Symons's

Meteorological Magazine.

No. 527. DECEMBER, 1909. Vol. XLIV.

Sir Arthur Mitchell, K.C.B., M.D.

19th January, 1826—12th October, 1909.

Although the great services to humanity, which were the main purpose of his life, lay in the study of mental diseases and the amelioration of the lot of the insane, and although the main study of his leisure was the archæology of Scotland, on which he wrote largely, Sir Arthur Mitchell did so much in the study of meteorology that his name would be remembered even if his fifty years' labours as a Commissioner in Lunacy, and his innumerable contributions to the earliest history of his country, had never been.

Sir Arthur Mitchell was the President of the Scottish Meteorological Society at the time of his death, and he was the last of the original members who founded the Society in 1855. He was on the Council of the Society in 1860, and continued for 49 years to take a leading part in its work as honorary secretary, vice-president and president. In this capacity he frequently suggested lines of research which were carried out by Dr. Buchan, his life-long friend. The two collaborated in several important pieces of work bearing on the relation of weather and disease, dealing in turn with general mortality, and with particular outbreaks of the plague, small-pox and influenza. Only last year, Sir Arthur dealt with the relation of weather and scarlet fever in Scotland.

At no time was Sir Arthur Mitchell more prominent in promoting meteorological research, than in the years of effort which resulted in the establishment of the Ben Nevis Observatory, and he was foremost in supporting all the work of the Society, of which, after the death of Dr. Buchan, he was the most experienced and the most indefatigable friend.

Sir Arthur Mitchell was a man of the kindest disposition, always ready to advise and encourage those who were taking up the studies in which he was a master, and we cherish many pleasant memories of his helpful advice.

THE BAROMETRIC DEPRESSION OF DEC. 2nd—3rd.

In the issue of this Magazine for February, 1907, we published a set of isobaric charts showing what was probably the highest recorded barometric pressure for Western Europe, the steep gradients around which produced a memorable gale. We give this month a map taken from the *Daily Weather Report*, modified by the *Weekly Weather Report*, of one of the deepest depressions observed in recent years, and also accompanied by a gale of extraordinary severity, which caused damage and loss of life in shipwreck on the west coast.

The week before the great depression appeared had been characterized by a slow procession eastward of ill-defined low pressure systems, which, gaining in strength, had gradually overcome and pushed away to the south the anticyclone which had covered our islands during the bright and dry month of November. These systems were marked by barometer readings below 29 inches, but were not very deep, the gradients being as a rule moderate; but on the evening of the 2nd a new centre was observed to be forming on the west of Ireland, with readings as low as 28·6 inches, and greatly steepened gradients. During the night this centre moved eastward, crossing Ireland and England, and became considerably deeper, the lowest points observed being 28·03 in. at Spurn Head and 28·09 in. at North Shields. The track appears to have crossed somewhere between these two points, and the *Daily Weather Report* shows it somewhat farther to the north than the *Weekly Weather Report*, in which the centre is indicated as lying near Grimsby. By the evening of the 3rd the system had moved to South Scandinavia, and later it travelled slowly northwards and gradually filled up. A small secondary depression crossed the south of England on the 4th, following the track of the main depression.

The gradients of the cyclone of the 3rd were steepest in the rear of the centre, but were steep in all parts, and disastrous gales were experienced in the British Isles, Norway, Sweden, France and Germany.

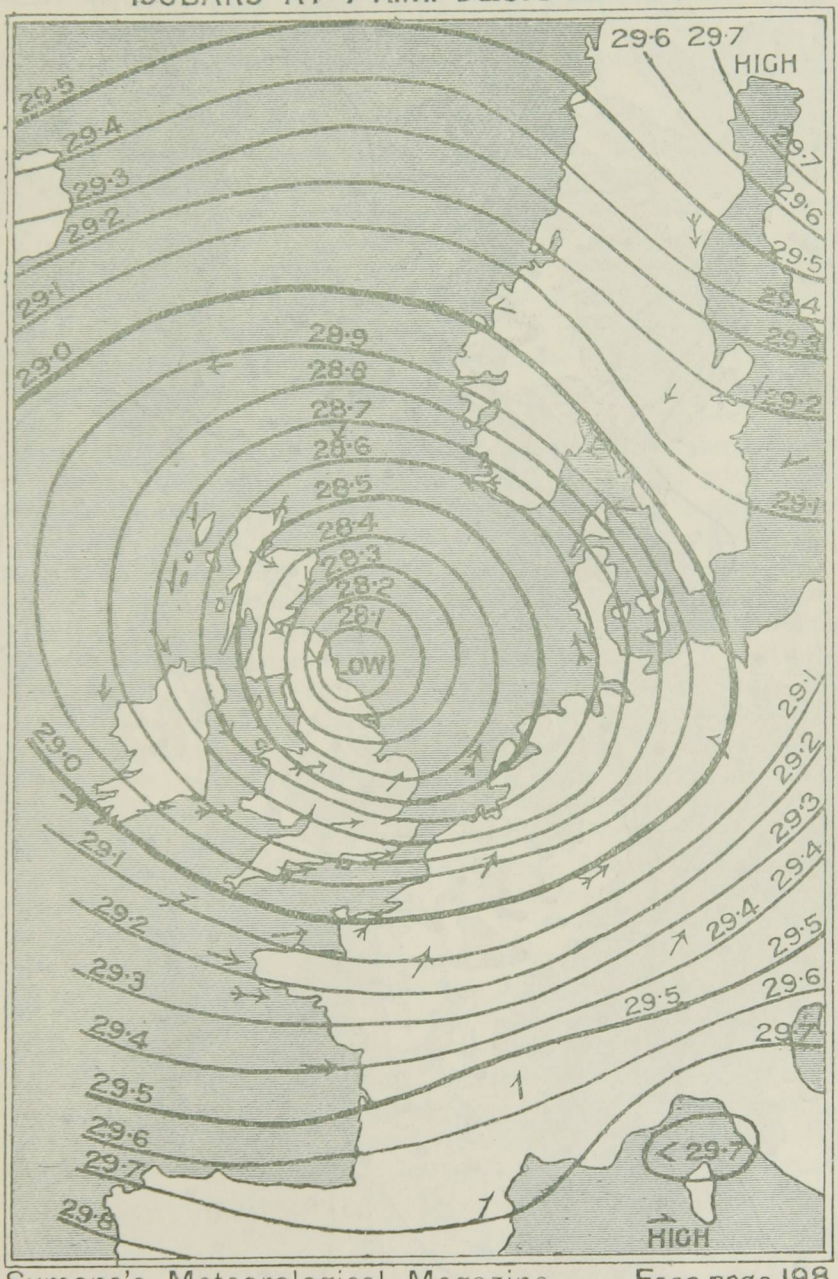
Some particulars of low readings of the barometer will be found in the Correspondence. It is unfortunate that the Redier barograph at Camden Square has too restricted a range to record a low minima of pressure, and the minimum passed over London during the night. There is reason to believe that it was by no means so low as many previous records, and did not approach the figure of 28·295 inches noted on December 9th, 1886.

THE WEATHER OF NOVEMBER, 1909.

By Fred. J. Brodie.

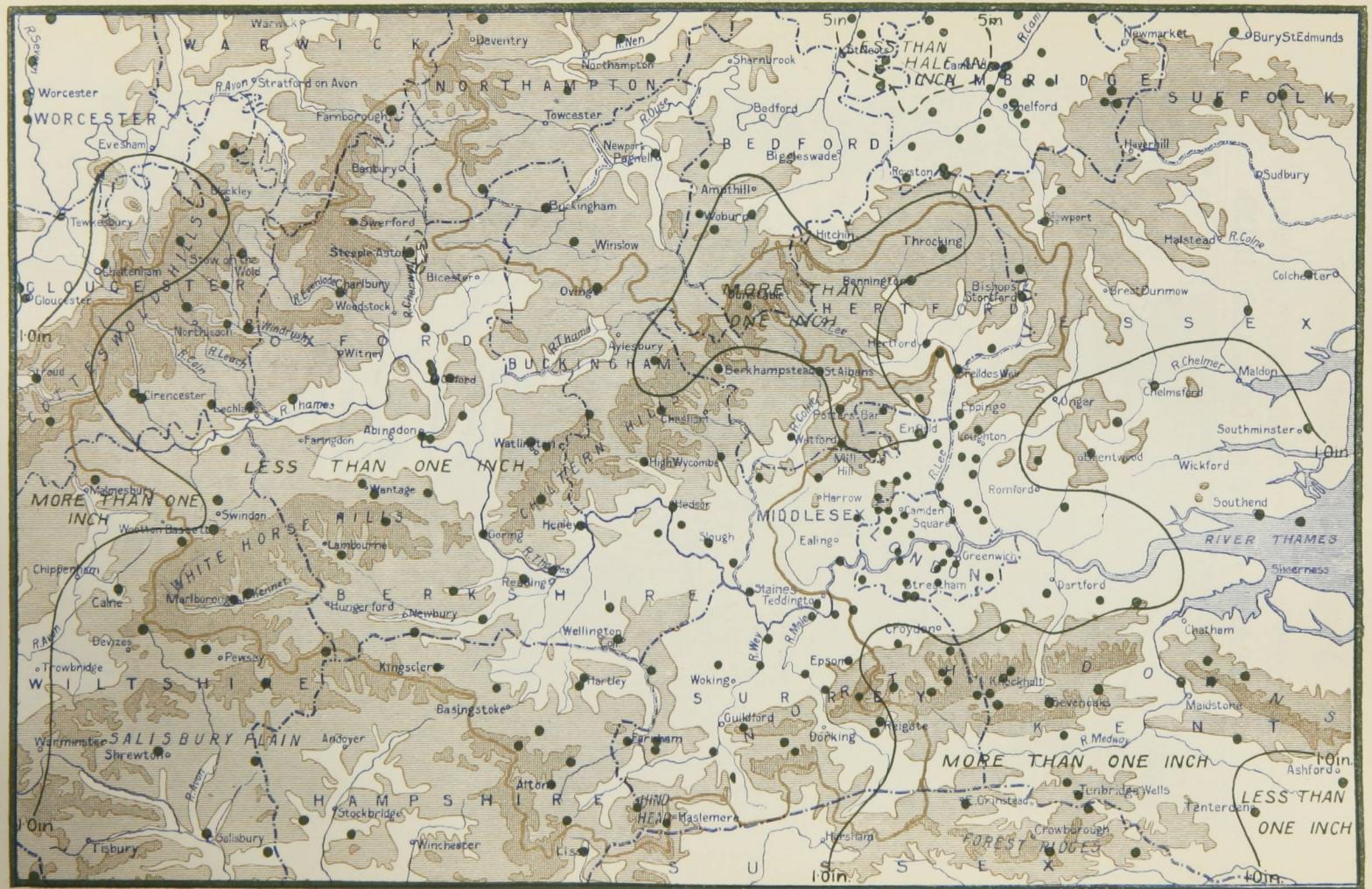
An autumn month, in which the United Kingdom was exposed almost entirely to the influence of cyclonic systems, was followed this year by one in which the anticyclone was even more strikingly in evidence. The contrast between the weather of October and November was,

ISOBARS AT 7 A.M. DEC. 3RD. 1909.



Symons's Meteorological Magazine. Face page 198

RAINFALL OF THAMES VALLEY, NOVEMBER, 1909.



Symons's Meteorological Magazine.

Watershed of River Thames above Teddington, and River Lee above Feildes Weir.

Isohyetals

therefore, very marked, the one month being for the most part mild and wet, the other cold and exceedingly dry. Had it not been for the change which occurred after the 25th of the month, the rainfall of November would, in fact, have been phenomenally small, and as it was the month ranked in many parts of the country as one of the driest Novembers on record.

The month opened with a sharp frost in Ireland, and with the gradual extension of a large anticyclone from the Atlantic over nearly the whole of Western Europe. After the 2nd, however, when the central portion of the high pressure system began to drift eastwards, a light breeze from south and south-west set in over our western and northern districts, and temperature rose above the normal. Later on the equatorial current became more general, and between the 3rd and 6th the daily maxima were well above 55° in most districts, readings as high as 60 degrees being recorded in several parts of Scotland and Ireland, and readings of 61° at Crieff and at Waterford and Roche's Point.

After the 6th, when a new anticyclone spread in from the Atlantic, the wind shifted temporarily to north and north-west, with colder weather, and on the night of the 7th and 8th a sharp frost occurred very generally. In the screen the thermometer fell at least 10° below the freezing point in many parts of the country, readings as low as 18° being recorded at Balmoral and West Linton; while on the surface of the grass the minima were below 15° at several northern and central stations, and as low as 12° at West Linton, Southport and Hereford. On the 9th the anticyclone receded to the south-westward, and the country was influenced for a time by large cyclonic disturbances moving from Iceland to Norway, and causing a general backing of the wind to the westward, with milder and rather changeable weather. Little rain fell, however, in any district, excepting the north of Scotland, where the passage of a small secondary depression from the Faeröe to the North Sea was accompanied on the 11th and 12th by an exceedingly heavy downpour, resulting in serious local floods.

Towards the middle of the month an anticyclone of increasing size and intensity extended from the Icelandic region; the wind became variable or easterly, and a frost of almost unprecedented severity for November was experienced in all the more western and northern parts of the kingdom. Between the 16th and 19th the thermometer in the screen fell below 15° in several Irish and Scottish districts, a reading of 10° being recorded at West Linton, and a reading of 3° at Balmoral. On the grass the minima were below 10° at many northern stations; at Balmoral the exposed thermometer sank to zero, while at Crathes it fell 5° below zero. Over eastern, central and southern England the frost was less severe than in the west and north, few places recording, by the sheltered thermometer, a reading as low as 20°. A light westerly breeze which sprang up in the north on the 18th and 19th caused a change

to milder weather, but between the 22nd and 24th, when the central portion of the Icelandic anticyclone drifted slowly southwards across the United Kingdom, a sharp frost occurred very generally, the cold being greatest in the western districts where the thermometer in the screen again passed below 20°; at Markree Castle and Llangammarch Wells the minimum on the 23rd was as low as 15°.

After the 25th the anticylonic period came to an end, and for the remainder of the month the extension of a large barometrical depression from the upper part of the Atlantic was accompanied by mild wet weather in all districts, the thermometer rising on the 28th and 29th to 55°, or a trifle above it in many parts of the country.

Over England the mean temperature of the month, though considerably below the average, was higher than in some recent years, and much higher than in 1901. In central Ireland the month was the coldest November since that of 1896, while in many parts of eastern and central Scotland it was the coldest since that of 1878. The record of bright sunshine was unusually good, nearly all places reporting more than the normal duration, and some of the western and southern stations a very large excess. In London (at Westminster) the total of 45 hours was 18 more than the average, but was a trifle smaller than in 1908, and much smaller than in 1894.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

LOW BAROMETER OF DECEMBER 2nd—3rd.

BELOW please find a few particulars of the barometric depression of December 2nd—3rd, 1909. Only once in 30 years has this low point been passed, viz., on December 8th, 1886, when the glass fell to 27·794 in. All readings are from a Standard Fortin barometer, corrected for temperature and reduced to sea-level.

	in.		in.
December 2nd, 8 p.m.....	28·581	December 3rd, 1 a.m.....	28·270
,, 9 ,, ...	28·503*	,, 2 ,, ...	28·198*
,, 10 ,, ...	28·411	,, 3 ,, ...	28·116
,, 11 ,, ...	28·347	,, 3.20 a.m.	28·112
,, Midnight...	28·335*	,, 9 ,,	28·469

I took many more readings; from them and my Redier barograph those marked with an asterisk are interpolated.

The barometer remained steady at 28·112 in. from 3.20 a.m. to 4.50 a.m. There was little wind except between 11 p.m. and 12.30 a.m., when there was a moderate gale; but I am informed that after the rise began there was a severe gale, which certainly subsided before 9 a.m. Rainfall, noon on 2nd to 9 a.m. on 3rd, 1·71 in.

My own barograph trace and another one I have received from a neighbour agree in showing that the descent of the barometer was

arrested from about 11.30 p.m. to 0.30 a.m., at the time the wind increased; also that the barometer remained stationary at its lowest point for about 1½ hours from 3.20 a.m. to 4.50 a.m.

List of Readings below 28·500 *in. in* 30 *years.*

	in.
1880, November 16, 12.30 p.m.	28·460
1884, January 26, 9.0 ,, ...	28·250 (about)
1886, December 8, 7-9 ,, ...	27·794
1891, November 11, afternoon	28·350 (about)
1899, December 29, 10 p.m.	28·380
1909, December 3, 3.20 to 4.50 a.m.	28·112

CHARLES LEWIS BROOK.

Harewood Lodge, Meltham, December 7th, 1909.

I THINK the readings of my standard barometer on the night of December 2nd to 3rd are worth recording. Each reading is corrected for temperature and reduced to sea-level :—

	in.	
December 2nd, 9 am.....	29·337	Just beginning to fall.
,, 3 p.m. ...	29·081	
,, 6 ,, ...	28·822	
,, 9 ,, ...	28·544	
,, midnight	28·405	
December 3rd, 1 a.m. ...	28·338	
,, 2 ,, ...	28·257	
,, 3 ,, ...	28·185	
,, 3.15 a.m.	28·178	Lowest point reached.
,, 3.30 ,,	28·201	Rising.
,, 9 ,,	28·526	

The night was rough, with heavy showers of rain and sleet. The rain for the first three days of the month was very heavy. Rainfall :—

December 1st	·96
,, 2nd	1·34
,, 3rd	·26
	2·56

G. C. LAWSON.

Mayfield House, near Ashbourne, Derbyshire, December 5th, 1909.

[We have received many letters on the subject of the low barometer which we would gladly print, but the writers have omitted to state whether the barometer they read is mercurial or aneroid, or whether it is corrected for temperature and reduced to sea-level or not, or else they state that it is uncorrected and give no data by which the readings can be made comparable with those of other Observers, and therefore the figures given are deprived of their full significance.—ED. *S.M.M.*]

RAINFALL MEASUREMENTS.

THE statement by two correspondents in the current (November) number of the Magazine, to the effect that they use the measuring glass to receive the rain which falls into the gauge has surprised me considerably. I had always been under the impression that it was

the invariable rule to use a bottle capable of holding two or three inches of rain. When the measure overflows during heavy rainfalls, as it must sometimes do, the contents of the can must need very careful emptying not to lose any of the water, so much so that a large bottle with small neck seems to me by far the simpler and safer receptacle.

As regards the discrepancies observed in the number of rain days recorded at stations in close proximity to one another (see the October Magazine, pages 165–167), I cannot help thinking that the personal equation has as much to do with it as negligence—perhaps even more. And in this connection I should like to make a suggestion. While acknowledging the importance of recording the total number of days on which rain (either truly such or dew) falls, would it not be an improvement to note in addition, and in parallel columns, how many of the falls so recorded were of ·02 in. or less. The number of small measurements specially noted in this way, when deducted from the larger number, would, if I mistake not, be found to smooth down the discrepancies materially, besides including very nearly every instance probably of the occurrence of dew. This method appears to me preferable to that suggested by Mr. Boys of ignoring altogether as rain days falls of less than ·03 in.

With reference to the question of returning to the gauge or throwing away amounts of ·004 in. and less, referred to by Mr. Brown in the October Magazine, I am of opinion that there should be perfect uniformity of action amongst observers. Personally, I throw all such small amounts away unrecorded, and the same rule is observed at the stations over which I have control. But I have heard of cases in the island where the opposite is done, and unmeasured small amounts returned to the gauge. The instructions of the Rainfall Organization appear to be hardly definite enough on this point; it being left to the wisdom of the observer to do either the one thing or the other.

BASIL T. ROWSWELL.

Les Blanches, Guernsey, 2nd December, 1909.

WEATHER IN WINTER.

In this north-western district of Furness, there is a very general impression among country people who are weather-wise—farmers and such-like especially—that if there is much winter weather, as hard frost and snow, before Christmas, there will be very little after.

This opinion we find is almost universal among our country people here, and skaters will tell us the same thing in another way, that is, if they have any skating before Christmas they do not have any after.

One would like to know if there is any foundation in fact for these opinions. Our own observations of temperature, etc., only go back for about twelve years, so we cannot pronounce on the subject. Are the same ideas to be found in the Midlands or in the south?

In this district the belief has found expression in the old, rather rough, Cumbrian couplet :—

" If Martinmas ice will carry a duck,
There'll be nothing after but slush and muck."

CHAS. P. CHAMBERS.

Orchard Head, Broughton-in-Furness, Dec. 3rd, 1909.

LIGHTNING STROKES.

YOUR readers may perhaps be interested to compare Mr. Druce's account, in the October number, of the effect of lightning on the oak tree at Stow-on-the-Wold, with my letter in Vol. **33** of the Magazine, p. 136, followed by one from Mr. Llewellyn Evans on p. 154, as to a parallel case at Charlton Kings in 1898. The similarity of the effects in the two cases is most marked, such as the stripping of the bark in one case in three separate grooves or seams ; in the other, in two such grooves extending separately from the top of the branches to the ground ; and the absence of burning or scorching. Like Mr. Druce I was left in doubt whether the tree had been struck by one, or by more than one, flash.

JAMES G. WOOD.

RESPONSE OF WELLS TO RAINFALL.

IT is so very seldom that one can get a clear idea of how soon rain really affects the level of my well, 125 feet in the chalk, that I send a few readings taken this autumn. From July 5th to August 31st there had been a steady fall of level in the well from 13 ft. to 12 ft. 2 in., on September 6th it read 12 ft. 1 in., and then rose thus:—

Weekly Readings of Level of Well.

	Level. ft.	in.	Rise. ft.	in.		Level. ft.	in.	Rise. ft.	in.
September 6	12	1	—		October 25	12	4	—	
,, 13	12	1	—		November 1	12	5	0	1
,, 20	12	1	—		,, 8	12	11	0	7
October 4	12	2	0	1	,, 15	14	10	1	11
,, 11	12	4	0	2	,, 22	16	4	1	6
,, 18	12	4	—		,, 29	18	0	1	8

I think we may conclude that the heavy fall in the last week in October made itself felt between 7 and 14 days after the fall occurred. The rainfall was as follows :—

October 26	1·50 in.	October 29	·03 in.
,, 27	1·43 ,,	,, 30	·01 ,,
,, 28	1·44 ,,	,, 31	·40 ,,

From November 1st to 13th inclusive there only fell a total of ·06 in. Perhaps we should be safe to say the heavy rain was certainly felt within a fortnight, though a daily plumbing would probably have shown a rise in level a little before November 8th.

RICHARD COOKE.

The Croft, Detling, Maidstone, December 6th, 1909.

THE STANDARDIZATION OF SUNSHINE RECORDERS.

By R. H. CURTIS.

(*Continued from p.* 191.)

In the specification given in the *Observer's Handbook*, however, three important points connected with the cards are not referred to, namely (1), the *colour* of the card. Originally the card adopted by Prof. Stokes was a purplish grey, but very soon this colour was changed to blue. There are, however, many shades of blue, and it is known that depth of tone affects the readiness with which the card burns. I have been told by Dr. Chree, the Superintendent of the Observatory Department of the National Physical Laboratory, that when a sunshine recorder is sent to the Kew Observatory for verification it is usual for the maker of the instrument to send with it a number of cards for use in comparing the traces got from the instrument with those obtained from the observatory recorder; and there is sometimes a considerable difference in the colour of the cards sent by different makers, and a corresponding difference in the results obtained which is not due to any fault in the instrument itself, and disappears when cards of standard tint are used.

(2) There is also, judging by some specimens of cards which have passed through my hands, a possibility of difference in the *texture* and quality of the cards, and this is a point which it is less easy to detect than is the case with departure from the standard tint.

(3) A third point which is still less capable of being dealt with by the majority of observers who use the cards arises from a sort of tradition—for after enquiry I can find no better authority for the belief—that the card before being printed upon is specially treated chemically with a view to the prevention of undue smouldering.

Neither of these points are, as I have said, mentioned in the *Observer's Handbook*; but as regards colour, the importance of having a uniform tint is fully appreciated at the Meteorological Office, where for some years a standard for colour as well as for shape, size and substance, has been kept for reference whenever new supplies are ordered.

There is reason, however, for thinking that at any rate most of the cards used in the British Isles, though obtained by the users from various sources, have a common origin; and if that be so there ought not to be the wide range of tint and difference of texture which one occasionally meets with, and to prevent which it would be wise for observers who buy direct from opticians to provide themselves with standard samples, and see to it that every fresh supply complies therewith.

Some two or three years ago the Meteorological Office found that some cards they were then using smouldered very freely, causing the trace to be very broad and irregular, and that occasionally the burn spread out on the card in a large round splash of black scorch. The makers of the cards were communicated with and were asked whether

any special treatment was applied to the card, and whether any variation in that treatment was responsible for the unusual readiness of the card to burn. The reply was that the matter would be enquired into, but the result of the enquiry, whatever it was, was not made known. There is, however, this obvious objection to the use of such a special treatment, that without great care in its application there would always exist a danger of variation in the burning capacity of the card arising from some designed or accidental modification of the formula employed.

This risk constitutes one of the greatest objections to the use of the photographic recorder. I have been assured by an optician who had prepared and sold large quantities of charts for these recorders that in spite of every precaution, such as buying the chemicals required from the same makers, and of the same quality, and the strictest adherence to the adopted formula, it was impossible to be sure of getting two batches of papers made at an interval of a few weeks of the same degree of sensitiveness; and without such extraordinary care, which is probably more than many would bestow upon the work, a large range of sensitiveness would be certain to occur.

To summarize:—The *lens* is the most important section of the instrument, because its diameter and focal length govern the dimensions of the bowl; and uniformity of burning power is practically ensured by the stipulation respecting weight and quality of glass.

The *bowl* ought to present no difficulty to makers who possess an acquaintance, however elementary, with the character of the diurnal and seasonal movements of the sun. Experience, however, has shown that even here a standard specification is necessary if uniformity is to be ensured; and it has also proved the necessity for seeing that the specification has been adhered to before accepting an instrument as satisfactory.

The *card* is an appendage to the recorder, and in that sense is outside the instrument itself. It is, however, indispensable; and if uniformity of result is sought, its conformity to a standard in respect of its colour and quality is perhaps as important as the conformity of the lens to the conditions laid down for it.

The capability of recorders to yield comparable results has been frequently tested, and indeed a part of the Kew test of a recorder is to compare its records with those of the Observatory instrument. When such tests have been carried out with instruments and cards which have conformed to the specifications quoted above, they have always yielded results which could be strictly compared with each other; and results such as those quoted by Mr. Wannery (p. 56, Vol. 44) have always been found to result from some grave departure from standard conditions. Sometimes the diameter of the bowl has been unsuitable to the time-scale on the card which has been used with it; at other times the fault has been found to lie in the size of the lens or to defective burning power; but as a rule the records of the two instruments under comparison are fac simile of each other.

I have already referred to the commercial use which is made of this element of meteorological observation. To that use there can, of course, be no objection; and indeed in the fact that so many public bodies have instituted systematic climatological observations, there is much cause for congratulation; but it is important that the sunshine recorder, as well as the thermometer and the rain gauge, should conform to such conditions as are necessary to ensure comparable results, and before concluding this article a word may be added respecting the measures taken to ensure uniformity in the *measurement* of the record of the Campbell-Stokes instrument, which is now the only form of recorder recognised by the Meteorological Office. The rule for measurement laid down by the Office is briefly as follows:—When the scorch is *faint* measure the whole of the trace *as far as it can* FAIRLY *be seen.* When the sun shines *brightly* but *intermittently* a slight allowance should be made for smouldering, and the measurement should not in such cases be carried to the extreme limit of each of the burns.

It is a stipulation of the Office that the cards from all stations for which statistics of sunshine are published shall be sent to the Office monthly for examination. Every card is looked at, and a selection of seven cards is made for re-measurement in the Office, the result being compared with the original measures made at the station. The degree of precision with which the traces can be measured is remarkable, and may be gathered from the fact that there are many observers whose measurements of the totals on individual cards rarely differ more than a tenth of an hour from the Office measurement; and since the differences which do occur are sometimes plus and at others minus, the difference between the total for the seven days is commonly within two-tenths of an hour. There are others, of course, which show larger differences but still within quite reasonable limits; and a very few whose tendency to exaggerate—or, shall I say, inability to make exact measures—proves the wisdom of the rule which insists upon an inspection of the cards—a rule which has now resulted in securing practical uniformity in method and result amongst the entire body of observers.*

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* The following are the mean differences obtained from six stations of each of these classes for the same three months of the past autumn, the differences are shown in percentages of the totals:—

Group (1)	0·4%	(2) 1·6%	(3) 2·7%
	0·4	1·3	3·3
	0·3	2·2	3·1
Mean	0·4	1·7	3·0

NOTE.—On page 191, owing to a misprint, the weight of the lens is given as 4 pounds; it should be 3 pounds.

ON RAINFALL IN RELATION TO WIND-DIRECTION.

By L. C. W. Bonacina.

It is becoming more and more recognised as a meteorological fact that in London and, presumably, also in all parts of England except the wet hill-districts, in all parts, that is to say, where the rainfall is not enormously increased and the precipitation conditions altogether complicated by orographical features, the most persistent rains and in general the foulest weather and most leaden skies occur when the wind is in the east. Premising, in the first instance, that we are dealing with cyclonic or otherwise rain-bearing types of atmospheric circulation, the following generalizations, based upon personal experience, concerning rainfall in relation to wind-direction may be fairly established:—(1) When the wind is S.W., or, say, between S. and W., the rainfall is usually intermittent and apt to be broken by bright intervals, and it is very variable in both intensity (*i.e.*, rate of fall) and quality (*i.e.*, size of drops and mode of fall). It is indeed seldom that the rain continues for more than about six hours without a break, or that the amount measured in twenty-four hours exceeds half an inch. Corresponding to the intermittent character of the precipitation, with strong S.W. winds, the sky is very changeable, being alternately broken and overcast. Very heavy showers separated by very fine intervals are, further, a not uncommon accompaniment of W. or S.W. winds in rain-bearing atmospheric depressions.

(2) The east-wind rain, on the contrary, or more properly the rain that falls when the wind is in the opposite quarter of the compass, that is between E. and N., is very persistent and much less variable in both quality and intensity than the west-wind rain. The rain usually falls incessantly for any period between twelve and forty-eight hours, whilst the amount normally recorded in twenty-four hours varies between half an inch and two inches. Even should the rainfall be more intermittent than usual, the sky remains obstinately overcast and intensely gloomy, without a single patch of blue or gleam of sunshine so long as the atmosphere remains under the influence of the rainy cyclonic depression.

Another point of distinction which may often be noticed between the east- and west-wind rains is this, that the former falls arrow-like to the ground, whereas the latter seems to grow out of the air and fall in beautifully curved paths. Having established the facts, I will endeavour to offer some suggestion which may shed some light on the causes of some of the phenomena. At first, I was tempted to ascribe the persistent nature of east-wind precipitation to the east-wind itself bringing conditions peculiarly favourable to persistent and heavy rainfall, and, but for a very curious fact discovered by Dr. Mill, I should hardly have sought for an explanation in any other way. Dr. Mill, however, has found, and he offers examples of the relation in the annual volumes of *British Rainfall*, that the heaviest precipitations—the largest measurements in 24 hours—almost

invariably occur in that portion of a cyclonic depression which lies on the left of the path of the centre, and this *irrespective of the direction in which the depression is travelling*, so that should a depression so alter its course as to describe a looped curve, as happened during the deluge of June, 1903, and also during the huge snowfall of April, 1908, a particular area may receive an unduly large rainfall as a result of being situated constantly in the left of the depression.

It would appear, therefore, that the large measurements of rain or snow associated with E. or N.E. winds are merely, as it were, an accident, dependent upon the fact that the great majority of our rain-producing cyclones travel towards the east, causing easterly winds to prevail to the north or left of the track, and westerly winds to the south or right.

Dr. Mill's discovery will, of course, need as much further confirmation as it can get, and whenever at rare intervals a typical cyclone is caught moving towards the west it should be very carefully studied in relation of rain to wind-direction. Now, why should the heaviest precipitation occur to the left of a cyclone track? I will suggest an explanation in this article, and test it more rigorously in a future one. The suggested explanation rests upon the well-founded assumption that the air in a cyclonic depression is not appreciably, at all events in the lower levels of the atmosphere, affected by the motion of translation of the depression, that is to say, it is not to any great extent carried forward by the system in its progress, but has simply a rotational velocity directed towards the centre of low pressure. The grounds for this assumption are these: First, if the air *were* carried forward by the cyclone in its progress there would be observed throughout the entire system what never is observed, namely, a westerly component in the winds of an eastward moving cyclone, which would have the effect of accelerating the velocity of the westerly wind on the right of the track, diminishing the velocity of the easterly wind on the left, and of occasioning a westerly wind in place of a calm in the central area of the cyclone; from the fact that there is no evidence of this westerly component, we need not be afraid to draw the obvious conclusion; in the second place, it is very difficult to conceive of a cyclonic eddy, in a compressible fluid like air, which could carry the same masses of air for any considerable distance, and yet preserve for any length of time the actual weather conditions which we know to be characteristic of such an eddy. As a matter of fact, the air is theoretically supposed to find its way to the centre of low pressure and to rise into the upper levels of the atmosphere, its place being taken by air flowing in from every direction outside the cyclonic system; thus the cyclone would always in its advance be affecting fresh masses of air. This reasoning, be it noted, does not hold in the case of a practically incompressible fluid like water. A water-eddy, or water-cyclone, to all appearances surrounds a water-vacuum, and such being the case there is no inherent difficulty presented to the imagination in regarding such an

eddy as being translated or carried along in *substance* consisting always of the same water particles, and not propagated like an air-eddy or air-cyclone as a kind of wave disturbance. Presuming, therefore, that cyclonic systems are transmitted as a sort of wave disturbance, without carrying the air with them at least for any great distance, how does the conception help us to explain the precipitation peculiarity referred to above, namely, the heavier rain in the left of a depression? It seems commonsense reasoning, which will no doubt be borne out by more thorough knowledge of the abstruse laws of hydro-dynamics, that a given mass of air which is travelling towards a cyclonic disturbance, that is to say, which is moving in an opposite direction to, or meeting the disturbance, will remain on the wave theory of cyclonic propagation a shorter time under the influence of the disturbance than the same quantity of air moving in the opposite direction, or with the cyclone. In our eastward moving cyclones, therefore, the winds blowing from an easterly direction should remain a shorter time within the cyclonic system than the winds blowing from a westerly direction, which would tend to get transported or dragged along with the system on account of the difficulty encountered by the disturbing influence in drawing in new masses of air to form a westerly wind, the old masses of air being liable to be taken up again.* If this is really the case, it is not difficult to account for the normally larger twenty-four hour records of rain brought with the easterly winds of eastward-moving depressions than with the westerly winds. A place experiencing an easterly wind in such conditions will be perpetually under the influence of nearly saturated surface air entering the cyclone, with the result that precipitation over that place will be heavy and persistent so long as the existing conditions last; but a place experiencing a westerly wind will be receiving, in a given time, a quantity of air which has remained for a relatively very long time within the cyclonic influence, and thus subject to the condensation of its moisture, with the consequence that having been thus more or less drained of its moisture, precipitation is on the whole less heavy and constant, and the twenty-four hour measurements smaller than at the place on the other side of a cyclone track where the easterly wind prevails. To summarise, then, this conclusion in a few words—precipitation is heavier on the left of the path of a depression because in that part of a depression the winds† are more or less meeting the disturbing

* This, be it carefully observed, is no refutation of the former conclusion, that the cyclone does not travel forward as a rigid system carrying the air with it.

† In considering wind-direction more importance has been given in this article to the E. and W. directions, than to the N. and S. The reason for this is that our eastward moving cyclones are on an average oval rather than circular, the average ratio of the largest to the shortest diameter being 1·78, and that the longest diameter lies in a very large majority of cases in a nearly W.S.W. to E.N.E. direction (see Dr. H. N. Dickson's "Meteorology," page 60).

influence. Typical westward moving cyclonic depressions are rare; but it would be most interesting to see whether the precipitation conditions accompanying the *westerly* winds of a *westward* moving cyclone were always analagous to those accompanying the *easterly* winds of an ordinary eastward moving one. It may, of course, be that the heavy rain brought with the easterly winds of ordinary cyclones are partly due to the E. wind itself. Easterly winds are usually relatively cold and dense, and it is possible that they may sometimes in a cyclonic system have a warm south-westerly wind climbing over them, the slow commingling of the two currents at a certain level being responsible for heavy precipitation. I have not made any calculation for ideal conditions as to how much water an ascending current of given strength, temperature, etc., is capable of sending down, but am disposed to think that while the rapid ascent of moist air into the upper regions is adequate for the initial stages of condensation—the formation of cloud and light rain—something more is needed in the shape of the mixing of currents of different temperatures to produce our heavy downpours of rain, whether these be associated with small thunderstorm depressions or big cyclonic systems.

ROYAL METEOROLOGICAL SOCIETY.

THE first meeting of this Society for the present session was held on November 17th at the Institution of Civil Engineers, Mr. H. Mellish, President, in the chair.

Mr. C. J. P. Cave gave an account of the methods which he employed for observing the pilot balloons used for investigating the currents of the upper atmosphere. Two theodolites are used at the ends of a measured base-line, and observations of the balloon are taken by both each minute from the liberation of the balloon. The readings are subsequently worked out and plotted graphically, when the height, direction and rate of travel of the balloon during its course are determined. The best time for observing balloons is shortly before sunset, as the sky will be becoming dark when the balloon reaches its greatest height, and continuing to be illuminated by direct sunlight, shines like a star. Mr. Cave has seen a balloon burst at a distance of 40 miles under these conditions. The rate of ascent of balloons is found to vary considerably near the ground, and in cloudy weather, particularly when there is cumulus cloud, but higher up the rate of ascent remains fairly uniform up to great heights.

Mr. W. Marriott read a paper on "Registering Balloon Ascents at Gloucester, June 23rd and 24th, 1909." During the Royal Agricultural Society's recent Show the author sent up ballons-sondes with recording instruments on three consecutive days. Two of the meteorographs, dropped when the balloons fell, were found and returned. The balloon on the 23rd fell 37 miles south-east, and that

on the 24th fell 43 miles north of Gloucester. The records showed that the temperature decreased pretty uniformly up to between five and six miles; above that height the temperature increased somewhat, and then kept nearly stationary up to the highest point reached by the balloons, about 12 miles. The temperature recorded on the 23rd was higher than that recorded on the 24th, and the point of change or the so-called "isothermal layer" was about half a mile lower in altitude. This was probably due to the balloon on the 23rd having ascended on the eastern side of the centre of a cyclone, while that on the 24th ascended on the western side of the centre.

Mr. R. Corless, on behalf of Dr. W. N. Shaw, showed two very interesting models illustrating the temperature distribution in the free atmosphere up to a height of 14 miles over the British Isles on July 27th and 29th, 1908.

Mr. Dines, Mr. Gold, Mr. Bryant, Mr. Bayard, Mr. Cave and Mr. Marriott took part in the discussion.

A paper on "Winter Temperatures on Mountain Heights," by Mr. W. Piffe Brown, was read by the Secretary. In 1867 the author placed a minimum thermometer on the summit of Y Glyder-fach, a mountain near Snowdon, and 3262 feet above sea-level, and this has been regularly observed and the lowest winter readings recorded each year. The author gives the readings in full.

Mr. E. Gold also presented a mathematical discussion of "The Semi-Diurnal Variation of Rainfall." The results of his investigation seem to indicate that the upward motion associated with the semi-diurnal variation of pressure is the probable cause of the semi-diurnal variation of rainfall in the tropical belt.

The following gentlemen were elected Fellows of the Society:—Mr. S. S. Ahmad, B.A., Dr. J. T. Ashton, Khan K. M. Azam, Mr. F. R. Bader, Assoc.M.Inst.C.E., Mr. F. A. Carpenter, Capt. T. H. Chudley, Capt. T. P. Fisher, Mr. F. J. V. Guy, Mr. E. L. Hawke, Mr. A. M. Hay, Mr. A. M. Huntington, Mr. D. P. James, Mr. W. L. Lindsay, Lieut. H. Phillips, R.N.R., Mr. F. E. Stokes, Capt. W. Trew, Capt. W. H. Wilkes, Dr. J. P. C. C. Williams, and Mr. J. H. Willis.

METEOROLOGICAL NEWS AND NOTES.

THE SYMONS GOLD MEDAL has been awarded by the Council of the Royal Meteorological Society to Dr. W. N. Shaw, F.R.S., in recognition of the valuable work which he has done in connection with meteorological science.

THE ROYAL METEOROLOGICAL SOCIETY is making a new departure, which should be appreciated by Fellows of the Society who rarely visit London. This takes the form of a provincial meeting to be held in the first instance at Manchester early next year. The meeting will take place in the University, at 5 p.m., on Wednesday, February 23rd, 1910, and papers on local and general meteorology will probably be read.

RAINFALL TABLE FOR NOVEMBER, 1909.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea.	RAINFALL OF MONTH.	
					Aver. 1870-99.	1909.
		° ′	° ′	ft.	in.	in.
Camden Square	*London*	51 32	0 8	111	2·45	·74
Tenterden	*Kent*	51 4	*0 41	190	3·22	·87
West Dean	*Hampshire*	51 3	1 38	137	3·25	·58
Hartley Wintney	,,	51 18	0 53	222	3·03	·54
Hitchin	*Hertfordshire*	51 57	0 17	238	2·56	·99
Winslow (Addington)	*Buckinghamshr.*	51 58	0 53	309	2·63	·69
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	2·50	·82
Brundall	*Norfolk*	52 37	*1 26	66	2·71	1·34
Winterbourne Steepleton	*Dorset*	50 42	2 31	316	4·82	·93
Torquay (Cary Green)	*Devon*	50 28	3 32	12	3·71	1·08
Polapit Tamar [Launceston]	,,	50 40	4 22	315	4·29	1·92
Bath	*Somerset*	51 23	2 21	67	3·06	1·21
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·99	1·20
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	3·18	·84
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·80	·80
Boston	*Lincolnshire*	52 58	0 1	25	2·14	·66
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	2·10	·27
Derby (Midland Railway)	*Derbyshire*	52 55	1 28	156	2·28	·50
Bolton (Queen's Park)	*Lancashire*	53 35	2 28	390	3·91	1·87
Wetherby (Ribston Hall)	*Yorkshire, W.R.*	53 59	1 24	130	2·23	·65
Arncliffe Vicarage	,, ,,	54 8	2 6	732	6·00	3·95
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	2·45	·58
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	2·65	·85
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	13·91	8·64
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	4·26	1·67
Haverfordwest (High Street)	*Pembroke*	51 48	4 58	95	5·41	2·17
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	4·68	2·27
Llandudno	*Carnarvon*	53 20	3 50	72	3·38	1·48
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	4·50	2·03
Hawick (Branxholme)	*Roxburgh*	55 24	2 51	457	3·71	1·14
Edinburgh (Royal Observy.)	*Midlothian*	55 55	3 11	442	...	·85
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	5·31	1·81
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	3·48	2·35
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	6·41	6·12
Mull (Quinish)	,,	56 36	6 13	35	6·43	4·51
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·76	·31
Braemar	*Aberdeen*	57 0	3 24	1114	3·94	1·20
Aberdeen (Cranford)	,,	57 8	2 7	120	3·47	1·65
Cawdor	*Nairn*	57 31	3 57	250	2·65	1·72
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	4·52	3·66
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	9·79	9·98
Dunrobin Castle	*Sutherland*	57 59	3 56	14	3·26	3·54
Castletown	*Caithness*	58 35	3 23	100	...	7·84
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	5·85	2·31
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	3·91	·88
Broadford (Hurdlestown)	*Clare*	52 48	8 38	167	3·19	2·12
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	3·21	1·97
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·60	1·43
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	3·44	2·36
Ballinasloe	*Galway*	53 20	8 15	160	3·60	2·33
Crossmolina (Enniscoe)	*Mayo*	54 4	9 18	74	5·63	4·05
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	3·93	3·00
Seaforde	*Down*	54 19	5 50	180	3·94	·93
Londonderry (Creggan Res.)	*Londonderry*	54 59	7 19	320	4·19	2·77
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	3·53	2·17

RAINFALL TABLE FOR NOVEMBER, 1909—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1870-99. in.	1909. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1870-1899. in.	STATION.
—1·71	30	·35	29	11	23·04	23·95	+ ·91	104	25·16	Camden Square
—2·35	27	·39	14	11	25·62	27·46	+1·84	107	28·36	Tenterden
—2·67	18	·33	29	9	27·19	29·68	+2·49	109	29·93	West Dean
—2·49	18	·26	29	10	24·55	26·57	+2·02	108	27·10	HartleyWintney
—1·57	39	.49	14	12	22·61	25·68	+3·07	114	24·66	Hitchin
—1·94	26	·28	14	11	24·48	23·77	— ·71	97	26·75	Addington
—1·68	33	·23	16	11	23·28	23·81	+ ·53	102	25·39	Westley
—1·37	49	·24	16, 21	18	23·27	20·46	—2·81	88	25·40	Brundall
—3·89	19	·37	29	12	34·87	36·04	+1·17	103	39·00	Winterbourne Stpltn
—2·63	29	·54	29	8	31·54	27·87	—3·67	88	35·00	Torquay
—2·37	45	·37	29	13	34·46	30·29	—4·17	88	38·85	Polapit Tamar
—1·85	40	·54	29	12	27·99	25·49	—2·50	91	30·75	Bath
—1·79	40	·31	29	14	27·37	26·18	—1·19	96	29·85	Stroud
—2·34	26	·21	27	11	30·12	26·48	—3·64	88	33·04	Wolstaston
—2·00	29	·20	16	11	26·77	23·49	—3·28	88	29·21	Coventry
—1·48	31	·17	29	17	21·51	23·15	+1·64	108	23·30	Boston
—1·83	13	·11	28	10	22·68	22·58	— ·10	100	24·70	Hodsock Priory
—1·78	22	·12	27	12	23·90	22·36	—1·54	94	26·18	Derby
—2·04	48	·38	28	17	38·24	40·72	+2·48	106	42·43	Bolton
—1·58	29	·20	27	12	24·77	24·63	— ·14	99	26·96	Ribston Hall
—2·05	66	·95	27	16	54·55	60·10	+5·55	110	60·96	Arncliffe Vic.
—1·87	24	·15	22	14	24·66	26·27	+1·61	107	27·02	Hull
—1·80	32	·22	21, 22	14	25·35	25·69	+ ·34	101	27·99	Newcastle
—5·27	62	2·01	28	15	117·98	109·74	—8·24	93	132·68	Seathwaite
—2·59	39	·45	27	13	38·38	32·54	—5·84	85	42·81	Cardiff
—3·24	40	·41	27	11	42·66	34·73	—7·93	81	47·88	Haverfordwest
—2·41	49	·28	26	16	40·92	37·39	—3·53	91	45·41	Gogerddan
—1·90	44	·40	30	15	28·03	27·67	— ·36	99	30·98	Llandudno
—2·47	45	·43	28	10	38·75	45·19	+6·44	117	43·43	Cargen
—2·57	31	·34	28	11	31·26	29·88	—1·38	96	34·80	Branxholme
...	...	·35	27	9	...	26·70	...	...	...	Edinburgh
—3·50	34	·30	28	16	43·63	44·23	+ ·60	101	48·87	Girvan
—1·13	68	·78	29	13	32·27	33·66	+1·39	104	35·80	Glasgow
— ·29	95	2·07	28	20	55·43	57·64	+2·21	104	62·80	Inveraray
—1·92	70	·72	29	19	51·05	43·97	—7·08	86	57·53	Quinish
—2·45	11	·10	28	6	26·22	23·46	—2·76	89	28·95	Dundee
—2·74	30	...	...	...	32·92	28·08	—4·84	85	36·07	Braemar
—1·82	48	·35	11	15	29·62	28·41	—1·21	96	33·01	Aberdeen
— ·93	65	·35	13	10	26·84	26·95	+ ·11	100	29·37	Cawdor
— ·86	81	1·30	28	14	38·58	34·05	—4·53	88	43·71	Fort Augustus
+ ·19	102	1·39	29	24	77·46	68·93	—8·53	89	86·50	Bendamph
+ ·28	109	1·14	11	14	28·21	28·72	+ ·51	102	31·60	Dunrobin Castle
...	...	2·72	11	25	...	33·35	...	...	...	Castletown
—3·54	40	·60	30	18	51·47	38·18	—13·29	74	58·11	Killarney
—3·03	22	·25	30	10	34·99	31·57	—3·42	90	39·30	Waterford
—1·07	66	·41	28	15	30·10	35·46	+5 36	118	33·47	Hurdlestown
—1·24	61	·45	13	15	31·71	32·75	+1·04	103	35·19	Abbey Leix
—1·17	55	·66	13	14	25·36	22·53	—2·83	89	27·75	Dublin
—1·08	69	·48	13	12	33·03	30·26	—2·77	92	36·48	Mullingar.
—1·27	65	·50	26	15	33·41	27·60	—5·81	83	37·04	Ballinasloe
—1·58	72	·64	30	21	44·69	43·35	—1·34	97	50·50	Enniscoe
— ·93	76	·90	1	16	37·64	36·30	—1·34	96	41·83	Markree Obsy.
—3·01	24	·36	30	8	34·97	34·11	— ·86	98	38·61	Seaforde
—1·42	66	·57	30	22	36·89	38·96	+2·07	106	41·20	Londonderry
—1·36	61	·46	30	13	34·08	33·72	— ·36	99	37·85	Omagh

SUPPLEMENTARY RAINFALL, NOVEMBER, 1909.

Div.	STATION.	Rain inches	Div.	STATION.	Rain. inches
II.	Warlingham, Redvers Road	1·22	XI.	Rhayader, Tyrmynydd	2·94
,,	Ramsgate	·36	,,	Lake Vyrnwy	3·16
,,	Steyning	1·42	,,	Llangyhanfal, Plâs Draw	1·33
,,	Hailsham	1·39	,,	Dolgelly Bryntirion	3·78
,,	Totland Bay, Aston House.	·77	,,	Snowdon, Cwm Dyli	...
,,	Stockbridge, Ashley	·61	,,	Lligwy	1·95
,,	Grayshott	·68	,,	Douglas, Woodville	1·32
,,	Reading, Calcot Place	·72	XII.	Stoneykirk, Ardwell House	2·76
III.	Harrow Weald, Hill House.	·80	,,	Dalry, The Old Garroch	3·38
,,	Oxford, Magdalen College..	·75	,,	Langholm, Drove Road	2·18
,,	Pitsford, Sedgebrook	·68	,,	Moniaive, Maxwelton House	2·27
,,	Huntingdon, Brampton	·47	XIII.	N. Esk Reservoir[Penicuick]	1·40
,,	Woburn, Milton Bryant	1·15	XIV.	Maybole, Knockdon Farm..	2·10
,,	Wisbech, Monica Road	·61	XV.	Campbeltown, Witchburn...	1·99
IV.	Southend Water Works	1·46	,,	Glenreasdell Mains	2·83
,,	Colchester, Lexden	·83	,,	Ballachulish House	7·53
,,	Newport, The Vicarage	·69	,,	Islay, Eallabus	4·10
,	Rendlesham	·86	XVI.	Dollar Academy	1·42
,,	Swaffham	·88	,,	Loch Leven Sluice	·85
,,	Blakeney	1·12	,,	Balquhidder, Stronvar	5·03
V.	Bishops Cannings	·50	,,	Perth, The Museum	·53
,,	Ashburton, Druid House	1·83	,,	Coupar Angus	·48
,,	Honiton, Combe Raleigh	1·20	,,	Blair Atholl	1·77
,,	Okehampton, Oaklands	2·16	,,	Montrose,SunnysideAsylum	·91
,,	Hartland Abbey	1·78	XVII.	Alford, Lynturk Manse	1·86
,,	Lynmouth, Rock House	2·60	,,	Keith Station	4·02
,,	Probus, Lamellyn	1·52	XVIII.	N. Uist, Lochmaddy	3·80
,,	North Cadbury Rectory	·76	,,	Alvey Manse	1·66
VI.	Clifton, Pembroke Road	1·56	,,	Loch Ness, Drumnadrochit.	2·33
,,	Ross, The Graig	·89	,,	Glencarron Lodge	9·38
,,	Shifnal, Hatton Grange	·70	,,	Fearn, Lower Pitkerrie	1·68
,,	Blockley, Upton Wold	1·10	XIX.	Invershin	3·75
,,	Worcester, Boughton Park.	·90	,,	Altnaharra	6·19
VII.	Market Overton	·64	,,	Bettyhill	5·7
,,	Market Rasen	·39	XX.	Dunmanway, The Rectory..	1·80
,,	Bawtry, Hesley Hall	·23	,,	Cork	·76
,,	Buxton	1·57	,,	Mitchelstown Castle	1·08
VIII.	Neston, Hinderton Lodge	1·06	,,	Darrynane Abbey	2·38
,,	Southport, Hesketh Park	1·70	,,	Glenam [Clonmel]	·71
,,	Chatburn, Middlewood	2·28	,,	Nenagh, Traverstown	1·87
,,	Cartmel, Flookburgh	2·00	,,	Miltown Malbay	2·84
IX.	Langsett Moor, Up. Midhope	1·63	XXI.	Gorey, Courtown House	1·68
,,	Scarborough, Scalby	1·95	,,	Moynalty, Westland	1·52
,,	Ingleby Greenhow	1·80	,,	Athlone, Twyford	2·24
,,	Mickleton	·98	XXII.	Woodlawn	2·52
X.	Bardon Mill, Beltingham	1·19	,,	Westport, St. Helens	3·07
,,	Ewesley, Font Reservoir	·54	,,	Mohill	1·95
,,	Ilderton, Lilburn Cottage..	1·05	XXIII.	Enniskillen, Portora	2·53
,,	Keswick, The Bank	2·98	,,	Dartrey [Cootehill]	1·58
XI.	Llanfrechfa Grange	2·76	,,	Warrenpoint, Manor House	1·02
,,	Treherbert, Tyn-y-waun	4·26	,,	Banbridge, Milltown	1·11
,,	Carmarthen, The Friary	1·81	,,	Belfast, Springfield	1·45
,,	Castle Malgwyn [Llechryd].	2·10	,,	Bushmills, Dundarave	1·78
,,	Plynlimon	6·00	,,	Sion House	2·29
,,	Crickhowell, Ffordlas	1·90	,,	Killybegs	5·40
,,	New Radnor, Ednol	2·11	,,	Horn Head	3·99

METEOROLOGICAL NOTES ON NOVEMBER, 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.—The outstanding feature of the month was its low R, following, as it did, an unusually wet October. Of the total fall, ·35 in., or 47 per cent., fell on 29th. The weather was generally of a cloudy type, but on several days considerable sunshine was recorded. Duration of sunshine, 59·0* hours, and of R 18·6 hours. Mean temp. 41°·5 or 1°·5 below the average. Shade max. 54°·9 on 3rd; min. 29°·1 on 21st. F 10, f 21.

TENTERDEN.—Duration of sunshine, 117·8† hours. Shade max. 58°·0 on 6th; min. 25°·5 on 26th. F 12, f 17.

TOTLAND BAY.—Duration of sunshine, 127·6* hours, or 47 hours above the average and 11·7 hours above the previous record for November. Shade max. 55°·5 on 6th; min. 29°·9 on 19th. F 8, f 16.

PITSFORD.—R 1·74 in. below the average. Mean temp. 39°·8. Shade max. 55°·6 on 4th; min. 26°·5 on 14th. F 15.

WINTERBOURNE STEEPLETON.—Cold and dry and very similar to November, 1901. Mean temp. 41°·2. Shade max. 57°·0 on 4th; min. 24°·0 on 24th. F 13, f 16.

NORTH CADBURY.—Dry and remarkably sunny. The roads were astonishingly clean for November, almost throughout. Shade max. 59°·0 on 5th; min. 23°·5 on 23rd. F 12, f 18.

ROSS.—Shade max. 55°·8 on 3rd; min. 23°·6 on 23rd. F 15, f 19.

HODSOCK PRIORY.—The driest November for at least 30 years. Shade max. 59°·3 on 4th; min. 23°·5 on 14th. F 13, f 23,

BOLTON.—Duration of sunshine, 54·7* hours, or 29·7 hours above the average. Mean temp. 40°·4, or 2°·4 below the average. Shade max. 52°·9 on 3rd; min. 28°·9 on 14th. F 11, f 25.

SOUTHPORT.—R 1·54 in. below the average of 35 years. Duration of sunshine 80·4* hours, or 30·8 hours above the average, and the greatest recorded for November. Duration of R 42·0 hours. Mean temp. 41°·3, or 2°·0 below the average. Shade max. 53°·4 on 5th; min. 25°·4 on 16th. F 12, f 18.

HULL.—Duration of sunshine, 52·9* hours. Shade max. 58°·0 on 4th; min. 26°·0 on 14th. F 7, f 18.

HAVERFORDWEST.—Duration of sunshine 109·7* hours. Shade max. 54°·8 on 3rd; min. 21°·0 on 23rd. F 11, f 17.

LLANDUDNO.—Shade max. 49°·0 on 5th; min. 28°·5 on 16th. F 5.

DOUGLAS.—Almost rainless to 25th with a wonderful excess of brilliant sunshine. The last 5 days were wet and stormy with H showers and some S on the hills. Temp. below the average throughout. Shade max. 56°·0 on 3rd; min. 31°·0 on 8 days. F 8.

CARGEN.—A sharp spell of frost from 13th to 26th occasioned a serious loss to farmers, through loss of unlifted potatoes and turnips. Shade max. 57°·0 on 3rd; min. 19°·0 on 16th. F 17.

EDINBURGH.—Shade max. 56°·2 on 2nd; min. 24°·1 on 16th. F 11, f 16.

COUPAR ANGUS.—The driest November in 30 years' record. The mean temp., 36°·9, was 3°·0 below the average, and was reduced by a severe spell of low temp. after 13th. Shade max. 59°·0 on 5th; min. 10°·0 on 17th.

FORT AUGUSTUS.—Shade max. 55°·0 on 4th; min. 15°·0 on 17th. F 16.

WATERFORD.—The driest November since 1879 when ·56 in. was recorded. Shade max. 60°·0 on 3rd; min. 23°·0 on 24th. F 12.

DUBLIN.—Cool and generally fine. Mean temp. 43°·0. On the morning of 15th two inches of S fell. Shade max. 56°·8 on 3rd; min. 28°·2 on 16th. F 6, f 14.

MARKREE.—Shade max. 55°·8 on 3rd; min. 13°·4 on 16th. F 17, f 23.

WARRENPOINT.—Shade max. 59°·0 on 3rd; min. 23°·0 on 14th and 15th. F 8, f 14.

* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, June, 1909.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	75·1	17	39·0	11	63·9	48·5	49·0	81	119·5	34·0	3·79	17	8·7
Malta	85·6	27	61·1	2	76·6	66·0	62·1	73	145·0	...	·08	2	2·8
Lagos	89·0	16	70·0	12†	84·7	74·0	74·5	79	159·0	68·0	19·55	20	8·3
Cape Town	79·2	2, 11	38·8	14	66·7	48·3	49·9	78	...	...	1·76	10	6·2
Durban, Natal ...	80·8	14	51·5	9	74·7	55·8	...	...	128·5	...	2·56	4	1·6
Johannesburg	66·9	23	36·4	11	60·1	42·1	40·6	70	119·6	32·0	·00	0	0·8
Mauritius	77·7	2, 3	58·0	14	74·8	64·3	62·9	81	145·6	48·7	7·57	22	7·0
Calcutta...	95·2	20	74·8	22	89·3	78·2	78·2	87	156·8	72·6	22·63	22	8·2
Bombay...	95·4	2	74·4	4	87·9	79·9	77·6	82	135·5	71·8	16·63	23	7·8
Madras	102·9	9	69·5	15	98·1	79·9	72·2	67	144·0	69·5	1·65	9	5·9
Kodaikanal	70·2	19	50·8	27	64·4	53·0	50·8	78	138·8	38·1	3·63	17	7·4
Colombo, Ceylon ...	87·2	18	72·8	26	86·1	77·8	75·0	80	149·6	72·4	3·64	18	6·5
Hongkong	89·7	19	73·6	1	86·3	78·6	75·4	81	141·5	...	7·39	18	7·8
Melbourne	64·8	1	32·7	30	55·2	44·9	43·9	80	100·8	27·5	3·27	23	7·8
Adelaide	67·0	17	38·5	30	59·5	46·4	46·6	81	132·2	29·9	2·24	14	6·0
Coolgardie	70·3	9	33·0	25	60·5	42·9	43·3	71	134·0	29·0	2·18	12	5·8
Perth	77·1	9	41·0	23	64·5	48·8	48·4	74	119·9	35·9	8·34	14	5·3
Sydney	72·9	24	41·9	17	61·5	49·1	36·6	78	101·1	28·9	4·27	22	5·5
Wellington ...	60·2	5*	40·0	9, 25	56·9	47·9	43·3	71	102·0	29·0	2·50	14	7·3
Auckland	65·0	14	44·0	30	59·8	51·5	50·7	84	114·0	41·0	3·24	22	6·4
Jamaica, Kingston ...	91·7	4	68·8	28	89·0	73·6	73·0	75	...	...	4·74	8	...
Trinidad	88·0	sev.	67·0	14‡	86·1	70·1	74·0	87	155·0	63·0	8·31	23	...
Grenada	86·0	7	70·4	1, 19	82·7	73·7	71·9	79	135·6	...	12·20	27	5·5
Toronto	90·4	21	42·9	18	75·4	55·5	...	...	109·0	40·3	1·21	6	...
Fredericton	89·0	25	28·5	2	73·8	48·3	...	66	...	...	5·40	6	5·6
St. John's, N.B. ...	79·5	26	38·7	2	65·5	50·0	...	...	...	...	1·75	11	5·1
Victoria, B.C.	75·8	8	42·2	25	67·4	48·5	...	68	...	...	·47	6	4·0
Dawson	86·0	30	29·0	2	70·2	42·7	...	...	...	...	2·66	12	5·7

* and 14, 19. † and 13. ‡ and 15, 20.

MALTA.—Mean temp. of air 71°·2. Average bright sunshine 10·3 hours per day.

Mauritius.—Mean temp. of air 0°·2, of dew point 1°·8, and R 5·46 in., above averages. Mean hourly velocity of wind 10·7 miles or 0·5 below average.

KODAIKANAL.—Bright sunshine 144 hours.

COLOMBO.—Mean temp. of air 79°·4 or 1°·6 below, of dew point 0°·8 above, and R 4·01 in. below, averages. Mean hourly velocity of wind 8 miles. TS on 12th.

HONGKONG.—Mean temp. of air 81°·8, or 1°·1 above. Bright sunshine 230·3 hours, or 74 hours above average. Mean hourly velocity of wind 12·5 miles. R 9·00 in. below average.

Melbourne.—Mean temp. of air 0°·2 below, and R 1·18 in. above, averages.

Adelaide.—Mean temp. of air 0°·4 below, R ·78 in. below, averages.

Perth.—Rainfall 1·72 in. above average.

Sydney.—Mean temp. of air 1°·0 above, and R 1·04 in. below, averages.

Wellington.—Bright sunshine 122·0 hours.

Auckland.—Rainfall 1·50 in. below, and mean temp. of air 2°·0 above, averages.