Symons's Meteorological Magazine.

No. 528. JANUARY, 1910. Vol. XLIV.

THE RAINFALL OF 1909.

For the third time since the full discussion of annual rainfall made the determination possible, the rainfall of the year for the whole of the British Isles considered together comes out as within one per cent. of the thirty years' average. The former occasions were in 1906 and 1907; but on each of the three occasions a large part of the country had a rainfall in excess of the average, and a large part of the country had a rainfall less than the average. The last column but one in the Table on p. 241 gives the percentage of the average rainfall experienced by 53 stations for 1909, and combining these with about 50 additional records for which it was possible to calculate the averages we are able to express the rainfall of various divisions and of the country as a whole in the following summary where 100 represents the local average in each case:—

England, South.	Wales.	England, North.	England and Wales.	Scotland.	Ireland.	British Isles.
102	95	107	103	99	95	100

The districts of excessive and deficient rainfall were arranged in a form somewhat similar to that experienced in other recent years. There were two conspicuous dry areas in which the rainfall was more than 10 per cent. below the average. One was the extreme south-west of Ireland, Wales and England, where for the last five years the annual rainfall has always been deficient, and here in 1909 the deficiency culminated with more than 20 per cent. below the average at Cork Harbour and Tresco Abbey, Scilly. The other was in the north-west of Scotland, but its limits are not clearly defined, as so few long records of rainfall exist in that region. The distinctly wet regions where the rainfall was more than 10 per cent. above the average surrounded the south and east of Great Britain, one area lying along the south and south-east of England, culminating in a patch round the Thames estuary, where the excess at Shoeburyness was more than 20 per cent. of the average. The region of lowest actual rainfall had thus the greatest excess when compared with its average. The second area with more than 10 per cent. of rain was in Lincoln, the east and north of Yorkshire and Lancashire, and there were also four

small patches with an equal excess near (1) Newcastle, (2) the margin of the Moray Firth, (3) in Galloway, and (4) in the west of Donegal. The extreme dryness of the north-west of Scotland and the wetness of the south-east of England in the month of June was certainly brought about by a northern anticyclone clearing the sky for sunshine on the north-west coast, while a procession of small cyclones running up the Channel brought gloom and showers to the south-east. The wettest month for the British Isles was March; and in that month great stretches of the south and east coasts had more than twice their average rainfall; but the same month was, as we have shown on p. 45, exceedingly dry in the extreme west of Scotland, thus showing the same distribution of wet and dry areas as June. These two months impressed their character on the year, the marked excesses in the south and east being accentuated also by the great falls in Sussex, Kent and Essex in October and December. November was the driest month of the year, the average being hardly reached at any point, and over very large areas the rainfall was less than one-third of the normal.

THE WEATHER OF DECEMBER, 1909.

By Fred. J. Brodie.

The closing month of 1909 was marked by weather of an extremely changeable character. With the exception of a brief period about the middle of the month, the type of pressure distribution was almost invariably cyclonic, many of the centres of disturbance passing directly over the United Kingdom. Rain was therefore frequent, and in some cases very heavy; and at the close of the third week, snowstorms were experienced over a large portion of north Britain.

Owing to the frequent changes in wind direction which attended the movements of the various barometric minima, the fluctuations in temperature were considerable. In the rear of a very deep depression which moved eastwards across the country on the 3rd, when severe gales were experienced in nearly all parts of England and Ireland, a cold wind spread down from the north-westward, and in the course of the ensuing night a sharp frost occurred in all our more western and northern districts.

Still colder weather was reported with the variable winds which set in a day or two later, the lowest readings being observed between the 6th and 8th in Ireland and north Britain, but on the 9th and 10th over eastern, central and southern England. In the latter districts the frost was not very severe, few stations reporting a mimimum temperature below 20°, but in Scotland and the north-west of England readings as low as 15° were experienced in many places. At Kilmarnock the sheltered thermometer fell to 12°, and at West Linton the readings were as low as 6° in the screen and 4° on the grass, while at Balmoral both shade and grass thermometers sank to zero.

On the 9th, when a large cyclonic system appeared over the

Iceland-Faeröe region, a mild breeze spread in from the south-westward, and on the 10th and 11th the thermometer rose above 50° in all districts, excepting the south-east of England, readings of 55° or a trifle higher being recorded at many western and northern stations. After this a large anticyclone extended down from northern Europe, and for the next few days the wind was in the east, and temperature fell to a rather low level, though with no sharp frost.

On the 15th a large area of low pressure began to spread over western Europe from the southern portions of the Atlantic, and in the course of the next few days the development of definite baric minima in the neighbourhood of our own islands resulted in a long spell of extremely unsettled weather, with a general prevalence of winds from some polar quarter. The lowest temperatures of the whole month were recorded between the 20th and 22nd, when the sheltered thermometer fell below 15° at a large number of stations situated in nearly all parts of the kingdom, and to 10° and less at many places in the west and north. On the grass and on the surface of the snow (which fell in large quantities on the 19th and 21st), the readings were as low as 5° at Buxton and 4° at Balmoral, while at Worksop on the morning of the 21st, the exposed thermometer fell to 7° below zero. A deep depression, which appeared off our south-west coasts on the evening of the same day, occasioned strong gales from the south-eastward over nearly the whole country, with heavy rain in the south of England, and much snow followed by rain in the north. Next morning the centre of the disturbance moved northwards along the west coasts of Ireland, the gale subsided quickly and the wind veered to south and south-west, with a rapid rise of temperature, the maxima on the 22nd and 23rd being above 50° in many parts of England and Ireland. In the closing week, the south-westerly current was supreme, and the weather was therefore very mild, the highest temperatures of the whole month occurring very commonly on the 26th and 27th, when the thermometer rose to 55° and upwards in all districts, including the north of Scotland, and reached a maximum of 57° at Cirencester and Markree Castle. The temporary extension of a large anticyclone from the southward on the 29th and 30th was, however, accompanied by rather sharp night frosts, the thermometer on the grass falling below 20° in many English districts, and touching 12° at Greenwich.

Over the entire northern half of the United Kingdom, the mean temperature of December was below the average, the deficit in central Scotland amounting to between 3°·5 and 4°. In the eastern, central and south-eastern parts of England, there was a slight excess of warmth. In spite of its generally unsettled character, there were many intervals of fair weather, and the duration of bright sunshine was nearly everywhere in excess of the normal. This was especially the case in London, the total amount of sunshine at Westminster, over 29 hours, was more than double the average, and larger than in any December of the previous 26 years, with the single exception of 1893.

A METEOROLOGICAL EXCURSION IN WALES.

By E. ANTONY LEES.

THE annual Committee vacation of a great city is useful, not only as providing for the holidays of the members of the Committee and of the officials, but also as affording opportunities for extended excursions to the Works with the conduct of which the Committees are charged, or to kindred undertakings; useful and indeed necessary proceedings for which the time cannot be found when meetings are frequent.

An excursion of the kind was undertaken on August 25th and 26th last, when a tour of inspection was made of the rain gauges established on the great gathering ground of the Birmingham Waterworks in the valleys of the rivers Elan and Claerwen, on the borders of the counties of Radnor and Brecknock.

In order to understand the purpose and results of this expedition it is necessary to go back a little. At the time when the Birmingham Corporation obtained their Act authorising the construction of the Welsh works, the only direct data of rainfall were furnished by a gauge which had been kept for some years by Mr. R. Lewis Lloyd, of Nantgwyllt, and on the data furnished by that gauge the engineer to the scheme, the late Mr. James Mansergh, F.R.S., worked out the capacities of the reservoirs required for the proper utilisation of the gathering ground. Up to the present the river Elan only has been dealt with. Three reservoirs have been constructed, one of which, Caban Côch, extends also into the Claerwen valley. The full scheme provides for three additional reservoirs on the Claerwen, to be constructed as they are found necessary. As regards the water drawn off from the watershed, the full amount of compensation water required by Parliament to be sent into the river, 27 million gallons per day, is being given regularly from the Caban Côch reservoir. The draught for consumption is only one-third of what the ground will ultimately yield; and, while the tunnel and cut-and-cover portions of the aqueduct have been constructed of sufficient capacity to convey the full ultimate yield, the syphon sections will require six lines of pipes, two of which only are at present provided, and when the time comes for the provision of additional pipes, those then responsible for the undertaking will be faced with the problem of what additional reservoirs will be required. With a view to providing in advance, data on which the solution to this problem must be based, the Water Committee have established a sufficient number of rain gauges over their gathering ground to enable accurate estimates to be made of the rainfall for a term of years.

In a matter of this kind, the locating of the gauges is very important, and the advice of Dr. H. R. Mill was sought on the subject. He selected fifteen positions, fairly distributed over the whole 71 square miles within the watershed, and chiefly situated on the summits of the level-topped moors, of which the gathering ground in great part consists.

All of these gauges were in working order by 1st January, 1908, but on an examination of the records for the completed year the figures in some cases appeared to be somewhat inconsistent between themselves, and also as compared with the records of other similarly placed gauges kept by other observers.

As, of course, rain gauges are of no use at all unless they are as nearly perfect as experience can make them, it was decided to take an opportunity during the vacation for Dr. Mill to visit the gauges in company with the officials directly concerned; and in pursuance of this plan we foregathered on the evening of August 24th, and started for the two days's trip on the morning of the 25th. The party comprised Dr. Mill, the Superintendent of the local works, the Observer, the Secretary of the undertaking (the present writer), and a student. As it was necessary that we should sleep out one night, and it was more than probable that at the end of the first day's tramp a change of clothing would be not only a luxury, but a necessity, well-furnished portmanteaux were sent on direct to the pre-arranged camping ground.

The weather at the time was very broken, and during the night before the start rain fell in torrents, but when we assembled for an early breakfast the sun was shining pleasantly, and our hopes rose correspondingly. We were conveyed by motor car to the limits of civilisation, in other words, to the extent of the made roads, inspecting two of the low-level rain gauges *en route*. Having arrived at the end of the roadway, we were met by a farmer, who brought two mountain ponies for the use of the party. The burden of the ponies was at first restricted to the wraps and other impedimenta, but before very long the significance of the provision became apparent to us, as we found the first considerable stream crossing our track to be so swollen by the previous night's rain as to be impassable on foot. We then had to work out our own solution of the old puzzle of the fox, goose and man with only one boat, so as to provide for the passage of the party of five with only two ponies, and this means of negotiating the streams had to be adopted many times in the course of the day.

The weather during the earlier part of the day was thoroughly enjoyable, and continued so up till the interval for lunch by the side of one of the streams. Never were sandwiches more welcome, and as for the drinks, the amount of previous night's rain, ·84 in., was found to be a fair measure for each round as we drank out of the rain glass, the number of rounds, however, not being strictly regulated.

No sooner had we started on the second half of the day's tramp, than the entire suitability of the region as a water supply gathering ground was exemplified uncomfortably, and for a couple of hours we struggled bravely through a storm of wind, rain and mist. The rain of the previous days, and the preceding night especially, had made the ground very soft, and as the storm found us in rather an unfavourable tract of country, the experience of those two hours is more pleasant to look back upon than it was to endure. Happily

the storm blew over, and the light first breaking on the distant hills and rapidly surrounding us was a glorious as well as a welcome sight.

The flutter of a flag on the sky-line, with a wreath of smoke from the angler's hut near by, told us that we were approaching our camping ground, and that the advance party responsible for the commissariat had arrived, and that the preparations for our reception were well in hand. Nor were our highest anticipations disappointed, as we were met with hot cups of tea, and very soon were enjoying the satisfied feeling which comes only after a long tramp, followed by abundant ablutions, dry clothes, and the immediate prospect of dinner.

The camping ground was near two mountain lakes, the Llynau Cerigllwydion, and adjoining an old monks' road, which before the dissolution of the monasteries connected the Abbey of Strata Florida in Cardiganshire with the Abbey Cwmhir, while our camp comprised a fishing hut kindly placed at our disposal, supplemented by bell tents. The moor at this point is 1500 feet above sea-level.

During the evening the regular observer told us stories of some of his adventures when reading the monthly gauges on the last day of each month; and the onerous character of the duty involved in reading these gauges was brought home to us by the fact that he has to sleep in the hut on the last night of every month. Fancy, for instance, each 31st December, after a tramp of 18 miles, finishing up where we then were, "and letting in the New Year" in the out-of-the-world place, to be followed on the next day by a similar tramp home again, whatever the weather may be. To illustrate the remoteness and loneliness of the spot, we may recall the anecdote that when the hut was being built a tramp strolled by; whence he came or whither going is not stated:—

Tramp to Builder: "What are yer doin'?"

Builder: "Buildin' a hut."

Tramp: "What for?"

Builder: "Oh, for somebody to sleep in."

Tramp: "Good Lord! what's he done?"

After a stormy night the morning broke fair. It had been arranged that some of us should visit one of the rain gauges before breakfast, and after a hasty cup of tea we set out, leaving behind one of our party to catch a dish of trout for the morning meal. As we reached the crest overlooking the lake after a couple of hours' tramp out and home, through miles of quaking bog, we saw our friend some yards from the shore whipping the water. As he caught sight of us he turned into the hut, and by the time we reached the camp our ears were greeted by the sound of the brown beauties frying over the fire. Breakfast, packing, and the despatch of the carriers with the portmanteaux, quickly followed.

The day opened out gloriously, and never shall we forget the splendid tramp over the moors with glimpses of the bird, plant and insect life of the moorlands. Most curious of the finds to meet our

eye were numerous fragments of exploded shells, a reminder that this had been selected a few years ago as the most desolate part of Wales for the purpose of experiments with new projectiles. Several lines of pools, now filled with water, marked the scoops of turf made by the larger fragments of the shells as they burst. Views of far off hills enabling us to trace the general line of the previous day's journey, and at last the lovely valley of the Elan, in which are now embosomed the beautiful reservoirs looking like natural lakes which have been there from the beginning of all things, formed a series of pictures which remain photographed on the memory.

The actual results of the 36 miles' tramp covered in the two days are, first, the satisfaction of knowing that the rain gauges as a whole are well placed and efficiently maintained and read; and, second, the decision to establish two additional gauges to illustrate the difference between the rainfall in valleys and on adjoining hills, and a third to provide a check upon a particular gauge which had exhibited vagaries in its readings. But, above all, there is the satisfaction of knowing that the data in future will be as accurate as care and experience can make them, and that future calculations of yield will not be based upon guess-work but upon ascertained facts.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on December 15th at the Institution of Civil Engineers, Mr. H. Mellish, President, in the chair.

Dr. W. N. Shaw, F.R.S., read a paper on "The Variations of Currents of Air indicated by simultaneous records of the Direction and Velocity of the Wind." He said that in order to form a mental picture of air flowing past an anemometer, we need to take into account the changes of direction as well as the changes in velocity. He described how he had endeavoured to combine these in a vector diagram, and he pointed out some interesting results obtained from such diagrams.

Capt. D. Wilson-Barker, Mr. W. B. Tripp, Mr. W. W. Bryant, Mr. R. Inwards, Mr. W. H. Dines, and the President, took part in the discussion, and Dr. Shaw replied.

Two practical and interesting papers by Mr. W. G. Reed, junr., were read by the Secretary. These formed part of the work done in the course of Climatological Research given in Harvard University, Mass., U.S.A., under the direction of Prof. R. de C. Ward. The first paper was "A Critical Examination of South American Rainfall Types," the author's object being to make a simple yet accurate map showing the seasonal distribution of rainfall in South America. The second paper was on "The Study of Phenomenal Climatology." The suggestion has several times been made that the treatment of weather elements by days and months is arbitrary and unnatural for places not within the tropics. The author pointed out

that in latitudes subject to cyclones the distribution of weather elements depends largely upon the relation of cyclones and anti-cyclones, and he therefore suggested that the cyclone is a more rational unit than the day or the month.

The following ladies and gentlemen were elected Fellows of the Society:—Mr. R. F. Bryant, Mr. R. Corless, B.A., Mr. R. F. Griffiths, Mr. C. J. Grist, M.A., Dr. W. J. Lewis, Mr. W. F. Masterman, Miss A. H. T. P. Parker, Mr. Y. B. Petley, and Mrs. E. M. Sutton.

SCOTTISH METEOROLOGICAL SOCIETY.

THE annual business meeting of the Society was held at 5, St. Andrew's Square, Edinburgh, on 8th December, 1909, Sir Archibald Buchan-Hepburn, Bart., in the chair.

The report from the Council referred to the great loss sustained by the death, on 12th October, of Sir Arthur Mitchell, K.C.B., the distinguished President of the Society. Sir Arthur had been associated with the Society since its foundation in 1855, and had been a member of Council since 1860. From 1888 until 1903 he was Honorary Secretary, in 1904 he was elected Vice-President, and in 1908 President. Memorial notices of Sir Arthur have been published in the Journal, Lady Frances Balfour dealing with his personal qualities and his remarkable career as a public man, and Mr. R. T. Omond with his many services to the Society and his contributions to medical climatology.

The Honorary Treasurer was able to communicate an extremely satisfactory financial statement. The Council having given up all hope of making good from public sources heavy obligations for which they had to assume responsibility when the Ben Nevis Observatories were closed in 1904, had recently put the whole matter before the members. The response had been of a most generous character. One anonymous donor had himself paid off a bank overdraft of £113, and there was every probability that a loan of £300 made by the Society to the Observatory Fund would be made good. Two-thirds of that amount had been already received.*

Professor A. Crum Brown, F.R.S., was appointed President; Sir A. Buchan-Hepburn, Bart., and Mr. J. Mackay Bernard of Dunsinnan, Vice-Presidents; Mr. R. T. Omond and Mr. E. M. Wedderburn, Honorary Secretaries; and as members of Council, Mr. Ralph Richardson, Dr. John Aitken, F.R.S., Mr. James Macdonald, Secretary Highland and Agricultural Society, Dr. C. G. Knott, Sir David Paulin, Mr. Gilbert Thomson, Professor F. W. Dyson, F.R.S., Mr. H. M. Cadell, of Grange, and Captain H. G. Lyons, F.R.S.

Professor Crum Brown was welcomed to the presidential chair, and delivered an address on "The Functions and Use of a Meteorological Society."

* The whole amount has since been paid off by the members.—ED., *S.M.M.*

Prince Yamashina,

3rd July, 1876—2nd May, 1908.

H.I.H. PRINCE YAMASHINA of Japan was educated at the Naval Academy in Kiel, and entered the Japanese Navy, where he held the rank of Captain at the time of his death. He was much interested in meteorology and seismology, and during the last two years his work has become familiar to European meteorologists from the volumes of observations at the First Order Meteorological Stations which he founded in Japan. These consisted of an observatory on the summit of the isolated volcanic peak of Mt. Tsukuban, and a low-level station near its base. The observations made at these stations were published by the Prince, and distributed to all meteorological institutions.

Capt. Henry Toynbee,

22nd October, 1819—29th March, 1909.

THIS genial old sailor and meteorologist died in his ninetieth year. He commenced life in the British Mercantile Marine in 1833 or 1834 as a midshipman on board the ship "Dunvegan Castle," and sailed for Calcutta. Some years later he entered the employment of Messrs. T. & W. Smith, who then owned a fine line of frigate-built passenger ships engaged principally in the East India trade, his first appointment being as third officer of the "Duke of Argyll." Toynbee in course of time commanded successively the "Ellenborough," "Gloriana," "Marlborough" and "Hotspur." He was a religious man, insisted on a full muster at Church-parade every Sunday, and always took a great interest in the welfare of sailors afloat and ashore.

His lifelong interest in scientific work, and especially meteorology, was greatly stimulated by his marriage in 1854 to a danghter of Admiral W. H. Smyth, F.R.S. His wife accompanied him on many voyages, and his meteorological logs illustrated by her sketches were remarkably complete.

After the death of Admiral FitzRoy, the Meteorological Office was transferred from the Board of Trade to the newly-formed Meteorological Committee of the Royal Society. This Committee on January 3rd, 1867, appointed Capt. Toynbee as Marine Superintendent; he held this post until his retirement in June, 1888; during this long period he was in charge of the oceanic meteorological discussions. In addition to writing reports for the Meteorological Office, he read papers bearing on Marine Meteorology, before several scientific societies; and in 1890 he published a little book on "Weather Forecasting for the British Islands by means of a barometer, the direction and force of wind, and cirrus clouds."

Correspondence.

To the Editor of Symons's Meteorological Magazine.

UNITS OF RAINFALL MEASUREMENT.

I THINK many of the discrepancies between neighbouring rain-gauges may be accounted for by their being constructed of different metals. For the last 10 months I have had a copper Snowdon gauge, and I have compared its records with those of my old gauge, which was of black japanned metal. At first they were side by side, but latterly in different positions about 200 yards apart, both placed on short grass. I have very rarely found any dew recorded in the copper gauge, but frequently in the japanned one. Another fact that I have noticed is, that the amounts in the japanned gauge are very frequently ·01 or ·02 in. higher than in the copper gauge.

GEORGE SHEDDEN.

Spring Hill, East Cowes, I.W., December 19th, 1909.

[From an interesting paper, which goes with great detail into the methods of making the experiments referred to, we extract the following.]

I HAVE two gauges, the receiver of one being $4\frac{1}{2}$ inches in diameter, and that of the other $2\frac{5}{8}$ inches. I experimented with both to find the deficit between the amount of rain run into each and the amount as poured out into the measuring glass. Water was run into the dry receivers from a suitably graduated burette, and then poured from the receiver back into the burette. The experiments showed that the deficit was greater in the large than in the small receiver, and that in order to pour out from the large receiver ·005 of rain there had to be poured into it ·0067 in., or to measure ·01 in. poured from the receiver ·013 would have to be poured in. The deficit with half-an-inch of rain is nearly ·005 in. Obviously then there will be an appreciable difference in the reading according as the rain is collected directly into the measuring glass or not.

Although the difference in practice that I have investigated may account for some apparent inconsistences between the results at neighbouring stations, I think it is probably quite the least important cause. Few people who have not been used to scientific work realize how important it is to hold a measuring glass level; and here is, I expect, one fruitful source of errors in rain gauge reading. There are also inconsistencies in reading the top or bottom of the meniscus, and many other possibilities of making small errors. For these reasons, and because of the comparative frequency of dews of ·01 in., I cordially agree with Mr. Boys that ·01 in. is a most unsatisfactory point at which to draw the "rain-day" line. I think that ·02 would in the main, be the most satisfactory line of demarcation. My experience of rainfall measuring is of only five years, and in this one place, so I speak with all reserve, but it seems to me that the limit of ·02 in. would exclude most dews and include most rains.

ERNEST H. CARTWRIGHT.

Myskyns, Ticehurst, Sussex, 13th December, 1909.

We have given liberally of our space to a discussion which we believed would be welcome to a small number of rainfall observers whose love of accuracy and conscientious zeal deserves every consideration, recognition and encouragement. But we were somewhat doubtful as to the wisdom of printing Mr. Hampton Brown's article, and we decided to do so only in the hope that the discussion to which it was bound to give rise would draw fresh attention to the importance of accuracy and uniformity, and enable us to give emphasis to our total disagreement with any suggestion of tampering with the generally accepted definition of a rain-day. What is measured by a rain gauge is not "rain" in the sense of drops of water falling from the clouds, but "total aqueous precipitation," including all that is condensed from the aqueous vapour of the atmosphere in such a form as to be collectable by a rain gauge. Most of it falls as "rain" in the narrow sense, and "rain" is used for convenience to express the whole, exactly as chemists use the word "chlorides" in determining the salinity of sea-water, although the actual precipitate includes small amounts of bromides and iodides as well. It would be excellent if dew-days, snow-days, hail-days and hoar-frost days could be counted and classified; but if this could be done it could only be done by a few persons possessed of exceptionally good instruments and almost incredible watchfulness. *In all that is written of the measurement of rain the word rain includes all forms of precipitation*, so that "rain-day" includes a day when there was heavy dew. This being made clear much of the difficulty vanishes.

The choice of ·01 in. as the unit of rainfall measurement was made after careful enquiry and the weighing, amongst others, of all the arguments put forward in the recent correspondence, all of which are as old at least as *British Rainfall*. The experience of 50 years in thousands of places confirms the wisdom of the rule. The Editors of *British Rainfall* have laboured incessantly towards the elimination of those diversities in instruments, exposures, hours of observation, and methods of reading the rain glass that give rise to discrepancies, and after half a century the result is that the numbers of rain days quoted have now some physical significance. In the earlier years they were of moral import only, the more rain-days reported the more conscientious the observer in the matter of daily readings. There are many very badly graduated rain-glasses in the market, and no glass should ever be used without the maker's name upon it, while no glass should be fully trusted without a certificate of accuracy. The correspondence impels us the more earnestly to insist on the need of observing No. 11 of the Rainfall Rules with scrupulous exactness.

Small Amounts.—If the gauge contains less than one hundredth (·01) of an inch but more than half that amount, it should be entered as ·01, while if there is less than half that amount the few drops may be thrown away, and the day entered as if no rain had fallen. THE EDITOR.

STANDARDIZATION OF SUNSHINE RECORDERS.

REFERRING to Mr. Curtis's valuable article on the Standardization of Sunshine Recorders in the *Meteorological Magazine* for November, he states that "56 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.*" I do not think that it is generally known that the first application of photography for the purposes of self-registering meteorological instruments was by the late Mr. T. B. Jordan, in the year 1838. He was then a mathematical and philosophical instrument maker, residing at Falmouth, and was the Secretary of the Royal Cornwall Polytechnic Society. A description of the instruments he designed will be found on pages 184 to 187 of the 6th Annual Report of that Society. There is a diagram of his Barograph, which is almost identical with the one now in use. Mr. Jordan also describes a new instrument, which he proposes to call "the Heliograph;" its object being "to yield an accurate account of the intensity of the light for every minute of the day, and permanently to register its indications. It consists of a light cylinder of metal, with a similar cylinder revolving about it, once in 24 hours on a screwed axis. The inner and fixed cylinder is covered with a sheet of the prepared paper, and the outer or revolving one (connected with a clock) has a small hole in it, through which the light shines on the paper. The axis of the cylinder and the position of the hole is so adjusted, that the hole shall at all times be opposite to the place of the Sun, and may, therefore, be considered as its picture, travelling over the paper; it is found that the muriate of silver with which the paper is covered, takes different tints in proportion to the intensity of the light to which it is exposed, provided that the times of exposure be equal." From the above it would appear that the late Mr. T. B. Jordan is entitled to the credit of inventing "the first Sunshine Recorder" rather than Mr. J. F. Campbell.

WILSON L. FOX.

Falmouth, 25th November, 1909.

THE brief historical sketch of the Sunshine Recorder which I gave in my paper on the Standardization of that instrument, was intended to trace the development of the Campbell-Stokes Recorder—the instrument with which the article is almost exclusively concerned. In a former paper, which may be found in Vol. **24.** of the *Quarterly Journal* of the Royal Meteorological Society, I have given a brief description of Mr. T. B. Jordan's instrument, and I added: "This plan appears never to have come into use."

That statement was the result of enquiries I had made in order to ascertain the stage to which the instrument had ever advanced. I could not definitely find that it had ever been actually made; but at any rate, it seemed never to have got beyond the experimental

stage, and I could find no evidence at all that it had been set up for the regular registration of sunshine.

The instrument which Mr. Campbell set up in Whitehall in 1853, was, I believe, the first sunshine recorder ever used for the systematic registration of the duration of sunshine, and "*systematic registration*" was the point I wished to bring out.

Of the priority of Mr Jordan's plan there can, of course, be no doubt; but as will be seen from the quotation given by Mr. Fox from the Report of the Royal Cornwall Polytechnic Society, the instrument was intended "to yield an accurate account of the *intensity of the light for every minute of the day*," and the incidence of direct sunshine was to have been inferred from the tint taken by the paper, through the intensity of the light acting upon the muriate of silver with which the paper was covered. It seems proper, therefore, to classify it rather as an Actinometer than as a Sunshine Recorder; the latter instrument is intended to record *only* the direct rays of the sun, and the difficulty with all photographic sunshine recorders lies in deciding how far weak records have been due to these rays or to the actinic power of diffused light.

R. H. CURTIS.

LOW BAROMETER OF DECEMBER 2nd—3rd, 1909.

I GATHER from the last issue of *Symons's Meteorological Magazine* that the remarkable depression of December 2nd—3rd, 1909, passed unrecorded barometrically at Camden Square.

The following are the standard barometer readings during its progress as recorded here, supplemented by two readings taken from a barograph which was in exact agreement with the standard barometer. The readings are corrected to sea level, and reduced to 32° F. :—

Thursday, Dec. 2nd.	8.30 p.m.	28·792 inches.	
	9. 0 ,,	28·762 ,,	
	10. 0 ,,	28·725 ,,	
	10.30 ,,	28·699 ,,	
	11. 0 ,,	28·673 ,,	
	11.30 ,,	28·642 ,,	
	12. 0 a.m.	28·611 ,,	
Friday, Dec. 3rd.	2. 0 ,,	28·553 ,,	
	4. 0 ,,	28·465 ,,	(minimum).

E. L. HAWKE, F.R.Met.Soc.

2, Akenside Road, Hampstead, 2nd January, 1910.

SUDDEN THAW ON DECEMBER 22nd.

No doubt you will have many letters about the night of the 21st—22nd. Here the temperature at 7.30 a.m. on the 21st was 25° F., and at 7.30 a.m. on the 22nd it was 51° F.

At 10.30 p.m., 21st, I drove home in a motor, a clear frosty night;

by 9 a.m., 22nd, ·56 in. rain had fallen, and as it could not sink into the ground at all it caused considerable floods.

There was a ball near here that night, and when the guests started to leave none of the motor cars could move, even with Parsons chains, and the people had to wait till morning. This means a very unusual condition of road surface. J. M. ROGERS, Lt.-Col.

Riverhill, Sevenoaks, 23rd December, 1909.

ON COMPENSATION IN WEATHER.

When we have had a great deal of one kind of weather, we naturally look in a vague way for a return of the opposite—a swing of the pendulum in the other direction; but the whole subject of compensation is too obscure at present to afford much help in weather prediction.

There are some facts about our winters that are, I think, interesting in this connection. Taking the Greenwich record (1841-1908), consider all cases of 30 consecutive winters, *i.e.*, the 30 ending in 1871, '72, '73, &c. Ascertain how many mild winters (mean temp. over average) each group had. We find there were either 14, or 15, or 16, or 17. Next, let us ask, What kind of winter came after each group having 14 mild winters, each group having 15, &c? We may measure these following winters by the number of frost days (Dec.-Feb.); the average is 33. Here, then, is the reply, and I characterise winters as m. (mild) or s. (severe).

Groups with 14 m. winters.	15 m. winters.	16 m. winters.	17 m. winters.
5 cases { 5 m. / 0 s.	16 cases { 10 m. / 5 s. / 1 av.	11 cases { 2 m. / 9 s.	6 cases { 3 m. / 3 s.

We may discern a tendency for the colder groups of 30 (few mild winters) to be followed by mild winters, and the milder groups by severe. Taking the groups with 14 and 15 together, we have 15 mild and 5 severe winters following; and after the groups with 16 and 17, 5 mild and 12 severe winters.

We have now to do with the group ending in 1909, and it had 15 mild winters. I may say that the only very severe winter following such a group previously was the anomalous winter '94-5, with 54 frost days. None of the others were over 38. Thus, if we are guided by theee data, an extremely severe winter, at least, would seem rather unlikely in 1909-10.

It is instructive to make out a series of 12 curves from averages of the mean temp. of each month in 30 years ending '70, '71, '72, &c. Certain gradual changes are thus revealed. The case of November is one of the most interesting. Its average temperature curve has been gradually rising on the whole since 1880, *i.e.*, in the 30 Novembers ending with '80. The following figures will give some idea of this rise:—

30 years ending		°	°
1880	.....	42·39	
'85	.....	42·77	+·38
'90	.....	43·13	+·36
'95	.....	43·48	+·35
1900	.....	43·94	+·46
'05	.....	44·05	+·11
'08	.....	44·32	+·27

The mean temp. for Nov. is 43°·21. The further development of this long wave may be watched with interest.

April shows an opposite variation. Its average curve has gone down on the whole since '83. October and December are alike in showing a long descent to '96, and a rise since that date. Thus we see a process of gradual change going on in individual months; but there is no reason to think such change is of a permanent character—compensation comes sooner or later. ALEX. B. MACDOWALL.

8, Marina Crescent, Folkestone, Dec. 3rd, 1909.

CORRELATIONS OF CLIMATIC CHANGES.

HAVING taken into consideration the yearly mean temperatures of the years 1891 to 1900, and having discarded all doubtful records, I have drawn maps representing the geographical distribution of annual departures from the normal temperatures, the means of ten years' observations being considered as normal values. On these annual maps, I call thermopleions, or simply pleions, the areas occupied by positive departures; antipleions, those of negative departures. The pleions and antipleions are bounded by the quasi-normal line. On this line the departures are *nil*, the values being equal to the ten years' means. The lines of equal positive and negative departures I call hypertherms and hypotherms The pleions represent inflections of the isotherms toward the pole, or more properly speaking, towards the regions of colder climate. The antipleions, on the contrary, characterize a local abnormal descent of the isotherms toward the equator. The maps of successive years for the same country, and those of different countries for the same year, show remarkable correlations of the distributions of the departures. A pleion, in most cases, exists during several years, moving from place to place. When one compares the different maps, and especially those of European and Asiatic Russia, one is led to believe that the pleions are produced by immense positive and negative waves intercrossing. It seems that for the whole world the years are either too warm or too cold, following the predominance of pleions or antipleions. For example the year 1893 was exceptionally cold, and 1900, on the contrary, was too warm. The temperature of the Earth's atmosphere was at least half a degree centigrade higher during the year 1900 than during 1893. It is a notable fact that neither the Alps, the Caucasus or the Rocky Mountains form barriers;

not even the Himalayas interrupt the progress of a pleion or antipleion. This demonstrates the fact that the thermopleions and the antipleions are products of temporary alterations of the general circulation of our atmosphere. A full discussion of the question of which this is but a short summary, is to be found in my memoir, "L'Enchaînement des Variations Climatiques," published recently by the Belgian Astronomical Society. I am working at present on the dynamical problems connected with the results I have already obtained, and hope to be able, in a short time, to propose a method of research by which it will be possible to predict successfully several months in advance the climatic anomalies of the different seasons of the year. In connection with this study I intend to examine the yield of cotton and grain.

HENRYK ARCTOWSKI.

1006, Park Road, Washington, D.C.

WEATHER REFERENCES IN OLD PARISH REGISTERS.

On the remote chance that you may not have seen the little book quoted from, I send you the few extracts relating to weather from "Parish Registers in England" by R. E. Chester Waters, B.A., published by F. J. Roberts in 1883. I also prefix Bishop White Kennett's remarks on entries in registers by the clergy; it may be that in his diocese his remarks were attended to, and that entries of interest relating to weather as well as other matters were entered.

The last remark of the author, "and his palace was blown down," must, I presume, relate to a part of it—as there is considerable part of the old work standing at Wells—unless the author refers to some other palace than that of Wells.

RICHARD COOKE.

The Croft, Detling, Maidstone.

Page 69.—"So far from being under any obligation to keep a mere dry record of dates and names, the Parson was encouraged by his Bishop to take pride in making his parish register a *Chronicon mirabile.* That learned prelate, Dr. White Kennett, Bishop of Peterborough (1718-28), took occasion in his charge at his first visitation to say to his clergy:—

"'One thing more I would intimate to you that you are not only obliged to enter the day and year of every christening, wedding or burial, but it is left to your discretion to enter down any notable incident of times and seasons especially relating to your own parish and the neighbourhood of it, such as storms and lightning, contagion and mortality, drought, scarcity plenty, longevity, robbery, murders, or the like casualities. . . . . You have had precedents of this kind in parochial registers within this diocese, and they have been cited to very good purpose by our worthy brother (Dr. T. Morton), the author of the Natural History of this County of Northampton.'—*Lansdowne MSS. in British Museum, No. 957.*

Precedents can be found in different registers of all the subjects enumerated by the Bishop; and I have selected, as examples, entries of the

great snow of 1615 and the drought which followed it, of the scarcity of 1587 and 1621, of the plenty of 1620, the frost of 1684, and the storm of 1703.

"YOULGRAVE, DERBYSHIRE, 1614-15.—Jan. 16th began the greatest snow which ever fell upon the earth within man's memorye. It cover'd the earth fyve quarters *(sic)* deep upon the playne. And for heapes and drifts of snow, they were very deep, so that passengers, both horse and foot passed over gates, hedges and walls. It fell at ten several times, and the last was the greatest, to the greate admiration and feare of all the land, for it came from the foure pts. of the world, so that all c'ntryes were full, yea, the south p'te as well as these mountaynes. It continued by daily encreasing untill the 12th day of March (without the sight of any earth eyther uppon hilles or valleyes) upon wch daye, beinge the Lorde's day, it began to decrease: and so by little and little consumed and wasted away, till the 28th day of May, for then all the heapes and drifts of snow were consumed, except uppon Kinder-Scout, wch lay to Witson week.

"The name of the Lord be praysed."

"There fell also ten lesse snowes in Aprill, some a foote deep, some lesse, but none continued long. Uppon Mayday in the morning, instead of fetching in flowers, the youths brought in flakes of snow, which lay above a foot deep uppon the moores and mountayns."

The great snow was followed by a drought. "1615. There was no rayne fell upon the earth from the 25th day of March till the 2nd day of May and then there was but one shower, after which there fell none tyll the 18th day of June, and then there fell another: after yt there fell none at all till the 4th day of August, after which tyme there was sufficient rayne uppon the earth: so that the greatest pt of this land, especially the south pts, were burnt upp both corne and hay. An ordinary sumer load of hay was at £2, and little or none to be gott for money. This pt of the peake was very sore burnt upp, onely Lankishyre and Cheshyre had rayne ynough all sumer: and both corne and hay sufficient. There was very little rayne fell the last winter but snowe onely."

"HOLY-ROOD CHURCH, SOUTHAMPTON.—1683-4. This yeare was a great Frost, which began before Christmasse, so that ye 3rd and 4th dayes of this month of February, ye river of Southampton was frossen all over and covered with ice from Calshott Castle to Redbridge and Tho: Martaine mar of a vessell went upon ye ice from Berry near Marchwood to Millbrook-point. And ye river at Ichen Ferry was so frossen over that severall persons went from Beauvois-hill to Bittern Farme forwards and backwards."

"ST. OSWALD'S, DURHAM.—1703. Mem. that on ye 27th Nov. was ye greatest hurricane and storme that ever was knowne in England: many churches and houses were extreamely shattered and thousands of trees blown down: 13 or more of her Maj'tyes men of war were cast away, and above 2000 seamen perished in them. N.B.—The storme came no further north than Yarmouth."

This is the storm to which Addison alludes in his famous comparison of Marlborough on the battlefield of Blenheim to an angel guiding the whirlwind. No such tempest was ever known in our latitude. It was long remembered as a national calamity, and was the occasion of a public fast, which was solemnly kept by the Queen's proclamation on January 19th, 1704. Amongst other lives which were lost, the Bishop of Bath and Wells was killed in his bed, and his palace blown down.

REVIEWS.

A Barometer Manual for the use of Seamen; with an Appendix on the Thermometer, Hygrometer and Hydrometer. Issued by the Authority of the Meteorological Committee. Sixth edition, extensively revised. London: printed for H.M. Stationery Office, 1909. Size $9\frac{1}{2} \times 6$. Pp. 68. Plates. Price 3d.

Meteorological Observations at Stations of the Second Order for the year 1906. With frontispiece map. Published by Authority of the Meteorological Committee. London: printed for H.M. Stationery Office, 1909. Size 12×10. Pp. x. + 162. Price 17s. 6d.

The Free Atmosphere in the Region of the British Isles. Contributions to the investigation of the Upper Air, comprising a Report by W. H. DINES B.A., F.R.S., on Apparatus and Methods in use at Pyrton Hill, with an Introduction and a Note on the Perturbations of the Stratosphere by W. N. SHAW, Sc.D., F.R.S., Director of the Meteorological Office. Published by the Authority of the Meteorological Committee. London: printed for H.M. Stationery Office, 1909. Size 12×10. Pp. iv + 56. Price 2s. 6d.

A GOODLY portion of the work of the Meteorological Office is included in the works cited above. The annual report noticed on p. 144 detailed a vast amount of solid work in connection with the routine of preparing weather reports and forecasts, and also in meteorological research. The re-arrangement of the publications now forming the British Meteorological Year Book is complete, and the Year Book for 1909 will in a few weeks include the Weekly Weather Report, the Monthly Weather Report, the Second Order Observations (the volume of which for 1906 named above completes, we believe, the working up of arrears), and the hourly readings at the four Observatories.

The Barometer Manual has been improved and augmented, the description and charts of the distribution of pressure over the Earth's surface forming the most complete and recent epitome of the groundwork of distributional meteorology which can be procured, and the almost nominal price of this important manual should secure for it a sale amongst students and private meteorological observers as well as amongst the sea-captains for whom it is primarily intended.

The work on the free atmosphere gives a brief summary of the history of upper air investigations, full particulars of the ingenious and effective methods introduced by Mr. Dines for simplifying and improving the accuracy of the observations, and a preliminary discussion of the results of meteorological kite and balloon ascents in the British Isles. It has been considered expedient to use the Absolute scale of temperature in centigrade degrees (*i.e.*, —273° C. = 0° A.), and to express the pressure in megadynes per square centimetre, or rather in fractions of that somewhat elephantine unit. We cannot profess to find either comfort or inspiration in these figures, and we venture to think that the majority even of scientific men

would prefer the more familiar units. There is no doubt that a unit which dispenses with the negative sign is an immense convenience (it is the strongest argument for the use of Fahrenheit degrees in the meteorology of an equable climate like ours), but the same reasoning would suggest that a unit which introduces a decimal point into every reading like the megadyne is a step backwards (the one advantage of the millimetre over the inch in rainfall measurement is that whole numbers suffice for all practical purposes). To a certain extent new units assist a new development of science by removing from it old associations which might lead one astray. In Dr. Shaw's concluding paper on the perturbations of the stratosphere he definitely adopts the name of troposphere for the portion of the atmosphere, usually within 11 kilometres (we venture to interpolate 7 miles) of the surface within which temperature falls as height increases, and the name stratosphere for the region above in which the temperature changes little if at all with increase of height, a very much better term than "isothermal layer," which we hope to see no more. He points out that while in the troposphere the temperature layers are stratified like the coats of an onion, in the stratosphere (despite its name) the temperature structure is columnar; but this is modified in a footnote to an "isothermal mass disturbed by an intrusive 'bed' of cold air." The paper gives a mathematical discussion of the perturbations of the stratosphere produced by the passage through the troposphere beneath it of V-shaped depressions which accompany in the upper atmosphere the movement of a cyclone over the surface. It is shown that the passage of a depression produces a horizontal difference of temperature in the stratosphere which retains its "columnar" thermal structure. A horizontal difference of temperature in the stratosphere of 20° C. corresponds to a local depression of the boundary of the troposphere of 1·4 miles.

L'Enchaînement des Variations Climatiques (The chain of climatic variations), par Henryk Arçtowski. Bruxelles. Société Belge d'Astronomie. 1909. Size $10 \times 6\frac{1}{2}$. Pp. vi. + 136.

THIS is a remarkable investigation which appears to point the way to important advances in the interpretation of meteorological phenomena. Attention is being more and more concentrated on the existence of simultaneous changes of climate in opposite directions in distant places. M. Teisserenc de Bort's treatment of action centres, Dr. Shaw's discovery of the coincidences between St. Helena wind force and the rainfall of the south of England, and Sir Norman Lockyer's discussion of the barometric see-saw between opposite regions of the Earth, all deal with facts of the kind, and Mr. Arçtowski shows that the relations of temperature are, if possible, even more striking and interesting. One point of his memoir is stated in the letter on "Co-relations of Climate," which we publish in this issue; and the pamphlet itself is so well summarized in a

review by M. F. de Roy in a Belgian journal, that we print the following abstract of a translation of the article which M. Arçtowski has been good enough to send us.

The activity of certain phenomena, occurring on the surface of the sun, continually increases or decreases. The eleven-year periods of sunspots is very well known, but there are shorter and longer periods as well, which characterize the variations of the sun's eruptive and electro-magnetic activity, and the quantities of energy radiated through space in the form of heat, vary slightly from year to year, and more considerably in the course of centuries. These far away manifestations are felt on the surface of the Earth, and cause the climatic changes.

If the solar heat acted in a regular and uniform way over the surface of the Earth, seasonal forecasts would be relatively simple, but this is not the case, the atmosphere surrounding the globe moves, the oceans have currents, and icebergs drift from the ice deserts of the poles, these factors, and perhaps others that we are ignorant of, make it impossible to attack the problem in its essence. We must unite a considerable number of observations, and try to draw from the study of the results a general law governing the distributions of climatic changes on the globe,if such a law there be.

These complicated researches have already been approached by several savants—Köppen, Bigelow, Merecki, Otto Pettersson, Gregory, Hann, Dove, and quite recently by Hildebrandsson—but none of them seem to have attacked the question on so large a basis as Dr. Arçtowski, the meteorologist of the *Belgica* South Polar Expedition, who has given much time to a very remarkable work, "L'Enchaînement des variations climatiques."

Having discovered in the antarctic regions moraines and other traces of the great ice age, Dr. Arçtowski was led to investigate the problem of climatic variations, which, after a preliminary study, proved so interesting that he resolved to start afresh and give himself wholly to this work. As temperature plays an essential part in climatic problems, Dr. Arçtowski decided to attack this part of the question first; and, to begin with, the annual means only. He has investigated the question of change of climate from a very large point of view, and, in fact, while all his predecessors have drawn their deductions from fragmentary and widely separated observations, our author decided to unite the known facts in one great whole. At the beginning, Dr. Arçtowski saw the impossibility of going very far back, although the thermometrical observations made in Europe give a long and relatively homogeneous series, the same cannot be said of those taken in the other continents, and so in order to be more complete it was impossible to go back farther than 1891, and he considers the ten years, 1891–1900. For these years he gives the annual mean temperatures of nearly all the localities where precise observations have been taken, a herculean labour which necessitated long research among thousands of documents, the writing of hundreds of letters for information, and visits to the great libraries of Paris and London.

His memoir contains the thermometric data already mentioned, divided into 63 tables for 804 stations, of which 490 are in Europe, 97 in Asia, 38 in Africa, 134 in the two Americas, 45 in Australia, and these tables contain more than twenty-thousand figures. For each year and for each station he

takes the departures which exist between the mean annual temperature and the mean normal temperature. On placing these differences, either negative or positive, on maps, and by joining the points which represent the same departures by lines, one sees immediately that the areas where there are excesses or deficiencies of heat do not fall accidently here and there, following no law, but form vast zones, which Dr. Arçtowski calls thermopleions and anti-pleions. He gives more than 150 of these maps, and has found that the temperature of the Earth's atmosphere has been higher during the years 1896 to 1900 than between 1891 to 1895, and that this positive excess for the whole globe is between 0°·2 and 0°·5 C. (0°·4—0°·9 F.) The displacement of the annual pleions and anti-pleions seems to be very irregular. In certain cases they seem to remain over the same regions during several successive years, then without apparent reason they change their positions. In 1896, '97 and '98, for example, all the north of Europe was covered by a pleion, that is to say, an excess of temperature was registered. In 1899 a notable change took place, the pleion was found on eastern Russia, and Scandinavia was lacking in heat.

There seem to exist, however, real centres from which the variations originate. To know better the mechanism of the formation of pleions, to find the laws governing their displacement, to learn to predict the regions which will be visited by excesses or deficiencies of heat, and where the crops will consequently be inferior or abundant, it is necessary to improve the method of investigation; monthly means of temperature will have to be taken into consideration as well as the atmospheric pressure. Dr. Arçtowski aims to do this. He has recently gone to America in order to continue his work at the Weather Bureau in Washington, where there is a great abundance of data to help him in his researches.

Bulletin of the Central Observatory of Japan. No. 2. Tokio, 1909. Size 8½ × 12, pp. 58, one plate.

THIS memoir is composed of five articles on Japanese meteorology, dealing respectively with the local cyclones of Central Japan, the earth temperature of Osaka, the frequency and distribution of graupel, the hourly observations of barometric pressure, and the velocity of falling rain drops. The data utilized are the observations subsequent to 1896, and apparently only a part of these have been completely analysed. The examination of the local cyclones seems to us an investigation of considerable importance; the author introduces the somewhat novel suggestion that the formation of these small depressions is the result of the peculiar configuration of the district in which they originate.

The Rains of the Nile Basin and the Nile Flood, 1907 and 1908. By CAPT. H. G. LYONS, F.R.S. Cairo, 1909. Size 7½ × 11, pp. 60 and 69, plates.

THE annual reports of the Nile Rains and Floods for 1907 and 1908, both published during 1909, are the last of this series issued under

the direction of Captain Lyons, and afford ample testimony of the great advance in our knowledge of the conditions governing the Nile inundations, which has taken place during his energetic administration. The flood of 1907 is described as very weak throughout, but of average date. This was the lowest of a series of poor floods, which had not reached the average since 1898, and now fell as low as 40 per cent. below it. A full though not excessive flood occurred however in 1908, in response to heavier rainfalls in the upper basin, principally in Abyssinia and the plains of the Blue Nile.

METEOROLOGICAL NEWS AND NOTES.

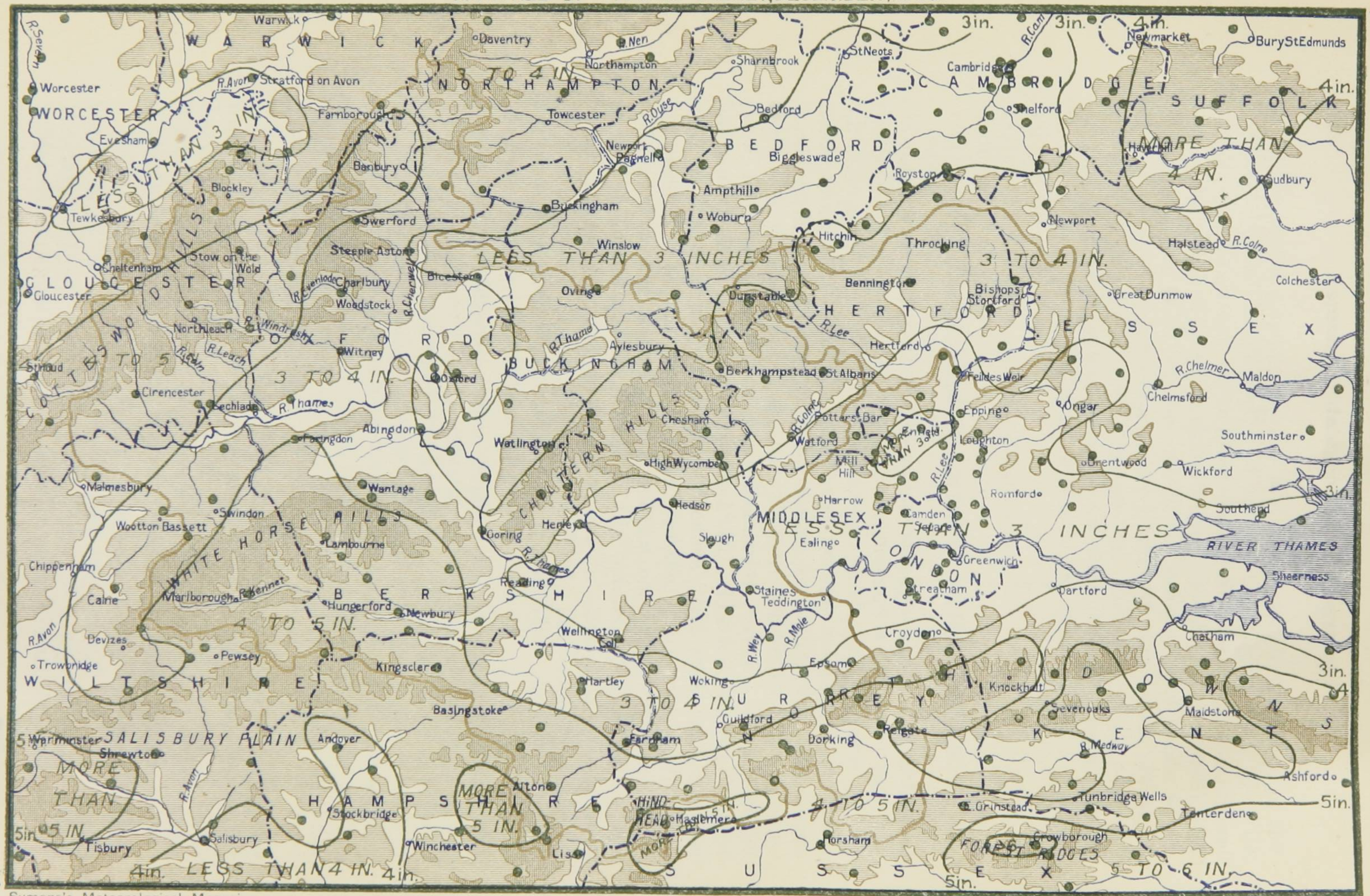
A MILD DECEMBER IN SWITZERLAND brought much discomfort in the shape of unseasonable thaws to the throngs who sought the Alps for the enjoyment of winter sports. In the lower parts of the country the mildness was extraordinary, as the following notes show. A correspondent states that at Montreux, 3,200 feet above sea level, heavy rain and a high temperature prevailed from December 21st to 31st, and old residents declared that such a state of things had not occurred in December since 1842. The well known limnologist, M. Delebecque, writes from Geneva that snow and ice had disappeared from the mountains up to 4,000 feet on Christmas Day, and he quotes the following temperature readings at Geneva, as an example of a winter föhn, which in the opinion of sporting visitors "had carried the joke a little too far":—Minimum temperature 39°·0 on December 22nd, 52°·5 on the 23rd; maximum temperature 68°·0 on December 22nd, and 69°·4 on the 23rd; the latter extraordinary warmth occurring at 3.30 a.m.

THE ROYAL METEOROLOGICAL SOCIETY has issued a circular to its Fellows pointing out how desirable it is that the membership of the Society should be substantially increased. The association of persons interested in meteorology in such a Society, which can give collective expression to a wide-spread interest in the science of the area, cannot but be helpful to all concerned, and it will give the Editor of this Magazine much pleasure to hear from any of his readers who are disposed to join the Society.

CAPTAIN R. SCOTT, R.N., C.V.O., has received a grant of £20,000 from the Government towards the expenses of his expedition to the Antarctic regions which is to leave England in the summer of 1910. We understand that the scientific staff will include Dr. G. C. Simpson, of the Indian Meteorological Service, as Physicist and Meteorologist.

DR. H. R. MILL has arranged to lecture for the Gilchrist Educational Trust on "Climate as a bond of union," at Widnes on Monday, February 14th, and on the four following days at Ashton-in-Makerfield, Crompton, Clayton-le-Moors, and Barnoldswick.

RAINFALL OF THAMES VALLEY, DECEMBER, 1909.



ALTITUDE SCALE

Below 250 feet	250 to 500 feet	500 to 1000 feet	Above 1000 feet

SCALE OF MILES

0 5 10 15 20

Symons's Meteorological Magazine.

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

Isohyetal

THE RAINFALL MAPS OF THE THAMES VALLEY.

THE rainfall from a considerable number of stations in the middle belt of southern England, which includes the Thames Valley, has been recorded each month on a map published in this Magazine, sometimes without comment, sometimes accompanied by remarks on the conditions of a particular month. The groundwork of the map shows the principal rivers in blue, and the height of the land is indicated in shades of brown. A black dot stands on the position of each station from which a report was received, and lines are drawn limiting the areas within which the rainfall had a particular value. These isohyetals are usually drawn for each inch, as in the December map opposite. On this map it is seen that the driest parts were two broad strips, each with less than 3 inches of rain, one lying north-west of the Chiltern and East Anglian Hills, the other south-east of that range and continuing eastward to the sea. Along the Cotteswold Hills there extends an area with more than four inches of rain, and the whole of the south of the Thames valley shows more than four inches also, with a chain of "splashes" of more than five inches. A four-inch area also appears in the extreme north-east of the map. On some of the maps where the differences in rainfall are slight lines are drawn for every half inch. As an example of a uniform distribution of rainfall, we may refer to the map of February, facing p. 21, where but for the half-inch line there would have been practically nothing to draw. The maps of June and July (facing p. 103 and p. 123) illustrate the extreme irregularity produced by the thunderstorm rains of summer; while that of October, the wettest month, facing p. 176, shows the effect of a succession of heavy cyclonic rains along the southern border where the isohyetal of eight inches appears in two places. The following Table shows the general rainfall of the Thames Valley for each month, and the difference from the average of 25 years, an average which we may mention is probably below the true average which would be yielded by, say, 35 or 40 years.

MONTH. 1909.	Total Depth. inches.	Difference from Average inches.
January	·99	— 1·18
February	·52	— 1·35
March	3·50	+ 1·63
April	2·02	+ ·40
May	1·66	— ·30
June	4·10	+ 1·94
July	2·71	+ ·48
August	2·71	+ ·30
September	3·05	+ 1·06
October	4·89	+ 1·75
November	·76	— 1·98
December	3·55	+ 1·06
YEAR	30·46	+ 3·81

RAINFALL TABLE FOR DECEMBER, 1909.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH.	
					Aver. 1870-99.	1909.
		° ′	° ′		in.	in.
Camden Square	*London*	51 32	0 8	111	2·12	2·79
Tenterden	*Kent*	51 4	*0 41	190	2·74	5·38
West Dean	*Hampshire*	51 3	1 38	137	2·74	3·57
Hartley Wintney	,,	51 18	0 53	222	2·55	3·24
Hitchin	*Hertfordshire*	51 57	0 17	238	2·05	3·13
Winslow (Addington)	*Buckinghamshr.*	51 58	0 53	309	2·27	2·79
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	2·11	4·19
Brundall	*Norfolk*	52 37	*1 26	66	2·13	4·67
Winterbourne Steepleton	*Dorset*	50 42	2 31	316	4·13	7·78
Torquay (Cary Green)	*Devon*	50 28	3 32	12	3·46	5·91
Polapit Tamar [Launceston]	,,	50 40	4 22	315	4·39	5·78
Bath	*Somerset*	51 23	2 21	67	2·76	4·49
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·48	4·08
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·92	4·71
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·44	3·06
Boston	*Lincolnshire*	52 58	0 1	25	1·79	3·71
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	2·02	5·25
Derby (Midland Railway)	*Derbyshire*	52 55	1 28	156	2·28	4·35
Bolton (Queen's Park)	*Lancashire*	53 35	2 28	390	4·19	8·33
Wetherby (Ribston Hall)	*Yorkshire, W.R.*	53 59	1 24	130	2·19	4·24
Arncliffe Vicarage	,, ,,	54 8	2 6	732	6·41	9·93
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	2·36	4·56
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	2·64	4·09
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	14·70	18·88
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	4·43	7·66
Haverfordwest (High Street)	*Pembroke*	51 48	4 58	95	5·22	6·50
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	4·49	6·36
Llandudno	*Carnarvon*	53 20	3 50	72	2·95	4·22
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	4·68	7·46
Hawick (Branxholme)	*Roxburgh*	55 24	2 51	457	3·54	3·37
Edinburgh (Royal Observy.)	*Midlothian*	55 55	3 11	442	...	2·87
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	5·24	6·35
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	3·53	4·60
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	7·37	10·81
Mull (Quinish)	,,	56 36	6 13	35	6·48	5·49
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·73	2·85
Braemar	*Aberdeen*	57 0	3 24	1114	3·15	2·62
Aberdeen (Cranford)	,,	57 8	2 7	120	3·39	4·95
Cawdor	*Nairn*	57 31	3 57	250	2·53	1·74
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	5·13	3·39
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	9·04	6·76
Dunrobin Castle	*Sutherland*	57 59	3 56	14	3·39	2·73
Castletown	*Caithness*	58 35	3 23	100	...	3·94
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	6·64	5·21
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	4·31	5·10
Broadford (Hurdlestown)	*Clare*	52 48	8 38	167	3·37	4·60
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	3·48	3·58
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·39	4·41
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	3·45	4·40
Ballinasloe	*Galway*	53 20	8 15	160	3·63	4·07
Crossmolina (Enniscoe)	*Mayo*	54 4	9 18	74	5·81	6·29
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	4·19	4·42
Seaforde	*Down*	54 19	5 50	180	3·64	4·55
Londonderry (Creggan Res.)	*Londonderry*	54 59	7 19	320	4·31	4·31
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	3·77	4·04

RAINFALL TABLE FOR DECEMBER, 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.
+ ·67	132	·44	2	24	25·16	26·75	+1·59	106	25·16	Camden Square
+2·64	196	1·11	21	23	28·36	32·84	+4·48	116	28·36	Tenterden
+ ·83	130	1·48	21	20	29·93	33·25	+3·32	111	29·93	West Dean
+ ·69	127	·70	21	18	27·10	29·81	+2·71	110	27·10	Hartley Wintney
+1·08	153	·49	21	22	24·66	28·81	+4·15	117	24·66	Hitchin
+ ·52	123	·44	21	21	26·75	26·56	— ·19	99	26·75	Addington
+2·08	199	·60	2	22	25·39	28·00	+2·61	110	25·39	Westley
+2·54	219	·56	10	20	25·40	25·13	— ·27	99	25·40	Brundall
+3·65	188	1·53	21	25	39·00	43·82	+4·82	112	39·00	Winterbourne Stpltn
+2·45	171	2·02	21	21	35·00	33·78	—1·22	97	35·00	Torquay
+1·39	132	1·20	21	24	38·85	36·07	—2·78	93	38·85	Polapit Tamar
+1·73	163	·93	2	23	30·75	29·98	— ·77	98	30·75	Bath
+1·60	165	·94	21	24	29·85	30·26	+ ·41	101	29·85	Stroud
+1·79	161	1·12	2	23	33·04	31·19	—1·85	94	33·04	Wolstaston
+ ·62	125	·66	2, 21	18	29·21	26·40	—2·81	90	29·21	Coventry
+1·92	207	·53	21	22	23·30	26·86	+3·56	115	23·30	Boston
+3·23	260	·91	21	25	24·70	27·83	+3·13	113	24·70	Hodsock Priory
+2·07	190	·74	2	27	26·18	26·71	+ ·53	102	26·18	Derby
+4·14	199	1·55	2	25	42·43	49·05	+6·62	116	42·43	Bolton
+2·05	193	·85	2	22	26·96	28·87	+1·91	107	26·96	Ribston Hall
+3·52	155	1·76	2	23	60·96	70·03	+9·07	115	60·96	Arncliffe Vic.
+2·20	193	·83	21	22	27·02	30·83	+3·81	114	27·02	Hull
+1·45	155	1·26	6	18	27·99	29·78	+1·79	106	27·99	Newcastle
+4·18	128	4·61	9	23	132·68	128·62	—4·06	97	132·68	Seathwaite
+3·23	173	1·37	21	23	42·81	40·20	—2·61	94	42·81	Cardiff
+1·28	124	1·10	10, 21	22	47·88	41·23	—6·65	86	47·88	Haverfordwest
+1·87	142	1·11	10	24	45·41	43·75	—1·66	96	45·41	Gogerddan
+1·27	143	·78	2	22	30·98	31·89	+ ·91	103	30·98	Llandudno
+2·78	159	1·76	9	13	43·43	52·65	+9·22	121	43·43	Cargen
— ·17	95	·82	2	16	34·80	33·25	—1·55	96	34·80	Branxholme
...	...	·64	2	16	...	29·57	...	...	...	Edinburgh
+1·11	121	1·70	10	23	48·87	50·58	+1·71	103	48·87	Girvan
+1·07	130	·87	9	15	35·80	38·26	+2·46	107	35·80	Glasgow
+3·44	147	3·31	9	21	62·80	68·45	+5·65	109	62·80	Inveraray
— ·99	85	1·39	9	18	57·53	49·46	—8·07	86	57·53	Quinish
+ ·12	104	·67	2	21	28·95	26·31	—2·64	91	28·95	Dundee
— ·53	83	...	...	...	36·07	30·70	—5·37	85	36·07	Braemar
+1·56	146	1·80	11	18	33·01	33·36	+ ·35	101	33·01	Aberdeen
— ·79	69	·42	10	8	29·37	28·69	— ·68	98	29·37	Cawdor
—1·74	66	·88	9	21	43·71	37·44	—6·27	86	43·71	Fort Augustus
—2·28	75	2·19	9	22	86·50	75·69	—10·81	87	86·50	Bendamph
— ·66	81	·60	3	15	31·60	31·45	— ·15	100	31·60	Dunrobin Castle
...	...	·58	18	28	...	37·29	...	...	...	Castletown
—1·43	78	·79	2	25	58·11	43·39	—14·72	75	58·11	Killarney
+ ·79	118	1·61	21	23	39·30	36·67	—2·63	93	39·30	Waterford
+1·23	137	·60	2	23	33·47	40·06	+6·59	120	33·47	Hurdlestown
+ ·10	103	1·00	2	16	35·19	36·33	+1·14	103	35·19	Abbey Leix
+2·02	185	1·03	5	21	27·75	26·94	— ·81	97	27·75	Dublin
+ ·95	128	·70	27	13	36·48	34·66	—1·82	95	36·48	Mullingar.
+ ·44	112	·80	2	21	37·04	31·67	—5·37	86	37·04	Ballinasloe
+ ·48	108	1·13	2	23	50·50	49·64	— ·86	98	50·50	Enniscoe
+ ·23	105	1·00	2	23	41·83	40·72	—1·11	97	41·83	Markree Obsy.
+ ·91	125	·91	2	20	38·61	38·66	+ ·05	100	38·61	Seaforde
·00	100	·73	2	22	41·20	43·27	+2·07	105	41·20	Londonderry
+ ·27	107	·77	2	21	37·85	37·76	— ·09	100	37·85	Omagh

SUPPLEMENTARY RAINFALL, DECEMBER, 1909.

Div.	STATION.	Rain inches	Div.	STATION.	Rain. inches
II.	Warlingham, Redvers Road	4·44	XI.	Rhayader, Tyrmynydd	9·36
,,	Ramsgate	3·91	,,	Lake Vyrnwy	9·01
,,	Steyning	6·15	,,	Llangyhanfal, Plâs Draw	4·70
,,	Hailsham	6·11	,,	Dolgelly Bryntirion	7·60
,,	Totland Bay, Aston House	3·91	,,	Snowdon, Cwm Dyli	...
,,	Stockbridge, Ashley	3·92	,,	Lligwy	4·86
,,	Grayshott	4·96	,,	Douglas, Woodville	6·92
,,	Reading, Calcot Place	2·95	XII.	Stoneykirk, Ardwell House	5·30
III.	Harrow Weald, Hill House.	2·79	,,	Dalry, The Old Garroch	8·93
,,	Oxford, Magdalen College	2·88	,,	Langholm, Drove Road	6·56
,,	Pitsford, Sedgebrook	3·78	,,	Moniaive, Maxwelton House	6·58
,,	Huntingdon, Brampton	3·27	XIII.	N. Esk Reservoir [Penicuick]	4·00
,,	Woburn, Milton Bryant	2·90	XIV.	Maybole, Knockdon Farm	4·60
,,	Wisbech, Monica Road	3·47	XV.	Campbeltown, Witchburn	5·47
IV.	Southend Water Works	2·89	,,	Glenreasdell Mains	..
,,	Colchester, Lexden	3·81	,,	Ballachulish House	...
,,	Newport	3·54	,,	Islay, Eallabus	4·43
,	Rendlesham	4·29	XVI.	Dollar Academy	5·96
,,	Swaffham	4·52	,,	Loch Leven Sluice	5·35
,,	Blakeney	4·11	,,	Balquhidder, Stronvar	7·44
V.	Bishops Cannings	4·13	,,	Perth, The Museum	3·36
,,	Ashburton, Druid House	8·38	,,	Coupar Angus	3·12
,,	Honiton, Combe Raleigh	5·45	,,	Blair Atholl	2·33
,,	Okehampton, Oaklands	7·17	,,	Montrose, Sunnyside Asylum	3·31
,,	Hartland Abbey	5·35	XVII.	Alford, Lynturk Manse	3·04
,,	Lynmouth, Rock House	6·49	,,	Keith Station	3·12
,,	Probus, Lamellyn	5·76	XVIII.	N. Uist, Lochmaddy	4·48
,,	North Cadbury Rectory	4·56	,,	Alvey Manse	1·79
VI.	Clifton, Pembroke Road	5·25	,,	Loch Ness, Drumnadrochit.	2·08
,,	Ross, The Graig	4·78	,,	Glencarron Lodge	6·21
,,	Shifnal, Hatton Grange	4·49	,,	Fearn, Lower Pitkerrie	1·65
,,	Blockley, Upton Wold	3·78	XIX.	Invershin	1·89
,,	Worcester, Boughton Park.	3·83	,,	Altnaharra	3·44
VII.	Market Overton	4·64	,,	Bettyhill	3·40
,,	Market Rasen	...	XX.	Dunmanway, The Rectory	7·41
,,	Bawtry, Hesley Hall	4·62	,,	Cork	3·49
,,	Buxton	9·98	,,	Mitchelstown Castle	4·49
VIII.	Neston, Hinderton Lodge	5·26	,,	Darrynane Abbey	6·04
,,	Southport, Hesketh Park	5·94	,,	Glenam [Clonmel]	4·99
,,	Chatburn, Middlewood	6·57	,,	Nenagh, Traverstown	4·67
,,	Cartmel, Flookburgh	7·50	,,	Miltown Malbay	4·41
IX.	Langsett Moor, Up. Midhope	7·82	XXI.	Gorey, Courtown House	5·50
,,	Scarborough, Scalby	5·29	,,	Moynalty, Westland	6·02
,,	Ingleby Greenhow	4·46	,,	Athlone, Twyford	3·83
,,	Mickleton	3·22	XXII.	Woodlawn	4·06
X.	Bardon Mill, Beltingham	3·75	,,	Westport, St. Helens	4·02
,,	Ewesley, Font Reservoir	3·04	,,	Mohill	4·51
,,	Ilderton, Lilburn Cottage	3·12	XXIII.	Enniskillen, Portora	...
,,	Keswick, The Bank	8·43	,,	Dartrey [Cootehill]	4·30
XI.	Llanfrechfa Grange	8·56	,,	Warrenpoint, Manor House	4·87
,,	Treherbert, Tyn-y-waun	17·12	,,	Banbridge, Milltown	2·69
,,	Carmarthen, The Friary	8·88	,,	Belfast, Springfield	4·07
,,	Castle Malgwyn [Llechryd].	6·19	,,	Bushmills, Dundarave	3·05
,,	Plynlimon	16·20	,,	Sion House	4·24
,,	Crickhowell, Ffordlas	8·90	,,	Killybegs	5·65
,,	New Radnor, Ednol	7·67	,,	Horn Head	4·84

METEOROLOGICAL NOTES ON DECEMBER, 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.—Cloudy or overcast skies with frequent but not heavy R prevailed almost throughout the month. Violent squalls from W. and S.W. occurred in the night of the 2nd—3rd. Duration of sunshine, 30·0* hours, and of R 64·1 hours. Mean temp. 40°·5 or 1°·3 above the average. Shade max. 53°·7 on 22nd; min. 23°·2 on 21st. F 12, f 23.

TENTERDEN.—The wettest December since 1876. A violent gale occurred on the night of 2nd—3rd. Duration of sunshine, 54·6† hours. Shade max. 53°·0 on 22nd; min. 22°·5 on 21st. F 12, f 19.

TOTLAND BAY.—Duration of sunshine, 74·5* hours, and the greatest amount ever registered in December. Shade max. 52°·3 on 2nd; min. 26°·2 on 21st. F 4, f 23.

PITSFORD.—R 1·66 in. above the average. Mean temp. 38°·1. Shade max. 51°·6 on 27th; min. 20°·1 on 22nd. F 13.

WINTERBOURNE STEEPLETON.—R greater than in any December during the previous 16 years. Shade max. 51°8 on 26th; min. 18°·1 on 21st. F 15, f 19.

NORTH CADBURY.—Temp. was slightly below, but wind movement slightly above, normal. A month of remarkable changes in which the bar. range was very large and its oscillations many and great. Shade max. 54°·0 on 23rd; min. 22°·5 on 21st. F 10, f 19.

ROSS.—Shade max. 54°·8 on 28th; min. 19°·4 on 21st. F 10, f 21.

HODSOCK PRIORY.—The wettest December since 1876. S on 19th and 20th to a depth of 8 inches. Between 5 and 6 p.m. on 21st a temp. of —4°·5 was recorded on the S, but it had risen to 32° by midnight.. Shade max. 53°·9 on 27th; min. 2°·9 on 22nd. F 12, f 23.

SOUTHPORT.—R 2·96 in. above the average of 35 years, and the greatest amount recorded in December in 39 years. Duration of sunshine 42·8* hours, or 10·9 hours above the average. Duration of R 117·2 hours. Mean temp. 39°·4. The land to E. and SE., for several miles, was almost covered by a single sheet of water. Shade max. 52°·2 on 10th and 28th; min. 18°·0 on 21st. F 10, f 18.

HULL.—Changeable with heavy R. Gales on 3rd and 22nd. Duration of sunshine, 10·4* hours. Shade max. 53°·0 on 28th; min. 12°·0 on 21st. F 13, f 19.

HAVERFORDWEST.—Duration of sunshine 64·8* hours. Shade max. 55°·4 on 3rd; min. 18°·8 on 21st.

LLANDUDNO.—Shade max. 55°·2 on 10th and 28th; min. 26°·2 on 21st. F 4.

DOUGLAS.—Exceedingly wild, stormy month with heavy R and S, alternating with brilliantly fine, frosty days. Temp. for the most part was considerably below the mean and there was more fog than usual.

CARGEN.—The weather was marked by constant and violent changes of temp., bar., and wind pressure. The land was much flooded during last week. Shade max. 53°·0 on 11th; min. 19°·0 on 8th and 21st. F 13.

EDINBURGH.—Shade max. 54°·9 on 10th; min. 21°·9 on 7th. F 12, f 20.

COUPAR ANGUS.—Shade max. 52°·0 on 10th; min. 13°·0 on 7th. F 5.

FORT AUGUSTUS.—Shade max. 51°·0 on 10th; min. 11°·5 on 19th. F 19.

WATERFORD.—Shade max. 52°·5 on 2nd; min. 19°·0 on 21st. F 12.

DUBLIN.—The heaviest December R since 1876. Mean temp. 41°·4 or 0°·5 below the average. Shade max. 56°·3 on 10th; min. 19°·5 on 21st. F 19, f 14.

MARKREE.—Shade max. 57°·0 on 27th; min. 16°·5 on 21st. F 16, f 23.

SION MILLS.—Shade max. 50°·0 on 10th and 27th.; min. 13°·0 on 20th. F 16, f 22.

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* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, July, 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	77·6	18	44·1	1	70·4	53·1	53·3	77	128·9	40·3	3·49	18	7·1
Malta	91·4	27	64·0	15	80·0	69·1	63·9	70	145·0	...	·00	0	1·4
Lagos	85·2	19	71·0	25	82·7	74·1	73·7	82	155·0	69·0	5·63	18	8·5
Cape Town	79·4	21	35·7	19	67·4	46·9	47·0	75	...	...	2·41	8	4·5
Durban, Natal ...	85·5	27	46·8	29	74·8	54·6	...	...	132·2	...	1·81	5	...
Johannesburg	67·4	27	28·0	29	60·1	41·8	35·8	63	117·2	26·9	·39	1	2·2
Mauritius	76·4	4	54·7	29	75·0	62·0	61·7	80	147·4	46·2	8·01	23	6·7
Calcutta...	92·3	6	76·4	22	88·5	78·8	77·7	87	158·6	75·5	9·94	23	8·5
Bombay...	86·8	3	75·3	17	83·4	77·1	76·3	88	125·7	73·8	31·37	30	9·3
Madras	102·2	18	71·7	23	94·7	77·5	73·2	74	142·2	70·3	4·36	16	6·8
Kodaikanal	66·6	19	48·9	18	62·0	52·1	51·0	84	134·1	40·0	3·49	19	8·1
Colombo, Ceylon ...	86·3	21	70·6	4	84·9	75·6	74·2	82	158·0	72·0	10·32	24	7·4
Hongkong	90·5	30	74·3	15	86·5	78·2	75·8	82	144·5	...	12·83	22	7·0
Melbourne	59·9	25	33·3	13	54·1	41·2	40·6	77	100·0	28·2	1·20	17	6·8
Adelaide	61·0	5	34·9	2	56·7	42·9	44·0	83	129·1	26·0	3·51	22	6·7
Coolgardie	70·0	31	32·0	18	59·5	37·7	37·6	66	132·2	27·0	·78	7	2·5
Perth	67·9	22	39·8	18	61·9	45·1	45·6	75	119·5	33·8	4·98	16	5·3
Sydney	66·1	25	38·9	18	57·9	43·9	39·9	76	106·3	26·0	·83	21	4·0
Wellington	61·8	21	35·0	15	52·8	45·7	40·2	67	100·0	28·0	6·45	23	8·0
Auckland	62·0	5, 7	42·0	13	58·4	49·2	50·7	89	112·0	38·0	5·32	20	6·4
Jamaica, Kingston ...	92·9	12	70·0	13	89·5	73·0	72·3	78	...	...	1·60	...	3·6
Trinidad	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada	86·0	4, 7	72·0	30	83·8	74·8	70·9	78	136·2	...	12·42	28	4·5
Toronto	86·9	8	47·6	4	77·9	57·5	...	...	...	...	3·47	16	4·1
Fredericton	88·0	28	44·4	5	75·4	54·7	...	76	...	...	3·00	14	5·8
St. John's, N.B. ...	80·2	14	48·7	8	67·5	54·1	...	...	...	...	2·61	14	5·5
Victoria, B.C.	78·0	2	44·9	2	67·6	51·6	...	75	...	...	·92	7	4·0
Dawson	83·0	10	37·0	21	72·6	48·3	...	...	...	...	2·10	14	5·7

MALTA.—Mean temp. of air 74°·3. Average bright sunshine 12·8 hours per day.

Johannesburg.—Bright sunshine 264·2 hours.

Mauritius.—Mean temp. of air 0°·6, of dew point 2°·3, and R 5·77 in., above averages. Mean hourly velocity of wind 9·4 miles or 2·6 below average.

KODAIKANAL.—Bright sunshine 102 hours.

COLOMBO.—Mean temp. of air 78°·0 or 2°·5 below, of dew point 0°·8 above, and R 5·71 in. above, averages. Mean hourly velocity of wind 6·8 miles.

HONGKONG.—Mean temp. of air 81°·9. Bright sunshine 252 hours. Mean hourly velocity of wind 14·1 miles.

Melbourne.—Mean temp. of air 0°·9 below, and R ·65 in. below, averages.

Adelaide.—Mean temp. of air 1°·7 below, and R ·94 in. above, averages.

Perth.—Rainfall 1·90 in. below average.

Sydney.—Mean temp. of air 1°·4 below, and R 3·71 in. below, averages.

Wellington.—Bright sunshine 91·6 hours. T and L on the 29th.