

Symons's Meteorological Magazine.

No. 526.

NOVEMBER, 1909.

VOL. XLIV.

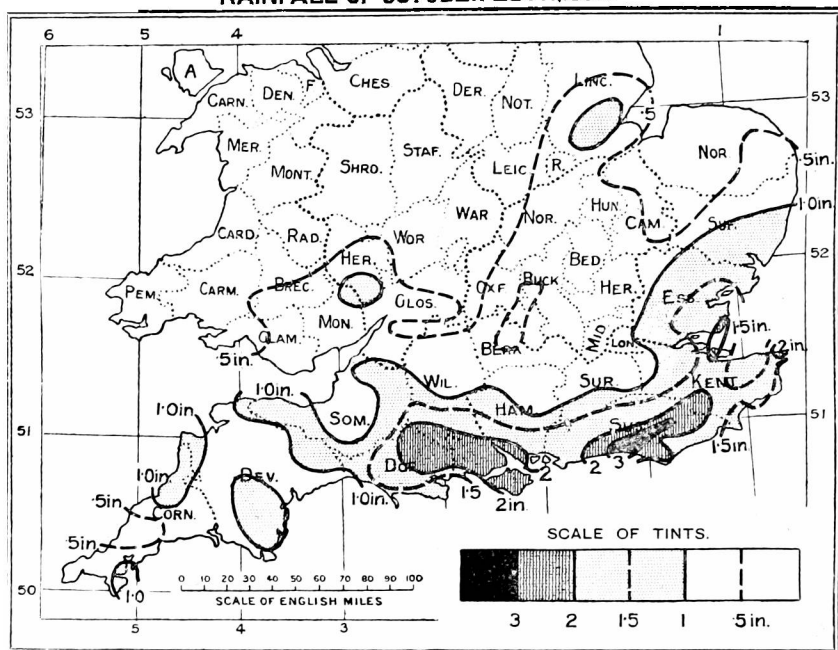
THE RAINFALL OF OCTOBER 26th-28th IN THE SOUTH OF ENGLAND.

For a considerable time before the end of October the British Isles had been subjected to the type of weather resulting from the passage of a series of depressions, following one another in succession from the Atlantic and passing away, as a general rule, in the direction of Scandinavia. The accompanying rainfall was usually persistent rather than heavy, though in the west considerable falls had taken place. On the evening of October 25th a rapid fall of pressure was proceeding over the extreme west of Europe, and by the following morning the centre of a deep depression was situated immediately to the south of Ireland. The system moved very slowly south-eastward for two days, travelling a distance of about five hundred miles across the mouth of the English Channel and the north of the Bay of Biscay. During the 28th a sudden change of direction took place, and the centre moved rather more rapidly in a north-easterly direction through the Netherlands to Denmark. The effect of this somewhat unusual course was to enclose the south of England between the south-east and north-east paths of the moving depression, thus keeping it always on the left side of the track. It is usually found that the area of heaviest precipitation accompanying a depression lies on the left of the track of the centre ; and in this instance, the rainfall in France, lying almost entirely on the right side, does not appear to have been anywhere so heavy as in the south-east of England. Whilst the Brighton fall shown in the map took place during the passage of the cyclonic system from Cornwall to the coast of Brittany, the fall in Kent on the 28th was associated with its northerly movement immediately after the change of direction. Several instances suggest that there is an intimate connection between a sudden change of direction in a cyclone track and a subsequent intense downpour of rain. It would be interesting if a closer investigation of the barometric distribution could be made, to examine whether any similar occurrence took place on the 26th which would synchronize with the large downpour in Sussex.

We reproduce a sketch map, showing, so far as it is possible at present, the rainfall of the first of the three days in the south of

England. It is interesting to note the linear arrangement of the series of splashes of heavy rain over the whole breadth of the country. It will be observed that, commencing at Falmouth with a small patch with rain just exceeding an inch, the recurring splashes, which are grouped with an almost equal interval, are of increasing intensity until the culminating point at Brighton is reached. The falls of

RAINFALL OF OCTOBER 26TH, 1909.



over two inches at Margate, and 2.50 in. at Shoeburyness, suggest a further extension of the great rainfall to the east, where, however, we have no means of following it.

Maps of the rainfall of the two following days were also constructed and they present features of considerable interest. On the 27th, although rain was general over the whole area affected on the previous day, the amount was less than half an inch, except in the extreme south-east of England, and only exceeded an inch in a narrow strip occupying most of the northern half of Kent. Over 1.50 in., however, fell at Ramsgate and other places within this strip. On the 28th the precipitation was again very similar in its broad features, the line limiting the area on which any rain fell almost coinciding on all three days, but on this occasion the part of the country with more than half an inch was much larger, occupying the whole of the land south-east of a line drawn from Kings Lynn to Weymouth. The amount exceeded an inch generally in the east of Hampshire and Berkshire, over the Chiltern Hills, the greater part of Surrey and Kent and in some isolated patches in East Anglia.

A large part of Sussex, however, escaped with about three quarters of an inch. The extension of the heavy fall over the Chiltern Hills is peculiarly interesting, since unless the coincidence of the heavier rain with the more elevated land is one of pure chance, it presents the uncommon phenomenon of a normal long-period distribution manifested in the rainfall of a single wet day. As on the 26th so on the 28th the rainfall appears to have had a tendency to increase in intensity eastwards and more than two inches fell over the east of Kent from Margate to Dungeness. At Broadstairs and Folkestone the day's yield amounted to three inches. On the further side of the Strait of Dover 1·34 in. was measured at 7 a.m. on the 29th at Cape Griz Nez, and it therefore seems probable that the very intense splash was not of great extent, and lay entirely to the left of the cyclonic track which passed through Belgium. The Isle of Thanet and its immediate vicinity was the part of the country most severely visited on the whole three days, the total fall reaching, roughly, six inches in that period.

The following is a complete list of the records we have received from the south of England in which more than 2·50 in. fell in one day, or more than 4·00 in. in three consecutive days at the end of October, the readings unless otherwise noted being at 9 a.m. :—

STATION.	COUNTY.	OCTOBER, 1909.			
		26th.	27th.	28th.	26th —28th
		in.	in.	in.	in.
Maidstone, Mill Street	<i>Kent</i>	1·53	1·26	1·83	4·62
Detling, The Croft	"	1·50	1·43	1·44	4·37
Folkestone, Surrenden Road	"	1·87	·74	3·00	5·61
" Capel Lodge ...	"	2·88	...	...	...
Ashford, Oakwood	"	1·72	·70	1·77	4·19
Canterbury	"	1·22	1·28	1·67	4·17
Bicknor Rectory	"	1·30	1·67	1·10	4·07
*Faversham, Colkins	"	1·41	1·42	1·51	4·34
Minster, Gas Works	"	1·38	1·37	2·06	4·81
Ramsgate, Southwood W. W.	"	1·42	1·62	2·96	6·00
Broadstairs, Providence Ho.	"	1·51	1·23	3·14	5·88
St. Peters	"	1·50	1·56	2·73	5·79
†Brighton	<i>Sussex</i>	3·60	...	...	...
"	"	3·32	...	...	...
† " Preston, Ashford Rd.	"	3·35	...	...	...
" " Drove	"	3·15	·61	·89	4·65
" " Ditchling Rd.	"	3·48	·81	·98	5·27
Heathfield, The White Cott.	"	2·99	...	...	...
Tottingworth Park	"	2·73	·68	·65	4·06
Ticehurst, Myskins	"	2·78	·62	·96	4·36
Ryde, Beldornie Tower	<i>Hampshire, I. of W.</i>	2·43	·30	1·33	4·06
E. Cowes, Spring Hill	"	2·82	...	...	...
Shoeburyness	<i>Essex</i>	2·50	·54	·64	3·68
Ashmore Rectory	<i>Wiltshire</i>	2·90	·49	·30	3·69

* Read at 7.30 a.m.

† Read at 7 a.m.

For the purpose of comparison we have extracted from the section on maximum falls in twenty-four hours in the volumes of *British Rainfall* since 1864, a list containing all known instances* of falls of 3·00 in., or more, in the counties of Surrey, Kent, Sussex, Hampshire and Berkshire. The list consists of 69 entries, excluding 1909, comprising 26 different dates in the course of 45 years. Of these, no fewer than 60 instances on 22 dates fell within the summer half-year, from April to September, suggesting that on a great many of the occasions on which so large a daily fall has occurred the precipitation was due to thunderstorms. In two of the winter half-year instances the amount recorded reached just 3·00 in. at one station only, leaving no more than December 26th, 1886 (six stations), and October 30th, 1894 (3·56 in. at Sidcup), which may be said to have been more remarkable than October, 1909, in this respect for the time of year. It is interesting to note that, so far as the available records show, no previous daily fall of 3·00 in. had been observed within 20 miles of Brighton, where 3·60 in. was reported on October 26th, 1909, or within 40 miles of Broadstairs, where 3·14 in. fell on the 28th. The network of stations reporting to *British Rainfall* has become closer and closer each year, so that it is not impossible that a local downpour on a small area might have escaped detection in the earlier years.

In previous years rainfalls exceeding 3·50 in. in 24 hours were recorded as follows in the district under notice :—

*Rainfalls of 3·50 in., or more, in 24 hours, 1864–1908, in Surrey,
Kent, Sussex, Hampshire and Berkshire.*

1867.....	July 26th,	Deptford Creek	3·98 in.
„	„	Hartlip	4·78 „
1872.....	July 31st,	Liphook, Milland House ..	4·11 „
1886.....	Dec. 26th,	Idsworth House	3·65 „
1888.....	July 31st,	Sandhurst.....	3·50 „
1889.....	Sept. 2nd,	Wilmington	3·90 „
1894.....	Oct. 30th,	Sidcup	3·56 „
1901.....	July 12th,	Maidenhead, Lowood	3·63 „
„	„	Maidenhead, Castle Hill ..	4·24 „
1902.....	Sept. 10th,	Weybridge	3·80 „
„	„	Esher ..	3·51 „
1903.....	May 30th,	Beddington Corner.....	3·67 „
„	July 23rd,	Tunbridge Wells.....	3·77 „
„	„	Speldhurst	3·55 „
„	„	Farningham Hill.....	3·78 „
„	„	Southfleet	3·54 „
„	„	Wilmington	4·03 „
„	„	Sidcup	3·94 „
„	„	Dartford	4·41 „

It was fortunate from the point of view of damage by flooding that

* It must be remembered that if two or more falls of 3·00 in., or over, occurred in one year, only the largest would be recorded in the list; but the probability of more than one such fall in one year is very small.

the scene of the most severe of the storms lay on the sea coast, thus facilitating the escape of vast quantities of water into the sea without inundating any very large area. The valley of the Stour was, however, within the district very seriously affected, and a great amount of flooding took place, the river spreading itself out over the land for twenty miles of its course. Canterbury and Ashford, the two largest towns in the upper part of the valley, suffered badly, and many low-lying villages in the neighbourhood, notably Chartham and Wye, were completely isolated. Eye-witnesses speak of the scene as resembling an inland sea, hedges and fences being entirely submerged. Many thousand sheep were said to have been lost from Kentish pastures.

The very exceptional rains of the last week came at the close of a month the rainfall of which already exceeded the average, except at a few stations on the east coast, and the map of the Thames valley and surrounding country in the present issue shows an unusually heavy and irregular fall. It is seldom that so large an area has more than five inches of rain in any month and very rare indeed to find, as on the southern border of this map, a broad stretch of the south of England with more than seven and even more than eight inches. The month, over the country as a whole, was by no means so wet as October, 1903 (see this Magazine, 38, p. 169) but there were some pretty large figures reported from the west. The most remarkable was 56·54 inches at Llyn Llydaw on Snowdon, the largest fall ever recorded in a month in the British Isles, and one that we should like to see confirmed by a duplicate gauge. The next highest fall was at The Styne in Cumberland, 30·50 inches, a figure which has been exceeded several times at that station. We are only able to refer to a few of the very numerous letters we have received on the rainfall of October.



THE WEATHER OF OCTOBER, 1909.

By FRED. J. BRODIE.

UNTIL the closing week of last month, a current of mild humid air from south or south-west blew almost persistently over the United Kingdom, and kept the thermometer well above its average level for the time of year. Owing to a rather general deficiency in the amount of bright sunshine, the day temperatures were by no means remarkable, the excess of warmth being greater at night-time, when terrestrial radiation was effectually checked by the presence of a cloudy or overcast sky. The highest shade maxima occurred, as a rule, between the 2nd and 4th of the month, when the thermometer rose to 65° and upwards over a large portion of Ireland, England and the neighbouring parts of Scotland, and touched 70° at Bawtry on the 2nd and Scarborough on the 4th. The nights were at the same time

unusually mild, many places reporting minima appreciably above 55° ; at Westminster, the thermometer on the night of the 3rd did not fall below 60° , the reading being, as a minimum value, the highest recorded in London in October since the year 1876. Further touches of midday warmth were experienced between the 10th and 12th, and between the 18th and 20th, the thermometer on each occasion rising to 65° , and a trifle above it at many English stations. On the night of the 16th a minimum of 60° was again recorded at Westminster, so that in the course of the month there were in London two nights which ranked as the mildest in October for more than 30 years past. The excess of nocturnal warmth was, however, not maintained without interruption. On the 5th and 6th, the sheltered thermometer fell below 40° in several parts of Ireland and Scotland; while on the night of the 8th it fell below 35° in most English districts, a sharp ground frost being experienced on the latter occasion at several inland stations. Further touches of frost were reported in many parts of the kingdom between the 12th and 14th, and again in Ireland and Scotland between the 19th and 21st, and over England on the 22nd.

In the closing week the very gradual movement of a barometrical depression passing our south-west coasts and across France, was attended not only by a torrential downpour of rain over the south of England, but by a shift of wind over the entire kingdom, firstly to south-east and east, and afterwards to north-east and north. With this change, the thermometer fell steadily to quite a wintry level, the coldest weather occurring on the 29th and 30th, when the thermometer over a large portion of the country failed to reach a maximum of 45° . Sharp frosts were experienced very generally on the nights of the 28th and 29th, and still sharper ones on the nights of the 30th and 31st. On the two latter occasions the thermometer in the screen fell at least ten degrees below the freezing-point in many parts of Great Britain; a minimum as low as 16° being recorded at Balmoral and Llangammarch Wells, and a reading of 17° at West Linton. On the surface of the grass readings below 20° were registered somewhat extensively, the exposed thermometer getting below 15° at many northern stations, and reaching 11° at West Linton, and 12° at Crathes and Burnley.

The cold experienced in the concluding week was, however, insufficient to counterbalance the effect of the previous long spell of warmth, and the mean temperature of the month was, therefore, above the average over practically the whole kingdom. In Scotland and the north of Ireland the excess was small, but in the southern districts it was much larger, the departure from the normal exceeding 3° at some inland stations in the south of England. The total duration of bright sunshine was in most places in fair agreement with the normal, the general tendency being for a slight excess. In London (at Westminster) the aggregate of 75 hours was 6 in excess of the average, but was smaller than in any of the four Octobers 1905 to 1908.

NEW METEOROLOGICAL STATION AT HAMPSTEAD.

THE Hampstead Scientific Society has, after overcoming many difficulties, established an astronomical observatory and Second Order Meteorological Station on the highest part of Hampstead. Our readers will recollect that the Society had obtained permission from the London County Council to erect the necessary structures in the Flagstaff enclosure on Hampstead Heath, but in consequence of the vehement opposition of the dwellers on the margin of the Heath, who questioned the right of the Council to permit any use to be made of the Heath except for the purposes of recreation, the consent was withdrawn. Fortunately another and less timorous public body, the Metropolitan Water Board, was induced to promote science by granting a site for the observatory, at a very moderate rent, on the highest position in the Borough of Hampstead. This is the top of the covered reservoir at the junction of Heath Street with the road skirting the south side of the Heath, and there a small astronomical observatory, with a revolving dome, has been erected, and an adjacent enclosure fitted up as a meteorological station, the height above sea-level being 450 feet. It may be recalled that the Meteorological Office station in St. James's Park is 27 feet above sea-level, Kew Observatory 18 feet, the Camden Square station 111 feet, and Greenwich Observatory 155 feet. The new observatory has cost the Society about £250 to build and equip, irrespective of the cost of an eight-inch reflecting telescope presented by Dr. F. Womack, a sidereal clock presented by Mr. Duveen, and a Robinson anemometer presented by Mr. Hawke.

Mr. P. E. Vizard, vice-president, presided over a meeting of the Hampstead Scientific Society, held at Heath Mount School on November 6th, when Dr. Womack formally declared the Observatory open, and gave an address on the astronomical side of the work to be carried on at it. Dr. H. R. Mill gave a short address on the meteorological side of the work. He laid stress on the importance of studying the climates of London, and pointed out that the only way this could be done effectively was by establishing meteorological records which could reasonably be expected to be permanent, the quasi-immortality of a scientific society furnishing a sort of guarantee that the work should not lapse by any ebb in the tide of interest or the risks of human life. The unique position of the new station should make the observations of duration of sunshine especially extremely interesting. The instruments provided are of the best patterns, the exposure is perfect, and the Society could be trusted to make a worthy use of them. He thought that special thanks were due to the honorary secretary, Mr. C. O. Bartrum, for the persistence with which he had pressed forward the establishment of the observatory, in the face of the most determined and totally unforeseen opposition.

Sir Samuel Wilks proposed a vote of thanks to the speakers, and expressed his own warm interest in the new departure in the work of the Society. The audience, which numbered about 100, then visited the observatory.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

HEAVY OCTOBER RAINFALL.

SOME particulars of the recent heavy rainfall here may be of interest.

Monday, October 25th, was fine, wind N.W.; the evening was clear. Rain began to fall early in the morning of the 26th, and the wind was then S.E. At 9 a.m. on the 26th .06 in. was measured. The rain was not remarkable before mid-day, but increased as the day went on, and was very heavy about 9.45 p.m. The wind had backed slowly and was then E.N.E. Rain continued through the night, and at 9 a.m. on the 27th 2.10 in. was recorded; the wind was then N.E.

Not much rain fell in the morning of the 27th, but there were some drizzling showers, one about 10.30 a.m. heavier. Rain set in again at 2 p.m. and continued falling, heavily at first, into the night. The wind continued N.E. At 9 a.m. on the 28th .81 in. was measured, and the wind had backed to N.N.E.

During the 28th no rain fell except a few spots now and then until 3.45 p.m. when gentle rain began to fall and was continuing at night. On the morning of the 29th the wind was N.N.W., and .41 in. was measured at 9 a.m. Rain ceased at 10.30 a.m. and the rest of the day was fine. On the morning of the 30th .03 in. was measured. The wind at one time attained gale force.

Thus the rain produced here by the storm system was as follows :—

October 25th	in
„ 26th .....	.06
„ 27th	2.10
„ 28th .....	.81
„ 29th .....	.41
„ 30th .....	.03
	3.41

There has been serious flooding in the valley of the River Teise, and a conservative estimate puts the maximum rise of water at 12 feet.

F. DRUCE.

Gore Court, Goudhurst, Kent, 31st October, 1909.

RAINING CATS AND DOGS.

WITH reference to your correspondent's query as to the origin of the above very well-known popular saying, I find the following explanation of it given in Dr. Brewer's "Dictionary of Phrase and Fable":—

"A perversion of the word *catadupe* (a waterfall). It is raining catadupes or cataracts. Mr. Ford ingeniously, though not with much probability, suggests the Greek *cata doxas* (contrary to experience), *i.e.*, in an unusual manner. Dean Swift, describing a fall of rain, says the kennels were overflowed, and that—

' Dead *puppies*, stinking sprats, all drenched in mud ;
Drowned cats, and turnip tops, come tumbling down the flood.
' A City Shower.'"

The above appears under the heading of "Cat and Dog." In a later part of the Dictionary, under "Rain," the saying is again referred to as below :—

" In Northern mythology the cat is supposed to have great influence on the weather, and English sailors still say, ' the cat has a gale of wind in her tail,' when she is unusually frisky. Witches that rode upon the storms were said to assume the form of cats ; and the stormy north-west wind is called the *cat's-nose* in the Harz even at the present day.

" The dog is a signal of *wind*, like the wolf, both which animals were attendants of Odin, the storm-god. In old German pictures the wind is figured as the ' head of a dog or wolf,' from which blasts issue.

" The *cat* therefore symbolises the down-pouring rain, and the *dog* the strong gusts of wind which accompany a rain-storm ; and a ' rain of cats and dogs ' is a heavy rain with wind."

As to the other " expressions " quoted by Mr. Dashwood, I can say nothing ; but they hardly seem to me to belong to the same class as the above.

BASIL T. ROWSWELL.

Les Blanchés, Guernsey, 4th November, 1909.

UNITS OF RAINFALL MEASUREMENT.

It occurs to me that a possible explanation of the discrepancy between small rainfall measurements (Magazine, No. 525, p. 165) may be due to the fact that one observer places his measuring glass inside the receiver, and so lets the rain run into the glass, thus losing not a drop. The tin receiver must of necessity " absorb " some small amount of rain, and so when the rain is poured into the glass there is rather less to show.

I always let the rain run into the glass, and in cases where there has been a lot of rain during the day I measure it also at 6 p.m., or take the glass out.

I think this difference of plan would account for the difference of " rain days."

JAMES CROSS.

Bailie House, Wimborne, 1st October, 1909.

I HAVE read with interest the article with the above title by Mr. A. Hampton Brown in the October number of this Magazine ; having myself noticed within the limited area for which I tabulate the rainfall returns of about 35 observers (*i.e.*, S.W. Wilts, N.W. Dorset and most of Somerset) the great discrepancies in the number of rain days recorded, and having further the advantage of some personal knowledge of many of the observers. Such experience as I have had

goes to show that these discrepancies are *partly* due to the localities. Thus at one station only three miles from my home every shower, however small, that may be about, will really produce measurable rain; while other stations within easy distance seem generally to escape. But I feel quite certain that the discrepancies are much more largely due to the personal equation of the observers themselves. Some—to use Mr. Brown's language—"with pardonable zeal make rather too much of the kindly dews of night"; others won't trouble themselves at all about dews or the very small rains.

But is not the definition of a rain day itself at fault? For myself I confess that after a heavy dew it is with the greatest possible repugnance that I put down as a rain day one that has been absolutely cloudless for the whole 24 hours. I *don't* do it if the dew amounts to less, say, than $\cdot 008$ in.; perhaps not even when it is more.

But if the definition of a rain day were altered so as to exclude these tiny falls of $\cdot 01$ in. and $\cdot 02$ in., then, as Mr. Brown points out in his valuable table, the discrepancies would almost disappear. These small amounts would still be measured and duly entered, but we should no longer be obliged to reckon an absolutely cloudless day as a rain day. Undoubtedly to draw the line at $\cdot 03$ in. would be arbitrary, but it must be drawn *somewhere*; and to draw it at $\cdot 01$ in. is arbitrary also, and open to the grave objections set out so forcibly by Mr. Brown.

H. A. BOYS, F.R.Met.Soc.,

Secretary of Mid-Wessex Rainfall Association.

North Cadbury Rectory, Oct. 27th, 1909.

In the Table of Rainfall for October, 1908, given on p. 167, I notice Malden (Worcester Park) is mentioned as having no small falls of $\cdot 01$ or $\cdot 02$ in., but having a total of $2\cdot 15$ in. On looking up my own record for New Malden (Edenfield)—which is only $1\frac{1}{2}$ or 2 miles away—I find October, 1908, had 16 rain days, 8 days with $\cdot 01$ in., none with $\cdot 02$ in., 8 days with other amounts, and a total fall of $2\cdot 10$ in., agreeing very nearly with Worcester Park record.

I would suggest that frequently small amounts of $\cdot 005$ in. or a trifle over are allowed to evaporate, or perhaps in being spread over the dry surface and sides of the receiving can (in emptying into glass measure) appear less than $\cdot 005$ in., and in consequence are treated as *nil*. I prefer to keep the measuring glass in the gauge except during severe frosty weather; in this way every drop of a small fall is secured for record.

There is always an extraordinary difference between New Malden Sewage Works' record and my own, which I can never understand, considering we are only about half a mile apart. The difference for 1908 being as much as $2\frac{1}{2}$ inches, the Sewage Works *less* than Edenfield.

W. J. CARTER.

Edenfield, Montem Road, New Malden, Surrey, 4th Nov., 1909.

IN the last number of the Magazine there is an article on discrepancies in the number of rain days at adjoining stations. Perhaps my humble experience can throw a little light on the matter. At one time I had under observation two gauges, one an ordinary japanned one standing upon short grass, the other a copper Snowdon, partly sunk in gravel. The latter was in much the more misty situation, yet I constantly found that the gauge on grass would have $\cdot 01$, $\cdot 02$, or even $\cdot 03$ in. of dew in it when the gauge partly sunk in the ground had none. I presume the warmth of the ground kept the sunk gauge above the dew point, while the chilling contact with the short grass cooled the other far below it. Probably in case of a thaw after a long frost the converse would have been the case. Perhaps an examination of the gauges referred to in the Magazine in the light of this experience might explain the discrepancies.

F. J. WARDALE.

Shrewton, Wilts, 3rd Nov., 1909.

HIGH OCTOBER MINIMA.

THE present month has been remarkable for high nocturnal temperature, but I think the minimum for to-day (October 17th), $58^{\circ} \cdot 5$, is unprecedented, while yesterday's reading (October 16th) was $56^{\circ} \cdot 5$.

On going through the Greenwich records back to 1841, the nearest approach is 58° on October 22nd, 1898; and to find a higher minimum than that of to-day one must go back to 1859, when $59^{\circ} \cdot 5$ was recorded on the 7th, ten days earlier than the record of to-day.

There has also been great uniformity in the maxima this month, the highest being $63^{\circ} \cdot 2$ and the lowest 60° , during the last eight days.

H. K. G. ROGERS.

"Glenart," Weybridge, 17th October, 1909.

DAYLIGHT METEOR, OCTOBER 6th, 9.34 a.m.

THE daylight fireball, described by your correspondents in Surrey, was observed by many others in Sussex, Norfolk, Northampton, Gloucester, Somerset, Devon, etc., etc. It was a fine object, and furnished a rare spectacle to all those spectators who were fortunate enough to get a glimpse of it. A man may look upwards at the blue sky on sunshiny days more than ten thousand times and never see a meteor fall; in fact, the spectacle must be accounted one of the most novel of celestial pictures.

The meteor passed over central England, from nearly S. to N., and in the region north-west of Northampton caused a loud detonation—for here its disruption evidently occurred—doors creaked, windows shook, and there were all the attributes of an earthquake, so that the people were alarmed and ran out of their houses for safety.

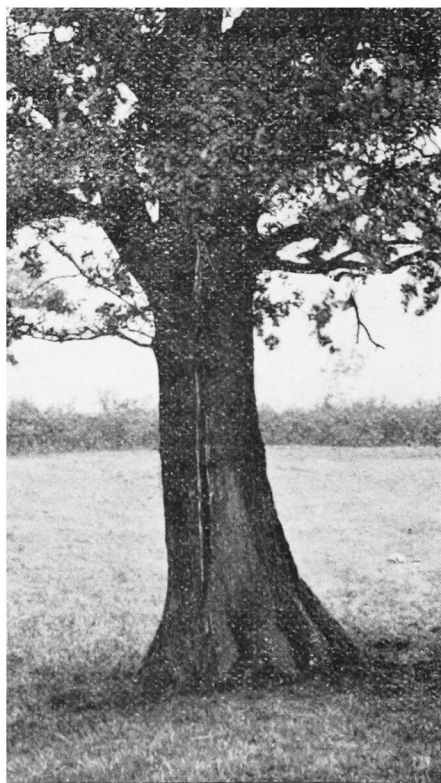
The meteor had a height of from about 75 to 30 miles, and a

velocity between 15 and 20 miles per second. But the observations are not sufficiently exact for very precise deductions to be made. At night it is comparatively easy to record a meteor's flight; but in sunshine the absence of visible reference stars occasions a difficulty. The radiant of the recent meteor was in Leo, where no October meteor showers are known. There were large daylight fireballs probably in 1900, January 9th (from Aquila), and in 1894, February 8th (from Hercules), at 2.55 and 0.28 p.m., respectively.

W. F. DENNING, F.R.A.S.

LIGHTNING SEEN TO STRIKE.

MR. W. H. DINES refers in the last number of this Magazine to the thunderstorm in the Thames Valley of September 17th. The two photographs below represent an oak tree struck by lightning during this storm. The tree stands by itself in a field, about 150 yards south-west of Stow-on-the-Wold station, Gloucestershire. It was struck just at 4 p.m. The storm was violent from 3.45 p.m. to 5 p.m., but rain lasted longer than this. At the village of Lower Slaughter, some two miles from the tree, 1.53 in. was measured, but no other gauge in the vicinity appears to have received so much as an inch.



The first photograph is from the N.W., and shows two "seams"; the other, from the S.E., shows one "seam." There was no sign of burning on the tree, which did not appear injured, except for the stripping of the bark down the "seams." This stripping is very apparent in the second photograph, in the upper part of the tree. Bark, some in long strips, was scattered about. A pony was killed in the same field in the storm; when found, it was lying fifty yards from the tree. Perhaps readers of this Magazine can say whether it is probable that the three "seams" were made by one flash, or by more than one. One only was seen to strike likely to cause the damage.

F. DRUCE.

IN reply to the letter of Mr. W. H. Dines in your last issue, I can corroborate the statement of his mechanic who asserts that he saw lightning strike the fields, but no mark of anything struck was to be found. About ten years ago, when I was at Church Stretton, in the course of a cricket match we were compelled to take shelter in the pavilion during a rather bad thunderstorm. The cricket field is situate in the valley alongside the railway, about half a mile on each side the hills rise up to 1,200 ft. on the east and 1,500 ft. on the west. As I was in the pavilion watching the storm, I saw a flash come straight down and strike the grass in the cricket field, about 100 yards from the pavilion, and only about 20 yards from a railway telegraph post. I distinctly saw the grass smoke where the lightning struck. Without diverting my eyes from the spot, and although it was still raining fairly heavily, I ran out to see if anything was to be seen. Unless I had marked the exact spot I should never have found it, for to an unobservant eye there was nothing to be seen, though there was a strong sulphurous smell. Looking carefully down I saw lines in the grass radiating from a centre as if a piece of cord had been dragged through the grass; there was no hole even in the centre, but just a small spot which was bare of grass. On getting back my fellow cricketers asked me if I had found the thunderbolt; I replied that I did not go to search for one.

R. P. DANSEY.

Kentchurch Rectory, Hereford, October 18th, 1909.

THE STANDARDIZATION OF SUNSHINE RECORDERS.

By R. H. CURTIS.

SOME important points in connection with the registration of sunshine are raised by letters which have appeared in recent numbers of this Magazine; and although these points, or at any rate most of them, have already been dealt with elsewhere, it may not be amiss, in view of the importance and widespread interest which now attaches to observations of this element, to give in these pages a brief account

of the development of the Sunshine Recorder, and of the steps which have been taken for the purpose of standardizing the instrument and its records.

Fifty-six years have now elapsed since the late Mr. J. F. Campbell began to register the duration of sunshine, and for that purpose set up in Whitehall the first sunshine recorder; and thirty years have passed since the *daily* registration of the incidence and duration of sunshine became possible as an element of ordinary meteorological observation. For some years prior to the year 1880 what may be termed a seasonal record had been obtained, first at Westminster and then, from the year 1875, at the Kew Observatory, by the use of the hemispherical bowls of hard wood introduced by Mr. Campbell. In the centre of the bowl was placed the lens, which in the earliest stage of the instrument was a hollow glass sphere filled with water—for it was not until 1857 that it became possible to obtain a suitable lens of solid glass, and the record was obtained by the charring of the interior of the bowl by the focussed rays of the sun. Each bowl received the record of six months' insolation, from solstice to solstice; but as the declinational change in the path of the sun's image is very gradual and slow, it was never possible to ascertain how much of the total result was due to the sunshine of relatively short intervals, or to differentiate between the effect due to *intensity* and to *frequency*. The negative record of a dull week sandwiched between two brilliant weeks would be absorbed by its brighter neighbours and disappear altogether; a sufficiently prolonged spell of sunless weather would, however, tell its tale by a strip of relatively uncharred wood left outstanding from the generally scorched surface; and, again, a period of continuous or of unusually hot sunshine would leave its signature engraved as a deeply bitten groove in the surface of the bowl. But it is obvious that from such a record it was only possible to draw conclusions of a general character as to the abundance or otherwise of sunshine during the six months, and nothing like accurate quantitative measurements of duration or intensity were possible either for part or for the whole of the record.

Quite early in the history of his instrument Mr. Campbell had attempted to get a *daily* record of sunshine, but not very successfully; and it was not until the year 1876 that a regular daily record was begun at Greenwich by the use of a metal bowl, made and presented to the Observatory for the purpose by Sir William Armstrong, and "a ball of good glass cast and polished by Mr. Chance of Birmingham." In this bowl a narrow strip of blackened card was laid each day along the path the sun's image would follow, and upon this card the focussed rays of the sun left their record as they traversed the bowl from side to side.

The adjustment of such a strip of card with the necessary accuracy upon a concave spherical surface is, however, not a particularly easy task to accomplish. At the Greenwich Observatory there would be little difficulty about it, but to the ordinary meteorological observer

it presented difficulties sufficient to put the daily registration of sunshine beyond his reach.

The difficulty was, however, soon met by the introduction in 1879 by the late Professor Stokes of a modification of Campbell's bowl. In place of the complete hemispherical bowl Sir George Stokes took but a portion of it, and divided a vertical arc of about 48° into three overlapping zones, each provided with grooves undercut in the surface, into which strips of card rather more than an inch wide could be easily slid and securely held in position. Each of these strips is wide enough to receive the sun's record for an interval of several weeks, but by using a fresh card every day a daily record of the duration, and to some extent of the intensity, of bright sunshine can be obtained and preserved. Since its introduction this form of recorder, known as the "Campbell-Stokes Sunshine Recorder," has had added to it a few simple arrangements intended to facilitate the operations of adjusting it and setting it in position, and for making it useable in low latitudes under a more or less vertical sun; but these are outside the instrument itself, which remains to-day practically as Sir George Stokes left it.

Although the value in many directions of a record of so powerful a climatic factor as direct sunshine was quickly appreciated, the use of the instrument became developed at first somewhat slowly. This was probably because it is somewhat expensive to purchase, and is besides one of those things that are never wholly paid for, since the yearly cost of the cards is a not inconsiderable item of maintenance; but, besides the question of cost, the instrument demands an exposure such that the sun's rays can reach it from sunrise to sunset, and this is a condition which cannot always be met even in cases where the question of expense needs not to be considered.

It was largely to meet the matter of cost that in 1885 Mr. J. B. Jordan introduced his photographic recorder, a very simple but very ingenious little instrument, which may be described as a pin-hole camera so contrived as to photograph continuously the sun's image whenever the sun was shining. The prime cost of this recorder as well as the cost of its upkeep was considerably less than that of the Campbell-Stokes recorder just described, but the necessity of providing an unobstructed view of the sun throughout its course was the same in both cases.

Very soon after the introduction of this instrument the discovery was made that the records obtained by the two forms of recorder frequently differed considerably, and it came to be pretty generally accepted that the Campbell-Stokes type gave as a rule a lower record than the other. It was not at once generally recognised that the two forms of instrument were not registering precisely the same thing, but that whilst the burning recorder was giving a record of the sun's *heat*, as shown by the power of its focussed rays to burn a strip of card under given conditions arbitrarily fixed, the photographic recorder was registering the *actinic* power of the sun's rays

as manifested in the chemical change they were able to produce on a strip of sensitized paper, prepared again in accordance with an arbitrarily selected formula ; and the overlooking of this fact led to some confusion of thought, and to the hasty adoption of positions which were not tenable.

The commercial value of the sunshine recorder as a means of advertising the pre-eminence in the matter of sunshine of nearly every watering-place in the Kingdom, was very early perceived and turned to account, and it was perhaps only natural that those whose chief interest in the matter lay in that direction should have favoured the type of instrument which was thought to register the biggest totals. In tabulating the records, too, every man was a law to himself, and in some cases a very liberal interpretation was placed upon the record. In this way some rather wild statements found a considerable circulation, and it soon became necessary to institute a careful and unprejudiced comparison of the records yielded by the two types of instrument when exposed under identical, and as nearly as possible perfect, conditions.

Such a comparison was carried out with the co-operation of the Royal Meteorological Society in 1896-7.* A recorder of each type was exposed side by side with an absolutely clear horizon, both instruments being carefully observed every day for twelve months, and the conclusions arrived at were briefly these :—

(1) The records of the burning recorder are capable of being more satisfactorily measured than those of the photographic instrument ; and (2) When the traces of both instruments are properly measured the photographic record is not upon the whole in excess of that of the burning instrument ; occasionally large differences occur, but they are not always in the same direction, and over such periods as a month the amounts by the two instruments agree fairly well.

The report then says :—"The burning recorder possesses a great advantage over photographic instruments in that given certain conditions as to lens and mounting, the records obtained with it from different observatories are absolutely comparable with each other ; and also that it is possible to fix a distinct standard, which can be easily recognised, as the inferior limit of what should be regarded as 'bright sunshine.' If it is agreed to define that limit as the degree of solar radiation which when concentrated upon a bluish tinted card, by a spherical crown glass lens 4 inches in diameter, is competent to produce a brown mark upon the card, I do not think it possible that any sunshine, the warmth of which is able to produce an appreciable effect upon either animal or vegetable life, is likely to escape registration. The instrument was not intended to be an actinometer, and the registration of the duration of *light* is not its function ; it is only intended to act when the sun's rays have attained a certain degree of heat-power."

* *Quarterly Journal*, Vol. 24, p. 1.

Following upon this the Report proceeds to point out the necessity for adopting a definite specification for all burning recorders, and suggests one which with slight variation has since been officially accepted by the Meteorological Office, and is fully set out in *The Observer's Handbook*.^{*} Its chief points are briefly as follows:—

Cards.—These are to be 0·02 in. thick. The straight or equinoctial cards are to be 1·56 in. wide, and the curved cards used in summer and winter 1·26 in. wide. The time scale on the equatorial card 12 hours = 9·00 in. in length.

Bowl.—Its diameter measured from 6 a.m. to 6 p.m. of an equatorial card must be 5·73 in., and the centre line of that card must lie equidistant from the top and bottom flanges of the bowl; the distance between the exposure edges of these flanges should be 2·47 in.

Lens.—Is to be of crown glass, colourless, or of a pale yellow tint; its diameter such that whilst it shall pass through a ring 4·01 in. in diameter, it shall not be able to pass through a similar ring 3·99 in. in diameter. It weight must be 4 pounds, and its focal length 2·98 in.

(To be continued.)

METEOROLOGICAL OBSERVATIONS AT PEMBA, EAST AFRICA.

THE following summary of nine years' meteorological observations at Banani in the Island of Pemba, near Zanzibar, has been kindly sent to us by Mr. T. P. Newman. The observations were taken by Mr. Theodore Burt, of the Society of Friends' Industrial Mission. Details of the monthly values in some years have appeared in our pages from time to time.

Year.	Mean Max.	Mean Min.	Absolute Max.	Absolute Min.	Extreme Range.	Rainfall.	Rain Days.
						in.	
1899.....	83°·3	70°·2	92°·0	65°·0	27°·0	105·24	149
1900.....	83·5	71·3	95·0	66·0	29·0	90·35	160
1901.....	81·8	70·4	90·5	65·0	25·5	92·78	166
1902.....	82·8	71·4	91·0	67·0	24·0	68·72	132
1903.....	82·3	71·3	91·5	66·0	25·5	63·24	136
1904.....	81·0	70·4	90·5	65·0	25·5	86·23	156
1905.....	81·6	71·3	90·5	64·0	26·5	101·28	153
1906.....	81·4	70·5	92·0	64·0	28·0	108·58	175
1907.....	81·5	70·2	89·0	63·0	26·0	76·23	177
Average of 9 years.	82·1	70·8	95·0	63·0	32·0	88·07	156

^{*} The Observer's Handbook. Meteorological Office, 1908, pp. 87-88.

RAINFALL TABLE FOR OCTOBER, 1909.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH.	
					Aver. 1870-99. in.	1909. in.
Camden Square.....	London.....	51 32	0 8	111	2·85	4·16
Tenterden.....	Kent.....	51 4	*0 41	190	3·60	5·97
West Dean.....	Hampshire.....	51 3	1 38	137	3·53	7·60
Hartley Wintney.....	".....	51 18	0 53	222	3·08	5·25
Hitchin.....	Hertfordshire.....	51 57	0 17	238	2·72	4·58
Winslow (Addington).....	Buckinghamsh..	51 58	0 53	309	2·89	3·83
Bury St. Edmunds (Westley).....	Suffolk.....	52 15	*0 40	226	2·66	3·81
Brundall.....	Norfolk.....	52 37	*1 26	66	2·98	3·62
Winterbourne Steepleton ..	Dorset.....	50 42	2 31	316	4·33	9·90
Torquay (Cary Green).....	Devon.....	50 28	3 32	12	4·09	6·64
Polapit Tamar [Launceston]	".....	50 40	4 22	315	4·97	7·45
Bath.....	Somerset.....	51 23	2 21	67	3·22	4·56
Stroud (Upfield).....	Gloucestershire..	51 44	2 13	226	3·10	4·45
Church Stretton (Wolstaston)..	Shropshire.....	52 35	2 48	800	3·99	4·28
Coventry (Kingswood).....	Warwickshire ..	52 24	1 30	340	3·18	3·71
Boston.....	Lincolnshire.....	52 58	0 1	25	2·62	3·54
Worksop (Hodsock Priory).....	Nottinghamshire	53 22	1 5	56	2·77	2·52
Derby (Midland Railway)...	Derbyshire.....	52 55	1 28	156	2·77	3·51
Bolton (Queen's Park).....	Lancashire.....	53 35	2 28	390	4·72	6·59
Wetherby (Ribston Hall)...	Yorkshire, W.R.	53 59	1 24	130	3·18	2·16
Arncliffe Vicarage.....	".....	54 8	2 6	732	6·55	9·86
Hull (Pearson Park).....	"..... E.R.	53 45	0 20	6	3·26	2·84
Newcastle (Town Moor) ..	Northumberland	54 59	1 38	201	2·94	2·18
Borrowdale (Seathwaite) ..	Cumberland.....	54 30	3 10	423	13·35	21·14
Cardiff (Ely).....	Glamorgan.....	51 29	3 13	53	4·81	7·24
Haverfordwest (High Street)	Pembroke.....	51 48	4 58	95	5·63	7·65
Aberystwyth (Gogerddan)..	Cardigan.....	52 26	4 1	83	5·58	8·04
Llandudno.....	Carnarvon.....	53 20	3 50	72	4·08	4·83
Cargen [Dumtries].....	Kirkcudbright...	55 2	3 37	80	4·39	11·30
Hawick (Braxholme).....	Roxburgh.....	55 24	2 51	457	3·42	6·09
Edinburgh (Royal Observy.)	Midlothian.....	55 55	3 11	442	...	4·49
Girvan (Pinnore).....	Ayr.....	55 10	4 49	207	5·42	8·26
Glasgow (Queen's Park) ..	Renfrew.....	55 53	4 18	144	3·36	5·39
Inveraray (Newtown).....	Argyll.....	56 14	5 4	17	6·34	10·99
Mull (Quinish).....	".....	56 36	6 13	35	6·09	7·99
Dundee (Eastern Necropolis)	Forfar.....	56 28	2 57	199	2·71	3·56
Braemar.....	Aberdeen.....	57 0	3 24	1114	4·05	5·89
Aberdeen (Cranford).....	".....	57 8	2 7	120	3·18	2·41
Cawdor.....	Nairn.....	57 31	3 57	250	2·85	4·38
Fort Augustus (S. Benedict's)	E. Inverness ..	57 9	4 41	68	4·38	7·80
Loch Torridon (Bendamph)	W. Ross.....	57 32	5 32	20	9·98	11·84
Dunrobin Castle.....	Sutherland.....	57 59	3 56	14	3·32	3·71
Castletown.....	Caitness.....	58 35	3 23	100	...	3·71
Killarney (District Asylum)	Kerry.....	52 4	9 31	178	6·05	8·03
Waterford (Brook Lodge)...	Waterford.....	52 15	7 7	104	4·00	7·28
Broadford (Hurdlestown) ..	Clare.....	52 48	8 38	167	3·12	6·69
Abbey Leix (Blandsfort)....	Queen's County..	52 56	7 17	532	3·45	6·16
Dublin (Fitz William Square)	Dublin.....	53 21	6 14	54	3·08	2·61
Mullingar (Belvedere).....	Westmeath.....	53 29	7 22	367	3·41	4·47
Ballinasloe.....	Galway.....	53 20	8 15	160	3·45	4·35
Crossmolina (Enniscoe).....	Mayo.....	54 4	9 18	74	5·04	8·17
Collooney (Markree Obsy.)..	Sligo.....	54 11	8 27	127	4·54	6·82
Seaforde.....	Down.....	54 19	5 50	180	3·82	5·86
Londonderry (Creggan Res.)	Londonderry ..	54 59	7 19	320	4·45	4·67
Omagh (Edenfel).....	Tyrone.....	54 36	7 18	280	3·72	4·85

RAINFALL TABLE FOR OCTOBER, 1909—*continued.*

RAINFALL OF MONTH (con.)					RAINFALL FROM JAN. 1.				Mean Annual 1870-1899.	STATION.
Diff. from Av. in.	% of Av.	Max. in 24 hours.		No. of Days	Aver. 1870-99.	1909.	Diff. from Aver. in.	% of Av.		
		in.	Date.		in.	in.			in.	
+1.31	146	.91	28	22	20.59	23.21	+2.62	113	25.16	Camden Square
+2.37	166	1.98	26	24	22.40	26.59	+4.19	119	28.36	Tenterden
+4.07	215	1.68	26	30	23.94	29.10	+5.16	121	29.93	West Dean
+2.17	170	1.22	28	31	21.52	26.03	+4.51	121	27.10	Hartley Wintney
+1.86	168	.89	28	28	20.05	24.69	+4.64	123	24.66	Hitchin
+ .94	133	.55	26	28	21.85	23.08	+1.23	106	26.75	Addington
+1.15	143	.93	28	20	20.78	22.99	+2.21	111	25.39	Westley
+ .64	122	.94	28	20	20.56	19.12	-1.44	93	25.40	Brundall
+5.57	228	1.69	26	27	30.05	35.11	+5.06	117	39.00	Winterbourne Stpltn
+2.55	162	.85	26	28	27.83	26.79	-1.04	96	35.00	Torquay
+2.48	150	.80	12.25	27	30.17	28.37	-1.80	94	38.85	Polapit Tamar
+1.34	142	1.03	26	25	24.93	24.28	- .65	97	30.75	Bath
+1.35	144	.66	23	29	24.38	24.98	+ .60	102	29.85	Stroud
+ .29	107	.53	23	25	26.94	25.64	-1.30	95	33.04	Wolstaston
+ .53	117	.46	23	25	23.97	22.69	-1.28	95	29.21	Coventry
+ .92	135	1.11	26	24	19.37	22.49	+3.12	116	23.30	Boston
- .25	91	.32	15	22	20.58	22.31	+1.73	108	24.70	Hodsock Priory
+ .74	127	.58	23	26	21.62	21.86	+ .24	101	26.18	Derby
+1.87	140	.99	3	25	34.33	38.85	+4.52	113	42.43	Bolton
-1.02	68	.35	3	22	22.54	23.98	+1.44	106	26.96	Ribston Hall
+3.31	151	1.86	23	27	48.55	56.15	+7.60	116	60.96	Arncliffe Vic.
- .42	87	.47	3	22	22.21	25.69	+3.48	116	27.02	Hull
- .76	74	.57	23	23	22.70	24.84	+2.14	109	27.99	Newcastle
+7.79	159	4.15	19	24	104.07	101.10	-2.97	97	132.68	Seathwaite
+2.43	150	.97	15	26	34.12	30.87	-3.25	90	42.81	Cardiff
+2.02	136	1.14	12	25	37.25	32.56	-4.69	87	47.88	Haverfordwest
+2.46	144	1.02	23	24	36.24	35.12	-1.12	97	45.41	Gogerddan
+ .75	118	1.21	3	25	24.65	26.19	+1.54	106	30.98	Llandudno
+6.91	257	2.34	12	23	34.25	43.16	+8.91	126	43.43	Cargen
+2.67	178	.89	12	25	27.55	28.74	+1.19	104	34.80	Branxholme
...	...	1.02	23	22	...	25.85	...	...	...	Edinburgh
+2.84	152	1.25	24	25	38.32	42.42	+4.10	111	48.87	Girvan
+2.03	160	.88	14	22	28.79	31.31	+2.52	109	35.80	Glasgow
+4.65	173	1.31	2	24	49.02	51.52	+2.50	105	62.80	Inveraray
+1.90	131	.89	14	25	44.62	39.46	-5.16	88	57.53	Quinish
+ .85	131	.81	23	21	23.46	23.15	- .31	99	28.95	Dundee
+1.84	145	...	...	...	28.98	26.88	-2.10	93	36.07	Braemar
- .77	76	.59	23	21	26.15	26.76	+ .61	102	33.01	Aberdeen
+1.53	154	.75	13	14	24.19	25.23	+1.04	104	29.37	Cawdor
+3.42	178	1.40	14	23	34.06	30.39	-3.67	89	43.71	Fort Augustus
+1.86	119	2.43	14	23	67.67	58.95	-8.72	87	86.50	Bendamp
+ .39	112	.52	3	18	24.95	25.18	+ .23	101	31.60	Dunrobin Castle
...	...	.65	13	28	...	25.51	...	...	...	Castletown
+1.98	133	.89	22	30	45.62	35.87	-9.75	79	58.11	Killarney
+3.28	182	1.05	19	21	31.08	30.69	- .39	99	39.30	Waterford
+3.57	214	1.19	19	26	26.91	33.34	+6.43	124	33.47	Hurdlestown
+2.71	179	1.09	17	26	28.50	30.78	+2.28	108	35.19	Abbey Leix
- .47	85	.49	23	24	22.76	21.10	-1.66	93	27.75	Dublin
+1.06	131	1.02	19	24	29.59	27.90	-1.69	94	36.48	Mullingar.
+ .90	126	.77	19	24	29.81	25.27	-4.54	85	37.04	Ballinasloe
+3.13	162	1.12	2	28	39.06	39.30	+ .24	101	50.50	Enniscoe
+2.28	150	1.06	23	24	33.71	33.30	- .41	99	41.83	Markree Obsy.
+2.04	153	1.04	23	20	31.03	33.18	+2.15	107	38.61	Seaforde
+ .22	105	.49	24	27	32.70	36.19	+3.49	111	41.20	Londonderry
+1.13	130	.52	23	23	30.55	31.55	+1.00	103	37.85	Omagh

SUPPLEMENTARY RAINFALL, OCTOBER, 1909.

Div.	STATION.	Rain inches	Div.	STATION.	Rain- inches
II.	Warlingham, Redvers Road	6.11	XI.	Rhayader, Tyrmynydd	9.99
„	Ramsgate	7.80	„	Lake Vyrnwy .....	...
„	Steyning	9.77	„	Llangyhanfal, Plâs Draw...	4.56
„	Hailsham	6.52	„	Dolgelly Bryntirion	9.06
„	Totland Bay, Aston House.	9.12	„	Snowdon, Cwm Dyli	15.15
„	Stockbridge, Ashley	7.73	„	Lligwy	6.45
„	Grayshott	8.00	„	Douglas, Woodville	8.16
„	Reading, Calcot Place.....	4.66	XII.	Stoneykirk, Ardwell House	7.33
III.	Harrow Weald, Hill House.	4.42	„	Dalry, The Old Garroch ...	12.33
„	Oxford, Magdalen College...	3.62	„	Langholm, Drove Road	9.65
„	Pitsford, Sedgebrook	3.00	„	Moniaive, Maxwellton House	10.15
„	Huntingdon, Brampton.....	3.46	XIII.	N. Esk Reservoir [Penicuik]	4.80
„	Woburn, Milton Bryant.....	5.71	XIV.	Maybole, Knockdon Farm..	6.86
„	Wisbech, Monica Road.....	3.25	XV.	Campbeltown, Witchburn...	5.16
IV.	Southend Water Works.....	4.56	„	Glenreadell Mains	6.78
„	Colchester, Lexden	4.15	„	Ballachulish House	11.41
„	Newport, The Vicarage.....	4.31	„	Islay, Eallabus	6.88
„	Rendlesham	4.78	XVI.	Dollar Academy	4.12
„	Swaffham	3.89	„	Loch Leven Sluice	5.03
„	Blakeney	4.42	„	Balquhiddier, Stronvar	14.05
V.	Bishops Cannings	4.58	„	Perth, The Museum	4.28
„	Ashburton, Druid House ...	10.60	„	Coupar Angus	4.16
„	Honiton, Combe Raleigh ...	6.24	„	Blair Atholl	6.43
„	Okehampton, Oaklands.....	8.53	„	Montrose, Sunnyside Asylum	2.88
„	Hartland Abbey	6.45	XVII.	Alford, Lynturk Manse ...	2.71
„	Lynmouth, Rock House ...	8.30	„	Keith Station	3.75
„	Probus, Lamellyn	6.40	XVIII.	N. Uist, Lochmaddy	6.75
„	North Cadbury Rectory ...	5.50	„	Alvey Manse	4.47
VI.	Clifton, Pembroke Road ...	6.06	„	Loch Ness, Drumnadrochit.	5.69
„	Ross, The Graig	4.18	„	Glencarron Lodge	10.82
„	Shifnal, Hatton Grange.....	2.79	„	Fearn, Lower Pitkerrie.....	2.90
„	Blockley, Upton Wold	4.59	XIX.	Invershin	4.47
„	Worcester, Boughton Park.	3.11	„	Altnaharra	5.81
VII.	Market Overton	3.40	„	Bettyhill	5.05
„	Market Rasen	3.57	XX.	Dunmanway, The Rectory..	10.74
„	Bawtry, Hesley Hall.....	2.08	„	Cork	5.72
„	Buxton	6.69	„	Mitchelstown Castle	6.75
VIII.	Neston, Hinderton Lodge...	3.25	„	Darrynane Abbey	8.75
„	Southport, Hesketh Park...	4.64	„	Glenam [Clonmel]	7.57
„	Chatburn, Middlewood	4.95	„	Nenagh, Traverstown.....	...
„	Cartmel, Flookburgh	7.31	„	Miltown Malbay	5.75
IX.	Langsett Moor, Up. Midhope	4.51	XXI.	Gorey, Courtown House ...	5.02
„	Scarborough, Scalby	3.42	„	Moynalty, Westland	5.34
„	Ingleby Greenhow	3.22	„	Athlone, Twyford	3.95
„	Mickleton	2.34	XXII.	Woodlawn	6.07
X.	Bardon Mill, Beltingham ...	...	„	Westport, St. Helens	7.31
„	Ewesley, Font Reservoir ...	2.81	„	Mohill	5.21
„	Ilderton, Lilburn Cottage...	3.57	XXIII.	Enniskillen, Portora	5.68
„	Keswick, The Bank	12.27	„	Dartrey [Cootehill].....	5.71
XI.	Llanfrechfa Grange.....	7.73	„	Warrenpoint, Manor House	5.22
„	Treherbert, Tyn-y-waun ...	19.24	„	Banbridge, Milltown	5.53
„	Carmarthen, The Friary....	9.03	„	Belfast, Springfield	5.83
„	Castle Malgwyn [Llechryd].	7.77	„	Bushmills, Dundarave	3.33
„	Plynlimon	14.20	„	Sion House	6.18
„	Crickhowell, Ffordlas.....	8.00	„	Killybegs	8.34
„	New Radnor, Ednol	6.15	„	Horn Head	6.58

METEOROLOGICAL NOTES ON OCTOBER, 1909.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail, S for Snow; F for number of days Frost in Screen; f on Grass.

LONDON, CAMDEN SQUARE.—Almost throughout the weather was of a gloomy nature, with great persistency of R. Temp. was unusually high, except during the last week, 60° or above being registered daily to 23rd, but from 26th to the close the temp. never reached 50°. Duration of sunshine 68·8* hours, and of R 86·4 hours. Mean temp. 53°·2 or 3°·4 above the average. Shade max. 67°·1 on 5th; min. 29°·1 on 30th. F 1, f 3.

TENTERDEN.—Temp. exceeded 60° on 21 days, and the weather was generally wet, excessively so from 26th to 28th. There were severe floodings in the Rother valley, and the railway was submerged and traffic stopped on the Robertsbridge line. Duration of sunshine, 98·3† hours. Shade max. 66°·0 on 2nd; min. 28°·0 on 30th. F 1, f 3.

TOTLAND BAY.—Duration of sunshine, 97·3* hours, or 13·5 hours below the average. A few flakes of S fell on 26th. Shade max. 64°·3 on 2nd; min. 33°·0 on 30th. F 0, f 4.

PITSFORD.—Mean temp. 48°·6. Shade max. 66°·4 on 4th; min. 28°·2 on 26th. F 4.

TORQUAY.—Duration of sunshine, 118·7* hours. Mean temp. 54°·0, or 1°·9 above the average. Shade max. 67°·3 on 1st; min. 31°·3 on 31st. F 2, f 8.

ASHBURTON, DRUID HOUSE.—The wettest October since observations began in 1866, with the exception of 1875, 1891 and 1903. Shade max. 66°·5 on 1st; min. 34°·2 on 31st. F 0.

ROSS.—Shade max. 64°·6 on 2nd and 18th; min. 24°·9 on 31st. F 2, f 6.

BOLTON.—Duration of sunshine, 79·2* hours, or 21·7 hours above the average. Mean temp. 48°·3, or 0°·9 above the average. Shade max. 64°·0 on 2nd; min. 28°·6 on 31st. F 2, f 15.

SOUTHPORT.—R 77 in. above the average of 35 years. Duration of sunshine 105·3* hours, or 9·8 hours above the average. Duration of R 70·0 hours. Mean temp. 50°·8, or 2°·2 above the average. Shade max. 65°·2 on 2nd; min. 27°·1 on 31st. F 3, f 5.

HULL.—Duration of sunshine, 80·7* hours. Shade max. 68°·0 on 2nd; min. 28°·0 on 31st. F 3, f 4.

HAVERFORDWEST.—Duration of sunshine 103·7* hours. Shade max. 63°·9 on 5th; min. 26°·7 on 31st. F 1, f 4.

LLANDUDNO.—Shade max. 64°·8 on 2nd; min. 29°·2 on 31st. F 1.

DOUGLAS.—The wettest October in 35 years, excepting only 1903, when 8·95 in. was recorded. Heavy R fell almost daily to 24th, accompanied by strong winds and low bar., and TSS occurred in the night of 12th. The temp., for the first time for several months, was above the average. The last week was fine, with cold E. winds and slight ground frosts.

CARGEN.—The wettest October since observations commenced in 1860. Floods, gales, and absence of sunshine, were accountable for great damage to agriculture. Shade max 63°·0 on 2nd; min. 23°·0 on 30th. F 2.

EDINBURGH.—Shade max. 63°·9 on 3rd; min. 30°·1 on 29th. F 4, f 6.

COPPAR ANGUS.—R fell persistently to 24th, but did not cause any flooding. The wet weather was detrimental to harvest work, and many places suffered damage and loss. Shade max. 65°·0 on 4th; min. 18°·0 on 31st.

FORT AUGUSTUS.—Shade max. 59°·7 on 7th; min. 19°·9 on 28th. F 5.

CORK.—Shade max. 64°·0 on 3rd and 4th; min. 26°·0 on 30th. F 3, f 4.

DUBLIN.—Wild, windy and showery to 24th, and very cold in the last week. Mean temp. 51°·3. Shade max. 66°·7 on 3rd; min. 30°·0 on 30th. F 3, f 4.

MARKREE.—Shade max. 64°·8 on 4th; min. 21°·5 on 29th. F 4, f 10.

WARRENPOINT.—Shade max. 64°·0 on 2nd and 4th.; min. 27°·0 on 29th. F 5, f 6.

* Campbell-Stokes.

† Jordan.

Climatological Table for the British Empire, May, 1909.

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.										
London, Camden Square	83.7	22	33.5	16	65.9	42.8	44.8	0.100	71	128.4	27.2	1.80	9	3.8
Malta	77.9	27	51.6	18	70.0	59.7	55.9	73	143.0	...	.77	4	6.1
Lagos	90.0	1	73.0	18†	87.9	76.0	75.8	76	160.0	71.0	7.08	18	8.1	
Cape Town	87.5	3	41.4	28	69.2	50.1	51.2	76	...	...	1.92	6	5.1
Durban, Natal	90.2	27	54.0	26‡	75.5	58.6	...	...	139.3	...	5.82	11	4.5
Johannesburg	69.3	16	39.0	19	62.1	46.0	41.5	69	129.5	35.2	1.08	5	3.7	
Mauritius	82.3	3	55.8	11	78.0	63.1	62.9	78	146.8	45.8	2.20	15	4.9	
Calcutta... ..	98.6	7, 25	71.3	21	95.3	78.2	76.5	75	158.7	69.4	4.52	6	3.2	
Bombay... ..	94.6	31	79.4	2	92.1	81.3	76.2	72	137.3	73.8	.00	0	2.8	
Madras	106.1	30	74.2	5	97.4	80.2	76.1	75	143.6	74.1	9.49	4	3.6	
Kodaikanal	71.2	2	49.5	4	66.7	54.7	52.8	78	140.5	37.2	8.17	20	5.8	
Colombo, Ceylon	90.0	15	74.0	4	87.7	78.5	76.1	80	154.0	73.0	5.91	22	6.6	
Hongkong	85.5	6	62.0	1	78.6	71.5	69.5	83	137.1	...	6.70	16	8.5	
Melbourne	65.4	28	40.0	20	59.2	47.4	45.5	75	114.9	34.4	3.14	17	7.2	
Adelaide	73.0	4	43.3	25	64.0	50.4	48.6	75	139.0	32.6	4.02	15	6.4	
Coolgardie	83.2	2	35.0	31	68.7	45.4	43.8	61	145.3	30.0	.77	4	3.4	
Perth	82.5	2	41.2	31	67.8	52.6	52.1	75	134.8	37.0	5.60	15	6.4	
Sydney	75.9	14	43.9	5	65.7	51.1	48.0	75	104.6	30.1	1.25	20	4.6	
Wellington ... ..	...	...	...	...	...	...	...	...	...	...	...	...	...
Auckland	70.0	2	42.0	16	63.1	54.1	53.1	80	120.0	39.0	4.72	18	5.6	
Jamaica, Kingston	91.6	7	67.7	3	88.4	72.3	70.5	70	...	...	1.50	5	1.5
Trinidad	90.0	12*	67.0	3	87.8	69.7	75.3	87	159.0	60.0	3.87	13	...	
Grenada	88.0	21	72.0	1	84.4	74.1	71.5	77	143.2	...	5.79	26	5.5	
Toronto	82.2	29	30.6	1	62.7	44.8	...	...	106.2	29.7	3.79	16	6.9
Fredericton	76.0	27	29.0	26	60.9	38.8	...	66	...	...	2.11	8	6.2
St. John's, N.B.	69.0	28	32.7	1	56.3	41.8	...	...	...	...	2.15	17	5.7
Victoria, B.C.	71.7	31	34.3	21	60.7	43.6	...	74	...	...	.96	10	6.0
Dawson	81.0	17	23.0	7	59.2	33.3	...	...	...	...	.81	4	5.3

* and 19. † and 22. ‡ and 28.

MALTA.—Mean temp. of air 65° 0. Average bright sunshine 8.3 hours per day.

Natal.—Rainfall 4.15 in. above average.

Johannesburg.—Bright sunshine 240.2 hours.

Mauritius.—Mean temp. of air 2° 1, of dew point 2° 4, and R 1.54 in., below averages. Mean hourly velocity of wind 8.1 miles or 2.2 below average.

KODAIKANAL.—Bright sunshine 189 hours. TSS on 23 days.

COLOMBO.—Mean temp. of air 81° 6 or 0° 7 below, of dew point 0° 8 above, and R 5.34 in. below, averages. Mean hourly velocity of wind 7.6 miles.

HONGKONG.—Mean temp. of air 74° 8. Bright sunshine 113.9 hours, or 40 hours below average. Mean hourly velocity of wind 13.4 miles. R 5.60 in. below average.

Melbourne.—Mean temp. of air 0° 7 below, and R 1.03 in. above, averages.

Adelaide.—A wet and rather cold month. R 1.28 in. above average.

Perth.—Rainfall .65 in. above average.

Sydney.—Mean temp. of air 0° 1 below, and R 3.80 in. below, averages.

TRINIDAD.—R .04 in. below 46 years' average.