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CCCCVI.]

NOVEMBER, 1899.

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THE BRITISH ASSOCIATION AT DOVER.

THE pressure on our space compelled the omission of our usual notice last month, and necessitates considerable abridgement in the following note :—

There were five reports and nine papers distinctly meteorological or magnetical, and several of the papers read in the Geographical Section also bore upon the subject. We purpose giving the titles of all the strictly meteorological papers, and notes upon them where we are able.

Climatology of Africa.—Eighth report, prepared by the Chairman, Mr. E. G. RAVENSTEIN.

Meteorological returns have reached your Committee, in the course of last year, from forty stations in Africa.

Niger Territories.—One year's observations from Old Calabar have been received from Mr. E. G. Fenton, the medical officer. We regret that no information respecting the interior of the country has become available.

British Central Africa.—The scientific department, under the zealous direction of Mr. J. McClounie, is now in full working order, and full reports have been received for two stations of the second order, namely, Zomba on the highland, and Fort Johnston on the Lake Level, and also reports, more or less complete, from twenty-two other stations. Mr. McClounie hopes to be able, in the course of the present year, to equip two more stations of the second order, namely, Chinde on the coast, and another station on the lake. He has attempted to make two-hourly observations on term days, but as the exposure in the morning air resulted in fever, he has given up the attempt.

We have, in addition, received three years' registers for Lauderdale, from our most faithful correspondent, Mr. John W. Moir, as also fifteen months' record from Kambole, a station of the London Missionary Society, near the southern extremity of Tanganyika. The observer at the latter place is Dr. James F. Mackay.

British East Africa.—Returns from eight Government stations have been received. These returns are, of course, most welcome, and they speak well for the zeal of Mr. Cranford and the officers working under him ; but considering the practical importance of meteorological work, it is much to be desired that something should be done. Let us hope that the satisfactory working of a

“Scientific Department” in the South African Protectorate may induce the authorities to organise a similar institution for East Africa and Uganda. As a proof of the high value placed upon work of this kind in the neighbouring German Protectorate, we may state that a professional meteorologist has been appointed as inspector, and that there are now at work twenty-six stations, including two of the first, and seven of the second, order.

We are likewise in receipt of rainfall observations made by the Rev. R. M. Ormerod at Galbanti, on the Tana river.

The old Scottish Missionary Station at Kibwezi has been abandoned, and the missionaries have removed to a new station in Kikuyu, whence three months' observations have already been forwarded.

Uganda.—The valuable observations on the level of the Victoria Nyanza have been resumed since the suppression of the mutiny.

Mr. C. M. Hopley has forwarded two years' record of the rainfall at Mumia's, the headquarter station of Kavirondo.

Meteorological Observations on Ben Nevis.—Report drawn up by Dr. A. BUCHAN, F.R.S.

The hourly observations at the two observatories, *i.e.*, on Ben Nevis and at Fort William, have continued without any interruption. It is earnestly to be hoped that they will still continue, as there is no first-class observatory of which as much can be said. Want of funds seriously threatened the service two years ago, and it is only by private munificence that Mr. Angus Rankin and his assistants and volunteers, are enabled to carry on the work. The mean barometric difference between the two stations is 4·552 in.; it varies very little. The absolute extremes of temperature are remarkable. On September 6th, 79°·7 was registered at Fort William and 62°·6 on Ben Nevis; this was very late in the season, and occurred during anticyclonic weather. The greatest cold at Fort William (21°·1) occurred on November 29th; on Ben Nevis the extreme was 9°·6, on February 20th. Once, on December 8th, the dew point fell below zero, to —6°·5. The mountain got 17 per cent. of the possible sunshine, Fort William 36 per cent. The mean hourly wind velocity on the top was 14 miles, the maximum being 27 miles in October, and the minimum 6 miles in July, the lowest value ever recorded. The rainfall, 240·05 in., also beats all records; December alone had 43·65 in., but the heaviest, almost tropical fall of 5·39 in. was on November 2nd. Fort William was, with 106·5 in. of rain, only 38 per cent. above average, whilst Ben Nevis exceeded the average by 59 per cent. Aurora was observed on thirteen nights; St. Elmo's fire on seventeen; of thunderstorms there are only four records; solar halos were seen on nineteen days, and lunar halos on five.

Meteorological Photography.—Report drawn up by Mr. A. W. CLAYDEN, M.A.

This Committee is practically a one-man Committee, and as Mr. A. W. Clayden has been unable to give so much attention to the work as in former years, there was only a short report. Some rare types of clouds and narrow ribbon streaks of lightning have been photographed. A narrow flash, seen at Exeter on July 22nd, lasted almost two seconds and broke up into sparks; it was not photographed, but well observed, and would explain the beads of bright light, noticed on certain photographs. Lightning seems frequently to

occur under the following conditions :—A lower cumulus cloud disc spreads out again from the middle to a higher cirriform disc. Discharges begin to play between the margins of the two discs, and then follows a discharge between the lower disc and the earth, corresponding to Lodge's impulsive discharge ; these discharges go together with heavy rains, and may have something to do with the dissociation of water.

Seismological Committee.—Report drawn up by Prof. MILNE, F.R.S.

The Report stated that as the British Association was now receiving co-operation from a number of observatories in foreign countries it was desirable that a central seismological laboratory should be established, at which earth movements could be recorded and analysed in relation to the corresponding registers received from abroad.

At Prof. Milne's station in the Isle of Wight, notwithstanding serious difficulties arising from the darkness and dampness of the room in which the instruments were placed, he had succeeded during the past year in recording 103 earthquakes. Over 70 per cent. of the Isle of Wight records are repeated in the register from Kew ; 58 to 65 per cent. of them were common to Nicolaiew, Potsdam, and Trieste ; and 56 per cent. to Victoria in British Columbia. From the times at which disturbances reached these and other observatories it had been possible to locate the centres from which they had originated. In many instances these were shewn to be sub-oceanic, and whilst they give evidence of geological activity on ocean beds they promise to indicate localities which it would be unwise to cross with telegraph cables.

A curious feature occasionally exhibited in a collection of seismograms referring to the same earthquake is that the large waves may be less in amplitude at a station near their origin, than they are at stations more remote. For example, an earthquake originating in Japan, crossing beneath the Pacific to Victoria, B.C., may yield a smaller diagram at that place than the one obtained in the Isle of Wight at double the distance. In this latter case the large waves swept over the free surface of two continents. The inference is that oceans exert a damping influence upon undulations of their beds. This possibly explains why seismograms from Mauritius show small amplitude.

The large waves, which appear to be surface waves, travel with a velocity that is practically constant. The preliminary tremors, however, although they out-pace the large waves at a constant rate near to an origin, have an average velocity practically proportionate to the square root of the average depth of the chord joining the earthquake centrum and the distant station. Taking this observation as the foundation for the assumption that the square of the speed is a linear function of the depth, Dr. C. G. Knott arrives at the result that the square of the speed increases 0.9 per cent. per mile of descent. Assuming that the waves are compressional, and that the density of the earth increases uniformly towards its centre, then the co-efficient of its elasticity increases at a rate of nearly 1.2 per cent. per mile of descent.

One of the last sections in the Report referred to what Mr. Milne provisionally called Earthquake Echoes. As an earthquake dies, it does so by a rhythmical succession of similar movements, which are more suggestive of surgings following reflections than of a spasmodic settlement of disjointed strata. The first of these surgings often appears about five minutes after the chief shock, and this, but on a continually decreasing scale, may be repeated many times before the earthquake has ceased.

Solar Radiation.—Report of the Committee.

It was stated that the instrument designed by Prof. Balfour Stewart, F.R.S., and constructed by Mr. Casella for the Committee (many years since) has now been placed in the hands of Prof. Callendar, F.R.S., for comparison with his own pattern of Solar recorder.

Recent Magnetic Work in N. America—by Dr. L. A. BAUER.

No abstract received.

Seismology at Mauritius—by T. F. CLAXTON, Director.

A Milne seismograph was established at Mauritius Observatory in September, 1898. The diurnal waves are of greater amplitude than at any other station. Rapid changes in the vertical have been observed on a good many occasions; on December 5th the boom went out of range after an easterly movement, due to heavy rains at the spot and to the west of it. A gradual change in the vertical is also going on. Air tremors occur every night, dying away at sunrise; they are not sufficiently explained. The amplitudes of earthquake records are disappointingly small.

The Hydro-Aerograph—by F. NAPIER DENISON.

The author has for some years been studying the fluctuations of large bodies of water in their relation to atmospheric pressure, and has constructed excellent apparatus for obtaining automatic records. A brief reference to his work will be found in *Meteorological Magazine*, Vol. xxxii. (1897), p. 74. Mr. Napier Denison has now, we are glad to say, been placed (by Mr. Stupart, the Director of the Canadian Meteorological Service) at Victoria, British Columbia, at the head of what we suppose may be defined as a westernmost look-out station for the Canadian service—something like what we have always thought that Valentia ought to be. Finding himself there, charged with responsibilities as to forecasting and the preparation of weather maps, Mr. Denison has put up a new recorder, and has already succeeded in getting curves which we take to be the instrumental representations of the “calling of the waves,” which are often useful monitors on our own coasts. We wish him great success.

Of the following papers we have no abstracts, but we add a word or two respecting some of them:—

H. N. DICKSON.—The Temperature and Salinity of the Surface Water of the North Atlantic during 1896 and 1897.

We believe that this paper did not differ materially from that recently read by the author before the Royal Meteorological Society.

J. HOPKINSON.—The Rainfall of the S.E. Counties of England.

This was a compilation from *British Rainfall*, similar to that for the S.W. of England, mentioned on p. 151 of our last volume.

Dr. van RIJCKEVORSEL.—On some connection between Sun-spots and Temperature.

A. L. ROTCH.—Progress in Exploring the Air with Kites.

A. L. ROTCH.—On the First Crossing of the Channel by a Balloon.

Dr. G. SCHOTT.—Oceanographical and Meteorological Results of the German Deep Sea Expedition in s.s. *Valdivia*.

HEAVY RAINFALLS, AUGUST & SEPTEMBER, 1899.

To the Editor of the Meteorological Magazine.

SIR,—With reference to Mr. Lucas's letter in the *Meteorological Magazine* for October, p. 144, I send the following falls of over one and a half inches which occurred in Northamptonshire during August and September. On August 15th—

	ins.		ins.
Ravensthorp Water Works ...	1·64	Sedgebrook.....	1·61
Great Brington	1·75	Aldwinckle St. Peter	1·58
Althorp	1·68	Oundle.....	1·83

Of the last-named, 1·63 in. fell between 6.0 and 6.30 p.m.

On September 6th and 7th the fall was—

	ins.	ins.		ins.	ins.
	6th.	7th.		6th.	7th.
Berrywood	1·90	·20	Kingsthorp	1·52	·26
Sedgebrook	2·48	·50	Oundle	·45	1·90

Yours truly,

FRED. COVENTRY.

The Vale, Ketton, Stamford, October 19th.

[See also *ante* p. 122.—ED.]

METEOROLOGICAL EXTREMES: II.—TEMPERATURE.

ON p. 132 of our last number we gave, on the high authority of the late Mr. Blanford, 120°·9 as the maximum for Jacobabad. We have just found a letter (to which we could not reply because we could not read the signature) in which were enclosed the Indian Weather Tables for June 10th and 12th, 1897, giving maxima for Jacobabad of 122°·5 and 123°·5 respectively. Of course Mr. Blanford could not, in 1889, know what was going to occur eight years later.

SMOKE-FOG AND MAXIMUM TEMPERATURE.

To the Editor of the Meteorological Magazine.

SIR,—The effect of smoke-fog in modifying the temperature of our large towns and surrounding districts during calm anticyclonic weather is well known, but the following instance is so remarkable that I think it worthy of record.

From Wednesday to Friday, October 18th to 20th, a dense black fog enveloped the cities of Leeds and Bradford, and the Aire valley from Keighley downwards. It was particularly bad on Friday, October 20th, the atmosphere then being perfectly calm. In the Bradford district the sun never penetrated the smoke-fog, and it was almost as dark as night the whole day.

At Ilkley, 9 miles N.N.W., there was a sharp frost in the morning (min. 28°·4 in Stevenson Screen), and at 8.30 a.m., when I left for Bradford, the sun shone brightly.

As usual on such mornings, I entered the fog on reaching the Aire valley near Shipley.

During the afternoon I went by rail from Bradford to Lancaster, and at about 4.15, when travelling between Shipley and Bingley (4 miles from the centre of Bradford), in the *bottom* of Airedale, I noticed that the thick hoar frost or rime on the trees, grass, etc., remained still unmelted, showing conclusively that the max. temperature during the day had not exceeded 32° . This was, perhaps, not to be wondered at, considering the darkness in the valley. (On the hills above it was brilliantly sunny all day, with a cloudless sky). On passing Bingley the hoar frost disappeared except in the shadows of hedges, walls, etc., showing that the sun had there penetrated the fog at some time during the day.

This state of things continued as far as Keighley. Beyond Keighley the frost entirely disappeared, and the fog rapidly diminished. After passing Skipton and leaving the smoky towns behind, the clear blue sky became visible.

The following day I went on to Garstang, a place situated in pure country, 10 miles S. of Lancaster, where I learned that Friday there had been a day of summer-like weather and temperature, the max. having reached $66^{\circ}\cdot 2$ in Stevenson Screen, or about 34° higher than at Bingley! The distance in a straight line from Bingley to Garstang is 39 miles.

Yours truly,

ALBERT WILSON.

4, Eaton Road, Ilkley, October 24th, 1899.

WONDERFUL STORY OF A THUNDERBOLT!

DEEPIING ST. JAMES.—During the storm on Sunday week, October 1st, between 5 and 6 o'clock, a thunderbolt fell down the chimney of a house occupied by Mrs. Atkin, near Deeping St. James station. In its passage it grazed the side of Mrs. Atkin's head, leaving a bad scar, and passing out by the open door it exploded in the road, burning fiercely.—*Stamford Post*, October 13th, 1899.

This is a fine specimen of the power of imagination. We accept as facts—(i.) that there was a thunderstorm; (ii.) that the chimney was struck; (iii.) that Mrs. Atkin's head was grazed. But we do not believe in the fall of a "thunderbolt" inasmuch as no such thing has ever been found. Possibly some portion of a brick from the chimney may have been knocked down and so wounded the lady, and as to the final story, the only explanation which occurs to us is that perhaps the discharge scattered the coals in the grate. The only "burning" thunderbolt we ever heard of was the chemical one manufactured by a sprightly youth at Notting Hill, for the express purpose of "taking in" the public—in which he was very successful. See *Quar. Jour. Roy. Met. Soc.*, Vol. XIV., p. 208. We wish that someone in the neighbourhood would ascertain precisely what happened.

DEFINITIONS OF DROUGHT.

To the Editor of the Meteorological Magazine.

SIR,—The suggestion of Mr. H. A. Boys in your issue for August, p. 101, is a reasonable one—that for a “protracted drought” (or any other) the allowance of rain per diem should be on a sliding scale. I have always thought that the definition of drought which appears to be thus far accepted is defective in this respect; for example, this spring we had a drought which has only *once* been exceeded in the over 39 years of my record—it was May 24th to June 17th inclusive, a period of 25 days with only .01 in. of rain. Yet this does not come into the record as a drought at all, being neither an “absolute” nor a “partial drought,” for the .01 in. so fell that there were but 14 consecutive days rainless. Yet surely such a drought is greater than one lasting 29 days with .29 in. of rain, which would be recorded as a “partial drought.” The one occasion on which the late drought was exceeded was 1893, March 18th to April 14th, 28 days, with .01 in., on which occasion there was an “absolute drought” of 19 days. It is true the drought this spring would not be so prejudicial as it might have been on account of the excessive rain which preceded it (3.22 in. in 16 days).

We have since had a partial drought, .32 in. in the 35 days ending August 26th, again, fortunately, following a rainy period.

Yours truly,

T. W. BACKHOUSE.

A COMPASS PLANT.

To the Editor of the Meteorological Magazine.

SIR,—In the September number, at p. 114, there is a short note on “A Compass Plant” that should be explained more fully. This is the *Silphium laciniatum*, one of the compositæ, and is also called Pilot weed, Polar plant, Rosin weed, and so on. It is 3 to 6 feet tall, rarely 11 feet, and has lower radicle leaves 12 to 30 inches long. These leaves in a strong plant, fully exposed on the prairie, will stand erect with their faces toward the east and west, thus having their edges toward the north and south. In the blackest, stormy night, one can feel the edge of the leaf and thus determine the true north. A singular fact in this connection is, that, when planted in a garden, it seems to lose this directive tendency, but the peculiar position of the leaves on the open prairie has been attested by a host of competent observers.

H. A. HAZEN.

September 25th, 1899.

FLOOD IN CAPE TOWN.

WE have been favoured by Mr. Stokes, of Apsley House, Margate, with a copy of the *Cape Times* for August 16th, 1899, giving 15 excellent photo-engravings of the flood in Cape Town, and in the Worcester and Wex River district on August 6th. The streets of Cape Town appear to have had about a foot of water, and outside the town a tramway track and the railway, at more than one place, were washed away. It always seems to us a pity that such volumes of water should be allowed to run to waste, especially now that persons are realising the value of water both for its own sake and because of the power which could be extracted from its fall.

The following are all the data respecting the rainfall which we found in the *Cape Times* :—

	Royal Observatory. in.	Wynberg Hill. in.	Table Mountain. in.
July 31	..... '40		
Aug. 1	..... '63	..... ..	..... '79
„ 2	..... 1·82	..... 2·64	..... 2·18
„ 3	..... '18	..... ..	..... '79
„ 4	..... '00		
„ 5	..... '71		
„ 6	..... 1·57		
Total	..... 5·31		
Total, 1st to 10th...		7·58	

REMARKS.

Royal Observatory.—On August 2nd, 1·31 in. fell between 1 and 4 p.m. ; and on 6th, 1·25 in. fell between 10 a.m. and noon.

Wynberg Hill.—This heavy rain was badly needed. In 1898 between January 1st and August 31st, 42·63 in. fell ; the total in 1899 up to date is only 27·60 in., whereof July contributed very little : less than half what fell in 1898.

Table Mountain.—This rainfall of 2·97 in. raised the depth of water in the Woodhead reservoir 24 ft. 5½ in., and this report does not include any record of the further effect produced by the subsequent storm of August 6th.

Another account gives the following details as to the fall on the 6th. Apparently it is the Royal Observatory record differently divided :—

August 6—1 a.m. to 8 a.m.	'70 in.
„ 6—8 a.m. to 10.45 a.m.	'85 „
„ 6—10.45 a.m. to 11.25 a.m.	'72 „

This rain, though heavy, does not seem one which should have caused so much damage, and there seem to be two explanations—(1) the fall may have been much greater in other parts than at the Royal Observatory : (2) the channel provided is not large enough.

A WET PERIOD, OCTOBER & NOVEMBER, 1899.

To the Editor of the Meteorological Magazine.

SIR,—The rainfall at Hazelhurst has recently been exceptionally heavy. I give the daily record :—

<table style="width: 100%; border-collapse: collapse;"> <tr><td>Oct. 26 ...</td><td>·25 in.</td></tr> <tr><td>„ 27 ...</td><td>1·10 „</td></tr> <tr><td>„ 28 ...</td><td>—</td></tr> <tr><td>„ 29 ...</td><td>·61 „</td></tr> <tr><td>„ 30 ...</td><td>·04 „</td></tr> <tr><td>„ 31 ...</td><td>—</td></tr> <tr><td>Nov. 1 ...</td><td>·09 „</td></tr> <tr><td>„ 2 ...</td><td>·63 „</td></tr> </table>	Oct. 26 ...	·25 in.	„ 27 ...	1·10 „	„ 28 ...	—	„ 29 ...	·61 „	„ 30 ...	·04 „	„ 31 ...	—	Nov. 1 ...	·09 „	„ 2 ...	·63 „		<table style="width: 100%; border-collapse: collapse;"> <tr><td>Nov. 3 ...</td><td>2·11 in.</td></tr> <tr><td>„ 4 ...</td><td>·78 „</td></tr> <tr><td>„ 5 ...</td><td>1·45 „</td></tr> <tr><td>„ 6 ...</td><td>·04 „</td></tr> <tr><td>„ 7 ...</td><td>·78 „</td></tr> <tr><td colspan="2" style="text-align: right; border-top: 1px solid black;">7·88 „ in 13 days.</td></tr> </table>	Nov. 3 ...	2·11 in.	„ 4 ...	·78 „	„ 5 ...	1·45 „	„ 6 ...	·04 „	„ 7 ...	·78 „	7·88 „ in 13 days.	
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The first five days of November averaged just over 1 inch per day. During the twenty-six* years, 1873 to 1899, there have been seven instances of 2 inches or more falling within twenty-four hours. The 2·11 in. of November 3rd, began at 4 p.m. on that day, and ended at 8 a.m. on the 4th; but the rain was practically continuous until 9 a.m. on November 6th, a period of 65 hours, during which 4·38 in. fell.

There was also a fall of 1·49 in. on October 1st.

Yours faithfully,

T. P. NEWMAN.

Hazelhurst, Haslemere, Surrey, Nov. 9th, 1899.

[Several other correspondents have sent us their records for the early part of November, and from them we have compiled the following table :—

COUNTIES.	STATIONS.	NOVEMBER				4 Days. in.
		2nd. in.	3rd. in.	4th. in.	5th. in.	
<i>Middlesex</i> .	Staines (Knowle Green)	·67	1·42	·09	1·22	3·40
„	Camden Square	·30	1·36	·30	1·30	3·26
<i>Surrey</i>	Haslemere (Hazelhurst)	·63	2·11	·78	1·45	4·97
„	Chiddingfold	·43	1·62	·59	1·67	4·31
„	Farnham (Great Down, Seale)	·46	1·45	·57	1·30	3·78
„	Guildford (Epsom Road)	·40	1·34	·52	1·35	3·61
„	Frimley (Ridgemont)	·36	1·44	·68	1·27	3·75
<i>Sussex</i>	Burgess Hill (Silverdale Road)	·76	·57	·42	2·19	3·94
<i>Hants</i>	Botley (Curdridge).....	·39	1·73	·62	1·31	4·05
„	Crondall (Warren Corner) ...	·38	1·58	·70	1·30	3·96
<i>Bucks</i>	Slough (Upton)	·21	·91	·47	·95	2·54

* As the Hazelhurst record did not commence until 1888, we believe that the earlier years are from the Lower Street record.—ED.

THE MOON AND THE WEATHER.

To the Editor of the Meteorological Magazine.

SIR,—In opposition to Prof. Hazen, I think we may have strong and convincing evidence of a connexion between two sets of phenomena, while unable, *a priori*, to comprehend the *how* satisfactorily; (take, *e.g.*, the case of sunspots and the magnetic needle).

Prof. Hazen's statement as to the effect of the moon on the barometer, I cannot think exhaustive of what may fairly be said to be known on the subject; still less, of all that is discoverable. Nature is apt to have surprises for those who shelve a subject as being thoroughly understood.

Curiously, just after reading the confident letter in which Mr. Dines tells us what the moon can and cannot do, excluding, *inter alia*, any electrical effect, I found in the *Meteorologische Zeitschrift*, that two able meteorologists, Ekholm and Arrhenius, had been arguing in the Swedish Academy, on a comprehensive basis, that the moon has an influence both on polar lights and on thunderstorms. It is further curious to discover that Prof. Hazen believes in the moon's influence on thunderstorms. In a paper to *Popular Science*, New York,* he says: "There seems good evidence to show that there are more thunderstorms during new than full moon."

Now I confess I find it difficult to understand, *a priori*, how the dead moon can have anything to do with thunderstorms; but I should not thereby be deterred from believing in such influence if a sufficient correspondence has been made out. Prof. Hazen, however, cannot have been, or at least *remained*, in such difficulty. On his own showing, moreover, the moon cannot here act either through pressure or temperature. Is it then a direct electrical effect, or what? Perhaps the professor would kindly say by what *a priori* reasoning he was able to supplement, in this case, as required, the results of observation.

Again, certain definite temperature changes usually accompany thunderstorms. If, then, the moon gives us more thunderstorms at one time than another, can it be truly said that she has no influence on temperature?

Yours faithfully,

ALEX. B. MACDOWALL.

* Given in *English Mechanic*, October 20th.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MAY, 1899.

STATIONS. <i>(Those in italics are South of the Equator.)</i>	Absolute.				Average.				Absolute.		Total Rain.		Aver. Cloud.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
London, Camden Square	74·2	31	34·4	5	63·3	43·9	43·1	72	120·4	29·2	1·38	12	5·4
Malta	84·3	25	54·3	4	74·7	60·1	58·0	75	150·0	48·7	·00	0	1·8
<i>Cape of Good Hope</i>	82·9	22	36·1	26	69·4	49·2	47·1	80	...	...	3·48	7	3·0
<i>Mauritius</i>	82·3	3	60·3	31	78·0	68·2	64·5	76	153·6	52·0	1·73	11	5·7
Calcutta	104·9	8	70·4	10	95·9	78·6	77·5	76	153·8	69·8	9·65	9	6·0
Bombay	92·2	28	77·9	1	90·5	81·2	75·5	72	138·5	72·7	·08	2	3·5
Ceylon, Colombo	92·2	2, 5	70·5	20	88·8	77·3	75·9	83	148·8	66·5	17·73	20	5·5
Melbourne	70·0	2	35·9	29	59·8	45·9	46·0	79	128·2	32·1	3·54	13	6·6
Adelaide	76·7	13	39·9	29	64·9	48·5	46·1	72	134·0	31·4	2·36	11	4·2
Sydney	72·0	3	44·3	24c	63·8	51·3	46·3	78	117·8	35·0	6·82	10	3·4
Wellington	65·0	6	37·0	11	55·5	45·9	42·3	74	115·0	30·0	6·87	26	5·3
Auckland	73·0	7	41·0	29	61·3	48·8	43·9	67	125·0	33·0	2·98	15	5·0
Trinidad	95·0	9a	66·0	Sev.	93·2	69·4	70·1	72	169·0	60·0	·52	5	...
Grenada	86·0	8b	73·0	24d	83·9	74·5	67·9	67	150·8	...	·49	9	1·5
Toronto	80·0	2	32·9	15	64·7	45·9	46·4	72	101·4	28·0	3·29	12	5·7
New Brunswick, Fredericton	77·7	25	30·0	6	63·0	38·1	35·4	50	...	...	2·64	10	4·6
Manitoba, Winnipeg	76·4	9	21·0	13	62·0	39·0	...	71	...	...	2·20	10	6·6
British Columbia, Esquimalt	...	...	...	...	...	...	...	...	...	...	...	...	...

a—and 23. b—and 25. c—and 27. d—and 28, 29.

REMARKS.

MALTA.—Adopted mean temp. 65°·9, or 1°·9 above average. Mean hourly velocity of wind 8·7 miles, or 1·4 below average. Mean temp. of sea 68°·4. L on 2nd.

J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·1 and of dew point 0°·2 above, and rainfall 2·60 in. below, their respective averages. Mean hourly velocity of wind 9·8 miles, or 0·5 below average; extremes, 26·2 on 21st and 2·0 on 28th; prevailing direction S.E., and variable. L on 3rd; T on 4th and 7th.

A. WALTER.

CEYLON, COLOMBO.—Mean temp. of air 82°·4, or 0°·1 below, of dew point 0°·8 above, and rainfall 5·84 in. above, their respective averages. Mean hourly velocity of wind 9·9 miles; prevailing direction S.W. Max. velocity on 14th, 25 miles per hour, for 45 minutes. TSS on 7 days. L on 7 days.

H. O. BARNARD.

Adelaide.—Mean temp. of air 0°·8 below, and rainfall ·50 in. below, the average of 42 years. A fairly good, seasonable month.

C. TODD, F.R.S.

Sydney.—Temp 0°·9 below; humidity 8·7 above; and rainfall 1·60 in. above, their respective averages.

H. C. RUSSELL, F.R.S.

Wellington.—A very wet, unpleasant month; winds chiefly S. and S.E., and strong from 12th to 15th, also strong N.W. wind on 18th; generally dull, damp weather. H on 12th; fog on 4 days. Earthquake on 22nd. Mean temp. 1°·3 below, and R 1·98 in. above, their respective averages.

R. B. GORE.

Auckland.—Unusually dry for the time of the year, the rainfall being 1·25 in. below the average. Mean temp. nearly 2° under the average.

T. F. CHEESEMAN.

TRINIDAD.—Rain 3·13 in. below the average of 30 years.

J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,
OCTOBER, 1899.

[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.
I.	Uxbridge, Harefield Pk..	3·56	XI.	Builth, Abergwesyn Vic.	5·67
II.	Dorking, Abinger Hall .	2·48	„	Rhayader, Nantgwillt ...	4·96
„	Birchington, Thor	1·74	„	Lake Vyrnwy	4·84
„	Hailsham	2·56	„	Corwen, Rhug	4·31
„	Ryde, Thornbrough	2·68	„	Criccieth, Talarvor	2·69
„	Emsworth, Redlands ...	2·65	„	I. of Anglesey, Lligwy..	3·50
„	Alton, Ashdell	3·43	„	I. of Man, Douglas	3·53
III.	Oxford, Magdalen Coll..	2·69	XII.	Stoneykirk, Ardwell Ho.	2·37
„	Banbury, Bloxham	2·24	„	New Galloway, Glenlee	4·62
„	Northampton, Sedgebrook	2·79	„	Moniaive, Maxwelton Ho.	4·05
„	Stamford, Duddington..	...	„	Lilliesleaf, Riddell	1·71
„	Alconbury	2·58	XIII.	N. Esk Res. [Penicuik]	3·60
„	Wisbech, Bank House...	2·83	XIV.	Glasgow, Queen's Park..	3·27
IV.	Southend	1·89	XV.	Inverary, Newtown	8·92
„	Harlow, Sheering.....	...	„	Ballachulish, Ardsheal...	7·88
„	Colchester, Lexden	1·84	„	Islay, Gruinart School ...	2·49
„	Rendlesham Hall	1·90	XVI.	Dollar	4·61
„	Scole Rectory	1·98	„	Balquhider, Stronvar...	7·22
„	Swaffham	1·99	„	Coupar Angus Station...	1·06
V.	Salisbury, Alderbury ...	3·04	„	Dalnaspidal H. R. S. ....	...
„	Bishop's Cannings	2·39	XVII.	Keith H. R. S.	1·38
„	Blandford, Whatcombe .	3·29	„	Forres H. R. S.	·89
„	Ashburton, Holne Vic...	4·96	XVIII.	Fearn, Lower Pitkerrie...	·93
„	Okehampton, Oaklands.	4·17	„	S. Uist, Askernish	4·37
„	Hartland Abbey	5·94	„	Invergarry	6·35
„	Lynton, Glenthorne ...	5·01	„	Aviemore H. R. S.	1·19
„	Probus, Lamellyn	3·60	„	Loch Ness, Drumnadrochit	3·05
„	Wellington, The Avenue	2·45	XIX.	Invershin	2·46
„	North Cadbury Rectory	2·10	„	Durness	6·36
VI.	Clifton, Pembroke Road	3·69	„	Watten H. R. S.	2·01
„	Ross, The Graig	2·95	XX.	Dunmanway, Coolkelure	4·22
„	Wem, Clive Vicarage ...	2·76	„	Cork, Wellesley Terrace	1·52
„	Wolverhampton, Tettenhall	2·97	„	Killarney, Woodlawn ..	2·76
„	Cheadle, The Heath Ho.	3·23	„	Caher, Duneske	1·54
„	Coventry, Priory Row ...	2·35	„	Ballingarry, Hazelfort...	1·59
VII.	Grantham, Stainby	2·52	„	Limerick, Kilcornan ...	1·02
„	Horncastle, Bucknall ...	2·62	„	Miltown Malbay	2·54
„	Worksop, Hodsck Priory	2·70	XXI.	Gorey, Courtown House	2·03
VIII.	Neston, Hinderton	3·47	„	Moynalty, Westland ...	1·97
„	Southport, Hesketh Park	3·09	„	Athlone, Twyford	1·55
„	Chatburn, Middlewood.	2·89	„	Mullingar, Belvedere ...	1·46
„	Duddon Val., Seathwaite Vic.	5·81	XXII.	Woodlawn	2·18
IX.	Melmerby, Baldersby ...	2·03	„	Crossmolina, Enniscooe ..	3·35
„	Scarborough, Observat'y	2·59	„	Collooney, Markree Obs.	2·39
„	Middleton, Mickleton ...	2·65	„	Ballinamore, Lawderdale	...
X.	Haltwhistle, Unthank H.	3·12	XXIII.	Warrenpoint.....	2·20
„	Bamburgh	1·33	„	Seaforde.....	1·86
„	Keswick, The Bank	6·87	„	Belfast, Springfield	2·55
XI.	Llanfrechfa Grange	3·84	„	Bushmills, Dundarave..	1·98
„	Llandoverly	4·92	„	Stewartstown	1·98
„	Castle Malgwyn	4·28	„	Killybegs	3·45
„	Brecknock, The Barracks	3·86	„	Horn Head	2·18

OCTOBER, 1899.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.				Days on which ·01 or more fell.	TEMPERATURE.				No. of Nights below 32°.	
		Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours			Max.		Min.		In shade.	On grass.
				Dpth	Date		Deg.	Date	Deg.	Date.		
I.	London (Camden Square) ...	2·03	-·86	1·02	27	10	63·4	1	33·5	8	0	7
II.	Tenterden	2·33	-1·70	·82	1	14	65·0	23	32·5	14	0	13
III.	Hartley Wintney	2·64	...	1·30	27	11	65·0	17	29·0	14	4	11
IV.	Hitchin	3·14	+·07	1·59	1	12	62·0	16	30·0	17	5	...
V.	Bury St. Edmunds (Westley)	2·27	-·82	·93	27	10	66·0	12	26·0	19	9	11
VI.	Norwich (Brundall)	1·89	-1·38	·57	27	9	60·0	27	31·0	6	...	...
VII.	Winterbourne Steepleton ...	2·30	...	·79	27	12	65·2	12	29·8	20	3	16
VIII.	Torquay (Cary Green)	2·26	...	·82	27	10	63·9	22	26·9	14	5	11
IX.	Polapit Tamar [Launceston]..	1·99	...	·79	27	11	62·4	10a	36·2	14	0	1
X.	Stroud (Upfield)	3·34	-1·59	1·13	1	13	67·2	18	26·7	14	5	8
XI.	Churchstretton (Woolstaston)	2·30	-·73	·50	1, 29	11	61·0	17	34·0	20	0	...
XII.	Worcester (Diglis Lock)	3·30	-·47	1·20	1	10	65·0	17	35·0	15	0	7
XIII.	Boston	2·10	-·73	·56	1	11	...	...	...	...	...	...
XIV.	Hesley Hall [Tickhill].....	2·83	-·28	1·25	1	9	65·0	17	32·0	18e	2	...
XV.	Breadsall Priory	2·90	-·20	1·36	1	11	65·0	17	26·0	20	6	...
XVI.	Manchester (Plymouth Grove)	2·85	...	·72	1	9	63·0	...	31·0	...	2	7
XVII.	Wetherby (Ribston Hall) ...	3·06	-·31	·73	13	13	68·0	19	31·0	15	3	7
XVIII.	Skipton (Arncliffe)	3·61	+·48	2·25	1	10	...	...	...	...	...	...
XIX.	Hull (Pearson Park)	5·16	-·87	1·60	1	12	...	...	...	...	...	...
XX.	Newcastle (Town Moor)	2·38	-1·27	·81	1	10	64·0	12	30·0	20	6	12
XXI.	Borrowdale (Seathwaite).....	1·78	-1·34	1·29	1	9	...	...	...	...	...	...
XXII.	Cardiff (Ely).....	13·34	+2·75	3·30	29	13	...	...	...	...	...	...
XXIII.	Haverfordwest	3·29	-1·25	·67	27	12	...	...	...	...	...	...
XXIV.	Aberystwith (Gogerddan)	3·76	-1·39	1·23	29	14	61·7	17	30·4	14	1	10
XXV.	Llandudno.....	4·12	-1·23	1·10	29	8	70·0	17b	...	...	...	...
XXVI.	Cargen [Dumfries]	3·65	+·26	·93	1	12	70·5	18	38·5	15	0	...
XXVII.	Edinburgh (Blacket Place)...	3·26	·00	1·10	29	8	63·0	18	26·0	15	6	...
XXVIII.	Colmonell	1·59	...	·48	1	13	67·4	19	32·2	15	0	5
XXIX.	Tighnabruaich	3·47	...	·88	3	14	66·0	20c	28·0	14	...	...
XXX.	Mull (Quinish).....	5·08	...	·77	28	16	55·0	11d	34·0	13g	0	...
XXXI.	Loch Leven Sluices	4·66	-·63	1·05	2	19	...	...	...	...	...	...
XXXII.	Dundee (Eastern Necropolis)	2·30	-·66	·80	30	9	...	...	...	...	...	...
XXXIII.	Braemar	·95	-1·29	·20	1, 25	11	63·6	10	27·1	15	1	...
XXXIV.	Aberdeen (Cranford)	1·78	-1·83	·36	30	15	60·2	10	25·0	15	5	16
XXXV.	Cawdor (Budgate)	·89	...	·15	9	16	70·0	10	30·0	14h	6	...
XXXVI.	Strathconan [Beaulj]	1·26	-1·47	·37	3	14	...	...	...	...	...	...
XXXVII.	Glencarron Lodge	4·42	-·23	·86	4	13	...	...	...	...	...	...
XXXVIII.	Dunrobin	10·58	...	1·70	11	23	67·0	19	30·0	15	2	...
XXXIX.	S. Ronaldshay (Roeberry) ...	2·05	-1·26	·45	11	12	64·0	19	33·8	13	0	...
XL.	Darrynane Abbey.....	3·58	-·15	·78	3	18	63·0	19	35·0	13i	0	...
XLI.	Waterford (Brook Lodge) ...	1·84	...	·21	26	17	...	...	...	...	...	...
XLII.	Broadford (Hurdlestown) ...	2·29	-1·53	·77	29	12	61·5	9	29·0	6	5	...
XLIII.	Carlow (Browne's Hill)	1·72	...	·38	25	14	...	...	...	...	...	...
XLIV.	Dublin (Fitz William Square)	1·73	-1·56	·58	29	15	...	...	...	...	...	...
XLV.	Ballinasloe	1·54	-1·84	·26	11	11	65·1	18	32·9	6	0	6
XLVI.	Clifden (Kylemore)	1·77	-1·22	·31	11	13	63·0	18	29·0	14	5	...
XLVII.	Warlingstown	4·45	...	·96	11	17	...	...	...	...	...	...
XLVIII.	Londonderry (Creggan Res.)	2·71	·00	·50	1	15	68·0	18	30·0	15j	8	12
XLIX.	Omagh (Edenfel)	1·77	-1·90	·51	11	15	...	...	...	...	...	...
L.	Omagh (Edenfel)	1·98	-1·12	·49	11	14	63·0	18f	30·0	20	4	9

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

a—and 11. b—and 18, 19. c—and 28. d—and 18. e—and 20. f—and 19.
g—and 14. h—and 30. i—and 24. j—and 19, 23.

METEOROLOGICAL NOTES ON OCTOBER, 1899.

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.

TENTERDEN.—There were several wet days at the beginning and end of the month, but from the 6th to the 23rd brilliant sunshine prevailed, except on the 12th. The max. temp. was 60°, or over, on 14 days. Heavy dews and foggy nights occurred from 17th to 23rd. TS with heavy R and high wind on 1st. Duration of sunshine 154 hours.

HARTLEY WINTNEY.—A pleasant month, warm and dry. Although heavy R fell on 27th the total for the month is .67 in. below the average, and R was much needed at the close. There was a period of calm weather from 7th to 25th, with dense fog each morning. Ozone was registered on 11 days, with an average of 4.

WINSLOW, ADDINGTON.—Little R fell until after the 25th, and there were many frosty and foggy mornings. On the morning of the 26th, at about 6.45 a.m., a fine rainbow was seen, followed by a wet day. Fog on 8 days.

BURY ST. EDMUNDS, WESTLEY.—A month of high barometer. R and temp. below the average. Distant T on 1st.

NORWICH, BRUNDALL.—A fine month, with average temp., and rainfall .75 in. deficient. Many very bright days in the second and third weeks. L on 13th. Fog on 5 days.

WINTERBOURNE STEEPLTON.—A very fine month. Between 5th and 25th, inclusive, the days were almost all sunny and bright, but towards the end of that period the mornings were rather foggy, soon clearing.

TORQUAY, CARY GREEN.—R 2.24 in. below the average. Mean temp. 54°·1, being 2°·6 above the average. Duration of sunshine 130 hours 35 mins., being 18 hours 25 mins. above the average; four sunless days.

POLAPIT TAMAR [LAUNCESTON].—A fine dry month, remarkable for absence of strong winds. Fog on 7 days.

STROUD, UPFIELD.—Fog daily from 20th to 24th. Westerly gale on 3rd.

CHURCH STRETTON, WOOLSTASTON.—Heavy R on 1st; otherwise dry and seasonable, without much frost. Gales on 3rd and 29th. Mean temp. 49°·6. H on 13th.

MANCHESTER, PLYMOUTH GROVE.—Fine autumn weather prevailed during the greater part of the month. H storm and T and L on 10th. Fog on 5 days. Mean temp. 45°·8.

WALES.

HAVERFORDWEST.—An unusually fine month. The first three days were wet and stormy, after which, till the 26th, the general character of the weather was fine. From the 26th to the end it was very unsettled. The wind reached the force of a gale on four days. Springs were very low and much more R is needed to bring them back to their normal volume. Agricultural operations well advanced.

ABERYSTWITH, GOGERDDAN.—A very fine and warm month.

SCOTLAND.

CARGEN [DUMFRIES].—L at night on 21st and 22nd.

EDINBURGH, BLACKET PLACE.—Mean temp. $1^{\circ}9$ above, and R half, the average. Duration of sunshine slightly below the normal. Solar halo at 11 a.m., on 6th; lunar halo on 18th. H at 10 p.m. on 13th. TS with R and H on 30th at 7.35 p.m.

COLMONELL.—R $1\cdot25$ in. below, and temp. $2^{\circ}6$ above, the average of 23 years. Gales on 6 days. T and L on 31st.

TIGHNABRUACH, CRAIGANDARAICH.—An average rainfall. The best display of T and L of the year occurred on the 30th.

MULL, QUINISH.—On the whole a fine month, with unusually high temp., and R below the average. No sign of winter up to the close. The R on 2nd, $1\cdot05$ in., came from N.E., which is most unusual.

BRAEMAR.—A month of excellent weather.

ABERDEEN, CRANFORD.—A fine and warm month, with S.W. and W. winds.

S. RONALDSHAY, ROEBERRY.—The first and latter parts of the month were stormy and unsettled, but the middle was fine. Mean temp. $47^{\circ}6$, being above the average of 9 years.

IRELAND.

DARRYNANE ABBEY.—Another dry month. The first part was very fine, but rather cold; the end was wild and rather stormy. H on 30th.

BROADFORD, HURDLESTOWN.—A very dry October. R $1\cdot11$ in., and rainy days 4, less than the average for 15 years. Fog on 3 days.

DUBLIN, FITZWILLIAM SQUARE.—A quiet, foggy, but withal, fine month. There was large range of temp., cold, foggy nights, alternating with sunny, warm days. The weather broke up on 24th, and to the end of the month R fell frequently. Mean temp. $50^{\circ}2$, being $0^{\circ}5$ above the average. L on 29th. High winds on 7 days, attaining the force of a gale only on 29th. Fog on 13 days. Solar halo on 18th. Lunar halos on 17th and 18th. H on 12th.

OMAGH, EDENFEL.—With seventeen fine and mostly brilliant days, the rainy and unsettled condition of the remaining fourteen was unable to destroy its general good character. Owing to the absence of frost, of any severity, the autumn tints never were more magnificent than they were up to the close of this month.