account of meteors doubly observed, with a table showing their real paths, velocities, and radiant points ; (2) a detailed account of large meteors ; (3) general directions and instructions to observers for recording meteors and aërolites, by Prof. A. S. Herschel ; (4) the discussion of a meteor of short period (*viz.*, the fireball of November 27, 1877, for which a short period, such as, say, 500 days, is found), by Capt. G. L. Tupman ; (5) an elaborate analysis of the constituents of masses of meteoric iron and stone-falls, by Dr. W. Flight.

REPORT OF THE COMMITTEE ON UNDERGROUND TEMPERATURE.

Prof. J. D. Everett read this report. The principal novelty was the proposal to make observations in filled-up bores by a thermo-electric method. Two wires, one of iron and the other of copper, each covered with gutta-percha, were to be joined at both ends, where a portion would be left uncovered. One junction would be buried in the bore, while the other would remain above ground available for observation. A current would flow through the circuit composed of these two wires whenever the two junctions were at unequal temperatures, and the observer would immerse the accessible junction in a basin of water containing a thermometer, and would regulate the temperature of the water until he found by a galvanometer that no current passed. He would then know that the temperature of the water as indicated by the thermometer was the same as that of the buried junction.

THE RAINFALL OF IRELAND.

Mr. G. J. Symons, F.R.S., read a paper on "The Rainfall of Ireland," in which he mentioned that the Irish hills do not appear to exhaust the rain-clouds, as the English hills do. With the exception of a dry central area round Dublin the rainfall all over Ireland may be taken to be almost the same. At present, instead of the greatest rainfall being in the south-west, or in Galway, we had the wettest spot of all (with one exception) under the shadow of Slieve Donard, in the south of the county Down, the very place which, theoretically, might be expected to be almost the driest part of Ireland. That showed that it is really more a question of the elevation of hills than of geographical position. He exhibited a map showing the number of stations established for the observation of the rainfall, and the averages at many stations. From 1866 to '76 there were thirty stations established, at which the rainfall was regularly recorded, and at those stations the fall in the ten years was not very different from that in the five years 1872-76. It was, therefore, a fair conclusion that the average from '72 to '76 was not far wrong. It might probably be wrong three or four per cent.

He had succeeded since the meeting of the Association in Belfast in obtaining the services of a large number of gentlemen volunteers throughout Ireland, who had taken charge of the rain gauges supplied to them, and had engaged to register their observations. There were still large districts, however, in which he had not been able to establish rain gauges, and the observations were, therefore, necessarily defective as to the average rainfall. There was a large district in the neighbourhood of Longford without a single station, and another in the S.W. of Cork, where it was essential that observations should be taken. If he could induce some gentlemen having property in those neighbourhoods to take charge of rain gauges, Ireland, instead of having to depend upon ten stations, as it did not many years ago, would be fairly represented, both geographically and physically.

The President said that the thanks not only of the section, but of the whole

people of Ireland, were due to Mr. Symons for bringing this question of the rainfall more nearly home to them (hear, hear).

Mr. Lynam suggested that if some of the head-constables of police of the various districts and the canal lock-keepers, who were men of great activity and intelligence, were asked, they would be very glad to keep rain gauges, and would keep them with care and accuracy.

Professor Hennessy intimated that he had long ago come to the conclusion that the distribution of rain over Ireland would be partly governed by the coast line, and partly by the elevation of the ground. He spoke warmly of the labours of Mr. Symons, and hoped he would be backed up in any grant he might require to complete the observations.

Dr. Roche (Kingstown) said that rainfalls depended on the velocity of wind, and many other agents were to be considered besides height. Longitude had also a great deal to do with the weather. Rainfall was of great interest to agriculturists, and in a great measure depended on the quantity of trees in the country. Rainfall was found to be of very great importance to the agriculturist, who was, in fact, as much interested in the subject as the municipal engineer who ministered to the wants of large towns, but he suggested that in future maps, the extent of forestry in a district should be taken into consideration.

Mr. Price asked what was the actual average of the rainfall in Ireland as compared with that of England and Scotland. In a former publication of Mr. Symons the average at that time was given as in England, 29·84 inches; Scotland, 35·98; Ireland, 33·99; average of the United Kingdom, 33·27.

Mr. Symons said it was exceedingly difficult to give the average since they did not know what was occurring in large districts (hear, hear); but he was inclined to think that Ireland did occupy an intermediate position between England and Scotland. Ireland had the reputation of being a wet country, and no doubt, as regards drizzling, uncomfortable rain, that was perfectly true, but as for downpours of six inches a day, there were no traces of anything of the kind, except at two very remote stations. He mentioned that an attempt to get rain gauges kept by the constabulary had failed, but he did not see why the resident gentry and clergy of Ireland should not take charge of them as well as the corresponding classes did in England.

The President, in closing the discussion, expressed a hope that the gentlemen of Ireland would fall in with the suggestion.

ON THE CLIMATE OF THE BRITISH ISLANDS.

Professor H. Hennessy read a paper on this subject. He said that for years he had paid considerable attention to the study of the climate of these islands, and especially to the distribution of temperature over them. When he first made his investigations he was led to the conclusion that the distribution would be represented by isothermal lines having a certain parallelism to the coast lines of these islands. Since he first made his maps a vast number of observations had been collected by the Meteorological Society of Scotland. His own isothermal lines had been laid down from actual observation, because he had found out that the law of increase and decrease of temperature, in going in-land over a table land or flat country, was so extremely slow that it was perfectly absurd to use the co-efficient of one degree to 300 feet, which had been obtained by balloons. The actual results confirmed in the minutest particulars the theory of isothermal lines, which he propounded years ago, and he believed that the more observations were multiplied not only in these islands, but in New Zealand, Tasmania, and similar places, the more would it be found that his theory was correct. The islands, however, must have their coasts bathed by oceanic currents of a high temperature. The isothermal lines for Ireland showed that the distribution of temperature was more influenced by the sea than by latitude.

Dr. Rambaut said the laws of temperature ascertained by balloon ascensions must be quite different from those on a mountain side. The latter was the only true test.

Professor Hennessy said the law of decrease of temperature might be regarded as consisting of three divisions—rapid going up in a balloon; slow going up a mountain; still slower going along a plain, like a table-land. The average height of the table-land of Ireland above the level of the sea was 300 feet. The distribution of temperature was scarcely at all affected by that slight ascent. It was, therefore, absurd to take as a basis the result of one degree in 300 feet, which had been found in balloon ascents.

The Rev. S. J. Perry said of course there must be a great difference between the decrease in temperature observed during the ascent of a mountain and the ascent in a balloon. The temperature must be affected by the earth's surface, but in certain cases it was quite necessary to take the element of height into account.

THE PARIS METEOROLOGICAL CONGRESS.

The French meteorologists did everything which it was in their power to do to ensure the success of the above meeting, both as regards the arrangement of the programme and as regards offering splendid hospitality to their guests. General regret was expressed that only one Englishman was present, and in that regret we heartily share, because, as was pointed out at one of the banquets, there is hardly any branch of science in which International co-operation is so nearly indispensable as in meteorology. And although it was in these very pages asked if there had not already been enough congresses, yet it was acknowledged that their great advantage was in the personal acquaintance of the leaders of the meteorological world—and some of the very best men were there. We do not pretend to give an accurate list of those present, but taking first the foreigners, there were—Billwiller (*Switzerland*), Buys Ballot (*Holland*), Collins (*United States*), Denza (*Italy*), Hoffmeyer (*Denmark*), Montigny (*Belgium*), Ragona (*Italy*), Symons (*England*), Tacchini (*Sicily*), and Zenger (*Austria*). The French colonies were represented by General Farre and Harold Tarry for *Algeria*, d'Abbadie for *Central Africa*, and Borius for *Senegal*. Almost every branch of French meteorology was represented by its acknowledged leader—e.g., among those present we noticed Prof. Mascart (Director of the New Meteorological Office), Lemoine (coadjutor with Belgrand in all his hydrological researches upon the *régime* of the Seine), Tissandier (the scientific aeronaut), Alluard (the founder and director of the observatory on the summit of the Puy-de-Dôme), General Nansouty (the hero of many a fight for life with the frost and snow at his observatory on the Pic du Midi). But we must stop, although we have by no means exhausted the list of eminent Frenchmen, far otherwise we have not mentioned Brault, Cousté, du Moncel, Fron, nor even Renou, nor the President, to whom the Société Météorologique owes much, and the foreigners owe more, the talented and ever genial Hervé-Mangon.

We do not intend at present to give any report of the papers and discussions, because we are glad to announce that the French Government has undertaken to print a full report of the entire proceedings, and that copies shall be supplied at the cost of paper, postages, and sundries, roughly estimated at about six francs. Something was said

as to the number of copies printed being limited, it may therefore be well for those who desire to receive a copy either to write direct to the Secretary Société Météorologique de France, 7, Rue des Grands-Augustins, Paris, or if they prefer it the Editor of this magazine would order it, provided the order and the amount (5s.) reaches him by September 21st.

WATERSPOUT OFF SOUTHAMPTON.

To the Editor of the Meteorological Magazine.

SIR,—I had the opportunity of observing on the morning of Wednesday, the 21st of August, one of those most striking phenomena connected with the ocean, a *water-spout*, or sea whirlwind. Being on Ryde Pier at seven minutes past 12 on the morning of that day, and looking northward I saw a long continuous dark-slate coloured band of stratoid cloud resting on the opposite shore distant about four miles, and on the upper edge of this bank, exactly in line with Southsea Castle, I first observed a depression of a triangular form or cone of so peculiar an appearance that it attracted my attention. It seemed to travel independently of the cloud-bank, from E.S.E. to W.N.W. by W. Turning a powerful pair of Casella's field glasses upon the object I perceived a considerable disturbance of the sea, immediately under it and travelling with it. I then observed a long, and very thin, continuous column of water uniting the cone above and the whirl of water below; and I could see that the whole was in a state of rapid gyration, apparently revolving in a contrary direction to the hands of a watch of which the face is uppermost. The weather at this time was fine, but unsettled, heavy detached banks of clouds in all directions. Barometer, corrected and reduced, 30·054 in., falling; dry bulb 63°·2, wet bulb 57°·5; wind E., force 3.

It was difficult to guess at the height of the water-spout, as all surrounding objects were obscured by cloud and mist, but from measurements made on the spot with a sextant by a naval officer, it was judged to be about one mile in height, with a disturbed surface of whirling sea of about 100 yards diameter, distant $2\frac{1}{4}$ miles. The column of water was of a light color at its axis, but darker at its edges, giving it a hollow appearance. The sea below was in a state of intense disturbance, the rapid rotation of the water not only contributing to the formation of the column, but throwing out also large circular sheets of spray, which were not taken up with the main body of water. I carefully watched it pursuing its course along the opposite coast through Stokes Bay until it reached a promontory called Hill Head, at the entrance of Southampton Water, distant about seven miles. The phenomenon had a very striking appearance as it proudly and grandly swept past, the vehemence of the feeding whirlpool, and the graceful curve of the whirling column of water and the inverted cone spread into the clouds above, afforded a remarkable sight.

The column did not break off suddenly with a violent disrapture, as

I had expected, but became gradually absorbed into the heavy adjacent cloud-bank, and disappeared from view at 12h. 18m. I enclose a sketch taken when the water-spout was exactly ahead of Ryde Pier.

Yours very truly,

CHAS. H. GRIFFITH.

Strathfield Turgiss, Sept. 4th, 1878.

[We engrave the sketch as a frontispiece to this number, and add another description].

A WATERSPOUT IN THE RIVER.—The somewhat heavy rain which we experienced on Wednesday seemed to have resulted from the breaking at the mouth of the Southampton Water of the waterspout, reported by our Ryde correspondent as having been seen off that place. Mr. W. J. Jeaffreson writing to the *Times* from that place, gives a circumstantial description of the phenomenon. "Shortly before midday," he says, "the south-east wind had massed heavy black clouds, fringed with greyish cumuli, over the Hants coast. Just about 12, I observed a thin streak of grey descend from the cumuli, somewhat to the east of Southsea Common, and stand out strongly against the black masses beneath, as it passed rapidly to the westward. It was not till a few minutes after 12 that I observed this thin streak to be in communication with the water, which threw up a column of white spray and foam distinctly visible, though quite four miles distant, at a height of several feet above the surface. A glass showed the disturbance to be considerable, though no pillar of dark water rose above the waves and the area of the gyration was not extensive. The waterspout moved rapidly, at an apparently short distance from the Hants shore, past Southsea pier and the entrance to Portsmouth Harbour. As it crossed Stokes Bay the commotion appeared to increase until it passed the White-house beyond the railway pier. Mr. Wynan's "Cigar ship" was not far from it at this point, and those on board must have had an excellent view. On nearing the opening of Southampton Water, and before nearing the Lightship at the Spit, the phenomenon disappeared in a heavy downpour of rain. One small yacht seemed close to the vortex just before its disappearance. Though less violent and affecting a smaller area and mass of water than a tropical waterspout, this one struck me as being very remarkable from its enormous height."

WATERSPOUT.—This extraordinary phenomenon near Stokes Bay on Wednesday morning, was witnessed by a large number of persons on Ryde pier. It is notable that there was a considerable rise in the temperature just before the waterspout was seen.

EXTRAORDINARY HAILSTORM.

To the Editor of the Meteorological Magazine.

SIR,—I must give a short description of the fearful hailstorm by which we were thoroughly smashed on the evening of August 4th. I had intended to send an account of several heavy thunderstorms which have occurred here since I last wrote, but these all are insignificant compared with that of the 4th. That oft-quoted authority, the "oldest inhabitant," is probably right on this occasion in asserting that he never saw anything like it. For my own part, I never witnessed a hailstorm approaching this in severity, even including the destructive hailstorms which occurred in the neighbourhood of Hereford on August 13th, 1857, or another which I can remember in 1848.

On August 3rd, a fog which had occurred in the early morning cleared about 8 a.m. Wind N.N.E., moderate; upper current, which carried fragmentary electrical clouds, E. by S. Thunder commenced in S.E. at 10.15, and continued with but little intermission between the claps (at times it was an unbroken roll) for two hours. This storm did not reach us, but worked its way very slowly to W.S.W. of this station, the nimbus becoming more circumscribed as it travelled. At 7 p.m. a dense bank of cirro-stratus extended over the N.E. sky, the edge moving rapidly from S.E. This bank spread slowly over us, and at 10 p.m. rain commenced, with a brisk N.E. wind.

The rain continued throughout the night, and from 3.45 to 7.45 of the 4th we had much thunder and lightning, which appeared heaviest in the E. On emptying the gauge at 9 a.m. I found that 0.83 in. had fallen. At 8 a.m. wind was N.E. and light, with a rapid E. upper current; the sky clearing in S.E. Nine hours of generally bright sunshine succeeded, during which the breeze went round to S.S.E., while the cirrus-current backed towards N.E. Cumuli of very high, narrow and fantastic forms hung about the sky; and at 3.20 p.m. a local thunderstorm broke in distant S.S.W., and travelled slowly off to W. At 4.30 a yellowish appearance began to be noticeable all over the southern sky, and in a short time a bright orange-coloured bank of cirrus appeared over that horizon, running up in filmy threads towards the zenith, the edge moving rapidly from E.S.E. Beneath the bank were vast towers of inosculating cumuli. Thunder commenced at 5 p.m. in S.S.E., and from that hour to 5.45 the storm rapidly approached, apparently increasing greatly in intensity, lightning being exceptionally vivid. When about two miles distant the peculiar roar of hail could be heard between the crashes of thunder, and was so very loud that it was evident that the storm would be of unusual violence. Observers had just time to get into their houses and shut windows and doors when it was upon us in its fury. This was at 5.50. What followed can best be described by its effects.

In a quarter of an hour hail covered the ground to the depth of two inches. All houses were thoroughly flooded, and windows facing S.E. generally smashed. Out of doors, flowers and vegetables had disappeared *in toto*, and as for the gardens,—“*fruit Ilium*.” The change of scene, from a brilliant August afternoon to a partial January thaw, was most theatrical. Fields all white, except here and there where black pools lay amid the ice; men engaged in shovelling the ice out of the village street, and digging it away from the doors of the houses; wreaths of white fog creeping over the surface, and overhead that leaden sky which is usually noticeable over snow-covered ground. The storm had gone, and left a wintry wilderness behind it.

Having to attend to the condition of my deluged house, and having a service in the church at 6.30, I was unable to weigh or take measurements of the hailstones until 8 p.m., when I found the stones to be in all cases exceptionally round and hard (presenting in this respect a marked contrast to those which fell in August, 1857), so hard that

there were several which I failed to break with my teeth. I measured some, which were just $4\frac{1}{2}$ inches and one which was $5\frac{1}{4}$ inches in circumference. This was two hours after they fell. Drifts of ice several feet in depth had been formed by the rushing water. Many of these drifts lay through the next day, in hot sunshine; and even yesterday evening, 78 hours after the storm, in warm weather, and when another inch of rain had fallen in the thunderstorms of the 6th, ice could still be gathered in some of the ditches.

The hailstones in this storm leapt several yards from the ground as they fell on my lawn, and the rain-gauge was also so much blocked by the ice that I do not trust its record at all. It yielded 1·34 in., falling in about 22 minutes, but I consider this very short of the actual fall.

The storm, which had come to us from S.S.E., turned somewhat to W. shortly after passing this place, and seemed to become much less severe. At 8.30 p.m. it presented itself in the W. as a bank of cirrus moving from a N. or N.E. point. At that hour a small thunderstorm was visible in the E., the lightning being bright, but thunder only faintly audible.

I find that at Lutterworth, 3 miles S.E. of this place, the hail was comparatively light, though some windows were broken. Two miles to the W. very little hail fell; and it did not extend far to the N., certainly did not reach Leicester. A few miles to the E. and N.E. the storm was very slight. The area of the great hail was, therefore, very circumscribed, and this place seems to have been exactly in the focus of the storm.—I am, Sir, yours truly,

W. CLEMENT LEY.

Ashby Parva, Lutterworth, August 8th, 1878.

TREES AND FROST.

To the Editor of the Meteorological Magazine.

SIR,—A friend of mine writing from Switzerland asks me to find out from ascertained data, what degree of cold (Fahrenheit), the sap of any given tree, and of the English pine in particular, can support, without injury to the tree, and what degree of cold would kill that tree. He tells me that some experiments have been made by priests of the convents on the Italian mountains, and that the results, as reported, are surprising. He doubts whether the circumstances under which the experiments were tried were such as scientific accuracy would require. If any of your readers can give me information on the subject that cannot be called in question, I shall be much obliged.

Faithfully yours,

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

Bannerdown House, Batheaston, 23rd August, 1878.

[Probably Col. Ward is aware of the paper by Mr. Forbes, of Culloden, reviewed in Vol. II. of this Magazine, page 94; it does not give *precisely* the data required, but is a very valuable pamphlet.—ED.]

THE EXCEPTIONAL RAINFALL OF 1878.

It is too early, and there is not in these pages room, to treat fully of the remarkable features of the rainfall of this year. By the insertion of two or three letters in previous numbers, we have given some details of the heavy individual rains in North London. We append to this a few letters respecting the fall on the south coast of England in August.

But that it is not alone the south coast, which has received an exceptional rainfall, is shown by the general tables, and by the observers remarks on page 126, to which we desire to call attention. This being the case, we further illustrate the matter by the following table :—

Daily Rainfall in August, 1878.

	London.	Margate, Acol.	Brighton.	Hastings.	St. Lawrence.	Selborne.	Stratfield Turgiss.	Hitchin.	Banbury.	Saffham.	Cheadle.	Killingholn.
1...	...	10	...	...	...	...	...	01	...	...	...	...
2...	04	24	17	18	16	04	...	02	02	01	25	22
3...	1 41	...	10	87	77	45	10	40	29	60	09	29
4...	60	...	12	01	14	17	22	1 13	73	...	62	30
5...	52	13	40	46	35	36	40	74	12	21	16	23
6...	...	...	01	...	...	...	...	...	09	...	1 21	93
7...	...	...	...	09	...	...	...	...	...	...	19	36
8...	...	02	...	...	...	...	...	...	...	...	...	...
9...	13	...	...	10	04	...	...	01	04	...	41	08
10...	18	18	11	02	1 15	10	12	20	20	19	64	20
11...	06	...	15	06	16	11	...	06	09	06	41	13
12...	13	03	12	03	05	20	14	01	...	25	09	08
13...	31	14	42	45	42	64	36	45	62	60	85	64
14...	01	...	01	01	...	...	...	07	04	36	26	14
15...	21	96	40	52	56	45	13	12	03	...	43	01
16...	25	36	12	12	08	12	18	65	17	34	21	13
17...	...	...	...	...	...	...	42	...	...	...	01	01
18...	...	...	02	06	03	...	...	...	...	...	...	...
19...	...	...	...	01	...	...	...	...	...	...	...	...
20...	...	...	...	...	15	...	...	...	...	...	...	...
21...	...	...	...	...	...	...	...	...	...	...	...	...
22...	46	15	32	20	30	32	60	34	67	16	44	03
23...	38	...	05	1 77	...	22	50	15	39	20	12	40
24...	53	...	75	1 56	01	14	09	21	01	14	37	12
25...	31	34	07	01	...	06	02	07	...	09	06	1 14
26...	01	10	06	22	14	12	...	...	...	...	05	05
27...	17	...	07	10	10	10	04	09	01	13	27	58
28...	13	...	51	38	04	06	22	07	02	...	04	...
29...	15	05	26	11	08	67	51	79	35	93	08	12
30...	41	03	10	1 55	91	42	16	13	12	36	10	53
31...	32	63	18	13	08	06	03	07	06	25	55	25
	6 72	3 46	4 52	9 02	5 72	4 81	4 24	5 79	4 07	4 88	7 91	6 97

In confirmation of the remarks of several observers as to the rarity of the phenomena of this summer, and indeed of the whole year up

to date, we add a few notes on the rainfall at Camden Square. It is, in fact, altogether without precedent. Attention was called to the exceptionally heavy daily falls, in our last number, but besides this, not only have many of the monthly totals been above their individual averages, but some of them are higher than any other monthly falls at Camden Square since observations were commenced in 1857, as shown by the accompanying table, in which it will be seen that although the amount in June was nearly half-an-inch greater than in any previous month for twenty years, it has been actually exceeded in August, so that this year we have had the two heaviest monthly falls, and the two heaviest daily falls, yet recorded there.

Table, showing the Total fall at Camden Square in every month since December, 1857, in which the Rainfall has exceeded 5 inches.

		in.			in.
1860.	June	5.47	1872.	October.....	5.20
1865.	October.....	6.22	1876.	December	6.25
1868.	December.....	5.12	1878.	June	6.71
1871.	August	5.28	„	August	6.72

On comparing the number of rainy days, we find that they are very slightly above the average, except in August, which is accounted for by the fact that the excess in the monthly totals was due more to heavy daily falls than to long wet periods.

The total rainfall from the 1st January to 31st August (26.85 in.) is more than ten inches above the average for that period, and nearly two inches above the average for the entire year, of which there are still four wet months left, and even if the rainfall in them be only equal to the average, the yearly total for 1878 will far exceed even that recorded for the extraordinarily wet year 1872.

To the Editor of the Meteorological Magazine.

SIR,—The rainfall of last month exceeds the fall of the whole of the three months, April, May, and June. The total measurement of those months was 9.11 in., that of August was 9.39 in. On the 24th a great quantity of rain fell between 4.15 a.m. and 9 a.m. I measured 1.94 in. At 3.15 p.m., a severe thunderstorm passed over, with hail; the storm lasted till about 5.30 p.m., and I then measured 1.75 in., making a total of 3.69 in. There was no thunder with the first rain, and the wind N.E. and calm.—Yours faithfully,

CHARLES M. MURRAY.

The Firs, Ore, Hastings, Sept. 3, 1878.

To the Editor of the Meteorological Magazine.

SIR,—My total rainfall for last month (August) was 9.85 in. ! Of this, 4.55 in. fell on Saturday, the 24th; rain commenced after mid-

night: amount in gauge at 8.30 a.m., 2.00 in.; rain ceased at 10.30 a.m., 0.35 in.; rain, with thunder, at 12.30 till 1.15 p.m., 0.10 in.; thunderstorm commenced at 3.15 p.m., and ended 4.30 p.m., rain collected 2.10 in. Total rain between midnight and 4.30 p.m., 4.65 in. 2.05 in. fell on Saturday the 31st.—Yours truly,

JAS. ROCK.

Brookwood, Hollington, Hastings.

To the Editor of the Meteorological Magazine.

SIR,—The amount of rain for August is greater than for any month since July, 1874, when I first began observations.

On the 3rd, at 9 p.m., there was 0.65 in. in the gauge. This fall took place almost entirely between 7.30 and 7.55 p.m., when a severe thunderstorm was passing over us.

The 1.77 in., entered to the 23rd, fell during a few hours of the early morning of the 24th. On the same day a very severe thunderstorm occurred in the afternoon, when, besides other damage, a barn was struck by the lightning, set on fire, and burnt to the ground. During its continuance 1.565 in. of rain fell. Unfortunately, I was away from Hastings at the time, and my deputy made no extra observations. I have asked my friend, C. Murray, Esq., of Ore, which is only about two miles from here, to send you an account of the storm.

Part of the 1.55 in., of the 30th, fell during the night of that day, but the main portion in the early morning of the 31st, but there was no thunderstorm.—I am, Sir, faithfully yours,

ALEX. E. MURRAY.

*Manor House, Hastings,
2nd Sept., 1878.*

To the Editor of the Meteorological Magazine.

SIR,—Till I read the account in *the Times* of to-day of the rainfall near Hastings, I thought we had the largest amount to record at this place. During August I measured 7.96 inches on 19 days—at 9 a.m. on the 23rd, 2.29; at 9 a.m. on the 24th, 1.49; making a total of 3.76 in sixteen consecutive hours, from a little past 8 p.m. on Thursday night till noon on Friday. I have only one instance of larger fall in 24 hours, 3.84 in. on Aug. 13th, 1858, and one of 3.63 in 36 hours, July 14th and 15th, 1875.

Our recent heavy fall was not accompanied by any near thunderstorm, although there were heavy ones subsequently on the Cotswold Hills, and to the E. and S.E. of us.

There has been no August since 1771 with equal fall in these parts, except, perhaps, 1782, when Gilbert White, at Selborne, registered 8·28; 1775 and 1797 had, however, very wet Augusts.

Yours faithfully,

H. SOUTHALL.

*The Graig, Ashfield, Ross,
Sept. 5th, 1878.*

P.S.—I am glad to say, notwithstanding, that the harvest is nearly completed, and the corn is not much injured.

SUPPLEMENTARY TABLE OF RAINFALL IN AUG., 1878.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see Met. Mag., Vol. X., p. 28., but the list is under revision.]

Div.	Station.	Total Rain.	Div.	Station.	Total Rain.
		in.			in.
II.	Acol	3·46	XI.	Castle Malgwyn	5·80
„	Littlehampton	3·37	„	Nantgwilt, Rhayader ...	8·91
„	Hailsham	4·42	„	Carno	7·50
„	St. Lawrence, I. of W....	5·72	„	Rhug, Corwen	4·65
„	Strathfield Turgiss	4·24	„	Port Madoc	5·10
III.	Addington Manor	4·97	XII.	Carsphairn	4·80
„	Oxford	5·57	„	Melrose	4·63
„	Northampton	4·41	XV.	Gruinart	4·15
„	Cambridge	3·74	XVI.	Grandtully .....	...
IV.	Sheering	4·10	XVII.	Tomintoul	4·69
„	Diss	3·77	„	Keith	6·07
„	Swaffham	4·88	XVIII.	Dalwhinnie .....	...
V.	Alderbury, Salisbury ...	3·66	„	Auchnasheen	2·52
„	Compton Bassett	4·72	„	Springfield, Tain	4·10
„	Dartmoor	8·96	„	Glenfinnan	7·98
„	Langtree, Torrington ...	5·85	XIX.	Watten	1·36
„	Cosgarne, St. Austell ...	6·66	XX.	Glenville, Fermoy	7·83
„	Taunton .....	...	„	Tralee	4·82
VI.	Bristol	4·40	„	Tipperary	4·20
„	Sansaw	5·34	„	Newcastle W., Limerick	5·58
„	Cheadle	7·91	„	Kilrush	4·06
„	Bickenhill Vicarage	6·66	XXI.	Kilkenny	4·29
VII.	Coston, Melton Mowbray	5·48	„	Kilsallaghan	5·44
„	Bucknall	7·14	„	Twyford, Athlone	5·36
VIII.	Walton, Liverpool	4·03	„	Belvedere, Mullingar ...	5·15
„	Broughton-in-Furness ..	7·07	XXII.	Ballinasloe	6·66
IX.	Stanley, Wakefield	4·90	„	Kylemore .....	...
„	Mickley, Ripon	7·05	„	Carrick on Shannon	4·10
X.	Gainford	4·89	XXIII.	Rockcorry	3·82
„	Unthank Hall	6·57	„	Warrenpoint	3·16
„	Shap	3·99	„	Newtownards ...	2·39
XI.	Llanfrechfa	8·24	„	Bushmills	6·61
„	Solva	5·16	„	Buncrana	3·29

AUGUST, 1878.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.				Days on which ·01 or more fell.	TEMPERATURE.				No. of Nights below 32°		
		Total Fall.	Differ- ence from average 1860-5	Greatest Fall in 24 hours.			Max.		Min.				
				Dpth	Date.		Deg.	Date.	Deg.	Date.	In shade	On grass.	
		inches	inches.	in.									
I.	Camden Town	6·72	+ 4·08	1·41	3	22	79·4	5	50·1	17	0	0	0
II.	Maidstone (Hunton Court)...	4·59	+ 2·39	·61	3	18	...	...	...	...	...	...	...
III.	Selborne (The Wakes).....	4·81	+ 1·63	·67	29	20	77·0	5	42·5	22	0	0	0
III.	Hitchen	5·79	+ 3·44	1·13	4	22	72·0	7, 9	44·0	24	0	...	...
IV.	Banbury	4·07	+ 1·94	·73	4	20	74·5	8	48·0	17	0	...	...
IV.	Bury St. Edmunds (Culford)...	4·28	+ 1·84	·95	24	19	77·0	5, 6	41·0	20	0	0	0
V.	Norwich (Sprowston).....	4·57	...	·59	27	22	...	...	...	...	...	...	...
V.	Bridport	3·55	+ ·96	·86	5	15	...	...	...	...	...	...	...
VI.	Barnstaple	5·62	+ 1·43	1·27	23	19	77·0	1†	55·0	2	0	...	...
VI.	Bodmin	6·39	+ 2·53	·88	22	25	75·0	19	50·0	4	0	0	0
VI.	Cirencester	4·87	+ 2·03	1·35	22	17	...	...	...	...	...	...	...
VII.	Shifnal (Haughton Hall) ...	5·12	+ 2·25	·74	5	20	75·0	9	46·0	1	0	0	0
VII.	Tenbury (Orleton)	7·81	+ 4·93	1·93	3	22	75·0	8, 14	44·5	8	0	0	0
VII.	Leicester (Town Museum) ...	6·76	...	1·78	3	22	74·8	5	46·1	1	0	0	0
VIII.	Boston	5·31	+ 3·02	·94	13	21	...	...	...	...	...	...	...
VIII.	Grimsby (Killingholme)	6·97	...	1·14	25	24	71·5	18	47·0	21	0	...	...
IX.	Mansfield	8·27	...	1·30	23	24	72·8	9, 26	43·9	1	0	0	0
IX.	Manchester (Ardwick).....	5·64	+ 2·13	·94	13	22	76·0	2	48·0	3	0	0	0
X.	York	3·99	+ 1·28	1·27	13	15	...	...	...	...	...	...	...
X.	Skipton (Arnccliffe)	7·19	+ 1·25	·80	13	26	74·0	26	42·0	25	0	...	...
XI.	North Shields	4·71	+ 1·86	·94	3	19	69·3	7	46·0	17	0	...	...
XI.	Borrowdale (Seathwaite).....	9·51	— 4·57	1·42	11	19	...	...	...	...	...	...	...
XI.	Cardiff (Crockherbtown).....	10·82	...	3·64	15	24	75·4	5	49·0	17	0	...	...
XII.	Haverfordwest	7·67	+ 2·79	2·20	4	17	74·0	1	43·0	16	0	...	...
XII.	Aberdovey	5·29	...	·82	13	19	93·0	25	52·0	17	0	0	0
XII.	Llandudno	4·46	+ ·64	1·57	13	18	78·5	5	51·2	26	0	...	...
XIII.	Dumfries (Crichton Asylum)...	3·14	— ·51	·80	30	18	78·8	1	43·0	17	0	0	0
XIII.	Hawick (Silverbut Hall).....	4·16	...	1·19	29	18	...	...	...	...	...	...	...
XIV.	Glasgow (Cessnock Park) ...	2·89	— ·79	·84	15	17	...	...	40·0	8	0	...	...
XVI.	Mull (Quinish)	3·14	...	·74	11	14	...	...	...	...	...	...	...
XVI.	Loch Leven	3·90	+ ·22	·80	17§	13	...	...	...	...	...	...	...
XVI.	Tyndrum (Ewick) .....	...	...	...	...	...	...	...	...	...	...	...	...
XVII.	Arbroath	4·78	+ 1·55	·98	6	19	72·0	18	51·0	17†	0	...	...
XVII.	Braemar	7·85	+ 4·01	1·70	15	21	77·0	2	34·8	23	0	1	1
XVIII.	Aberdeen	3·71	...	·88	15	25	73·1	1	46·4	18	0	0	0
XVIII.	Gairloch	2·51	...	1·02	7	13	...	...	...	...	...	...	...
XVIII.	Portree	3·51	— 3·94	1·56	7	14	...	...	...	...	...	...	...
XIX.	Inverness (Culloden)	4·42	+ 1·17	1·10	16	19	72·9	1	44·9	23	0	0	0
XIX.	Dunrobin	3·06	+ ·60	·60	15	19	73·5	4	44·0	12	0	...	...
XX.	Sandwick	1·40	— 2·31	·28	10	13	69·5	1	41·4	20	0	0	0
XX.	Caherciveen Darrynane Abbey	6·46	...	1·00	21	28	...	...	...	...	...	...	...
XX.	Cork	7·07	...	1·50	23	19	...	...	...	...	...	...	...
XXI.	Waterford .....	...	...	...	...	...	...	...	...	...	...	...	...
XXI.	Killaloe	4·75	— ·18	·71	13	20	83·0	1	46·0	28	0	...	...
XXI.	Portarlington	3·60	— ·90	·60	13	24	75·0	1	47·0	27	0	...	...
XXII.	Monkstown, Dublin	6·22	+ 3·01	1·75	13	22	...	...	...	...	...	...	...
XXII.	Galway	6·14	...	1·15	13	24	80·0	2	49·0	12	0	...	...
XXIII.	Waringstown	3·52	...	·63	7	19	79·0	3	45·0	16	0	0	0
XXIII.	Edenfel (Omagh)	3·57	...	·68	26	19	76·0	1	44·0	16§	0	...	...
XXIII.	Ballyshannon	3·87	...	·50	7*	16	...	...	...	...	...	...	...

* And 13, 27.

† And 6, 7, 10.

‡ And 23.

§ And 18.

§ And 31.

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

METEOROLOGICAL NOTES ON AUGUST.

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.

SELBORNE.—Much T on the 3rd; a man at work near my house fell down, either struck by L or from fright. I never witnessed such vivid L or heard so loud a clap of T before. The harvest much retarded by the wet weather during the last half of the month, and the wheat somewhat injured.

BANBURY.—Thunderstorms on 3rd, 4th, 10th, 23rd, and 30th.

CULFORD.—Easterly winds prevailed during 15 days; TSS were frequent, and that of the 30th was remarkably severe. The rainfall (upwards of $4\frac{1}{2}$ in.) was much above the average. Average temp., $60^{\circ}5$.

SPROWSTON.—An excessively wet month, with a great deal of T. Harvest operations much delayed, and corn secured in very bad order.

BODMIN.—Average temp., $64^{\circ}6$. Rainfall, 2.19 in. above the average of 29 years.

SHIFNAL.—R almost daily till the 17th, and from the 26th to the end. Harvest, which commenced early in the month, sadly impeded and much damage done, especially to the cut barley. The wettest August since 1860, when 5.58 in. fell. Wasps increased rapidly by the 7th, and were most destructive even to the half-ripe fruit. Swifts gone by 10th. Few butterflies seen, and not one clouded-yellow after the strange influx of that rare sort last August.

ORLETON.—The temp. of the month was even, and about half-a-degree below the average. Rainfall excessive. The only months during the last 48 years in which the rainfall amounted to 7 in. were—July, 1834, 9.23 in.; September, 1852, 7.07 in.; November, 1852, 8.22 in.; June, 1860, 7.25 in.; September, 1871, 7.25 in.; so that the fall of this month 7.81 in. has only been exceeded twice in the last 48 years. On the afternoon of the 3rd, during a great TS, 1.91 in. of R and H fell in four hours; a few miles E. and S.E. the fall was greater. Again on the 22nd and 23rd, 2 in. fell in 24 hours, and in consequence the river Teme was level full. The weather was generally very showery, and distant T was frequently heard; but there were a few bright days. The bar. was generally low and steady and the movement of the air light, except on the 17th and 28th, when the wind was rough.

LEICESTER.—Thunderstorms frequent.

KILLINGHOLME.—A disastrous month, the wettest during the last 12 years. Very little corn carried, though most of it has been cut. Potatoes more free from disease than could have been expected. TSS on 11 days. Wheat harvest general by the 8th.

MANSFIELD.—Thunderstorms on the 4th, 6th, 24th, and 30th; those of the 6th and 30th being severe.

ARDWICK.—A month of unsettled weather, unusually wet and sometimes cold. Two or three TSS, but not very severe.

NORTH SHIELDS.—Thunderstorms on four days.

SEATHWAITE.—Rainfall below the average; only two days on which the fall exceeded 1.00 in.

WALES.

HAVERFORDWEST.—A very warm, fine month; T and L very frequent, and in some places severe storms. Three heavy rainfalls took place, two exceeding 1.00 in. and one exceeding 2.00 in. All green crops looking remarkably well; abundance of grass: few remember so much at this time of year. Although the weather has been trying owing to so much R, the harvest operations have not been seriously interfered with or the crops much injured. Ther. at or above 70° on 13 days, few nights below 55° .

ABERDOVEY.—The month was on the whole favourable for harvest operations. Heavy R occasionally from 9th to 16th. T on 29th.

LLANDUDNO.—A wet but warm month. Mean temp. $1^{\circ}5$ above the average. The temp. was tolerably equable, but the winds were variable both in strength and direction. A heavy gale on the night of the 3rd, and a heavy rainfall on that of the 13th, when 1.57 in. fell.

SCOTLAND.

HAWICK.—A very good harvest month, and much corn secured in fine order. The turnips are looking beautiful, and potatoes keeping clear of disease. The heavy rains of the last three days freshened up the pastures, which were much parched.

CESSNOCK PARK.—Distant T on 7th, 25th, and 28th.

QUINISH.—Showery broken weather from 6th to 12th. Hot and moist from 25th to 30th. Rest of month very fine and warm.

ARBROATH.—Rainfall two inches above the average of the last 36 years. TS on 7th.

BRAEMAR.—A very wet month. L on 12th and 13th.

ABERDEEN.—A rather dull month, with temp. a little above the average. Mean temp. $57^{\circ}3$. Rainfall 0.55 in. above average of 21 years. T and L on 8th.

DUNROBIN.—The month was, on the whole, favourable for all kinds of crops.

SANDWICK.—A pleasant month. The R was not half the average of the previous 37 years. Since the 24th the weather has been hazy, with very few gleams of sunshine. All kinds of crops are above the average, and reaping has begun.

IRELAND.

DARRYNANE ABBEY.—The wettest August for the last nine years. As a consequence, the hay and corn harvests are very backward; indeed, as a rule, the oat crop is destroyed. Potatoe crop also very bad.

KILLALOE.—T and L frequent, particularly on 27th. R heavy, and delayed harvesting.

WARINGSTOWN.—A very fine month on the whole, though the first fortnight was showery. All crops unusually good.

EDENFEL.—Although the rainfall was large, the weather was, on the whole, very favourable, and by the end of the month the most abundant harvest for many years was in full operation.

BALLYSHANNON.—The month was warm and favourable for harvest work. The crops are all good, and this year promises to be a cheap and plentiful one for the different agricultural products.

THE WEATHER IN AUGUST.

For the first three days in August there was a nearly general fall of the barometer. On the 2nd the readings were highest in the north and lowest in the south. A depression moving northward across France on the 2nd, had its centre on the 4th over the south of England, the Netherlands, and the north-east of France. The next day it was moving in a westerly direction to the south of Ireland, where it disappeared. After this mercury began to rise, and on the 9th was uniformly high over Germany, France, and England, but was beginning to fall somewhat decidedly in the west of Ireland and over the Bay of Biscay; this fall became more brisk on the 10th, 11th, and 12th, when numerous depressions appeared in the west, moving east-north-eastward. On the 10th a primary depression advanced north-eastwards from the Atlantic

towards Scotland, and a small secondary one was travelling in a similar direction across England, followed by a temporary rise of the barometer. During the first ten days of the month, the weather was mild, but dull, very showery, and marked by frequent and severe thunderstorms in most parts of the United Kingdom. The wind was for the most part very changeable; breezes from opposite points of the compass succeeded each other very quickly.

During the next period (12th to 17th) the weather was exceptionally wet and unsettled. The barometer was continuously highest over France and the Bay of Biscay, and several depressions passed over us, bringing with them, not only heavy falls of rain, but in some cases (*e.g.*, between the 12th and 14th) very strong winds and gales from south-west and west. Thunderstorms were frequent and severe; temperature was rather low and the barometer very unsteady. On the 15th the barometer was high both in the south and north, low in the west, and falling. New depressions advanced towards Ireland during the night, the old ones disappearing over the Baltic and Russia. The following day a well-defined pear-shaped depression crossed over England in an east-north-easterly direction, the barometer rising generally in its rear. On the 17th this depression was over Denmark and the south of Norway. A very small shallow disturbance passed near our extreme west and north-west coasts in the day time, but soon dispersing or travelling away northwards.

From the 17th to 22nd no important change occurred. The weather was fine in some places in these islands, but was dull and cloudy over most parts of the Continent.

On the 22nd the centre of a well-formed and rather deep depression arrived off the south of Ireland from the S.W., making gradients rather steep for south-easterly winds in the S.W. In the N.E. the barometer still rose, and an area of high pressure lay over the North Sea, and a smaller one over the south of France. On the following day the depression had advanced to the mouth of the English Channel, where it dispersed; and a secondary depression travelled across France, lay near the Isle of Wight. On the 24th this depression became much larger (but no deeper), spreading over all these islands and apparently had two or three centres. Pressure was very irregularly distributed to the westward of these islands, while a higher barometer (30.1 in.) was reported from the northern parts of Scandinavia, and rather lower readings from the south of France. The weather was consequently very unsettled: a heavy fall of rain (0.6 to 0.8 in.) occurred in France; at Valentia 0.60 in. fell, and smaller amounts in London and elsewhere.

On the 27th the barometer rose somewhat decidedly in the south, whilst it fell over Scandinavia, and the region in which so many irregularities in pressure were noticed, lay considerably to the northward of the position it had recently occupied. A fresh fall of the barometer was in progress at Valentia, but this lasted a very short time, the mercury again rising more than a quarter of an inch during the day. On the 28th a further rise was reported from all parts of our islands and France, and a further fall in Sweden, while in the north pressure continued to be very irregularly distributed. The weather became fine generally over these islands, though no considerable increase of temperature took place.

On the 29th a small well-formed depression reached the mouth of the St. George's Channel from the Atlantic; and travelled suddenly to the east-north-eastward till it lay over Cambridgeshire on the 30th, while another depression crossed the north of these islands and lay off the Northumberland coast. By the 29th the weather had again become very unsettled over the United Kingdom, and thunderstorms prevailed in our southern counties. Large quantities of rain fell over our islands and Holland, the largest amounts being 1.4 in. at Scilly, 1.1 in. at the Helder, and 0.9 in. at Greencastle, Oxford, and Cambridge.

H. E. M.