

# Symons's Meteorological Magazine.

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## THE DEATH OF KING EDWARD VII.

THE sudden death of the King will nowhere arouse deeper feelings of sorrow and regret than amongst the readers of this Magazine, and while it would not be appropriate here to enter into such particulars as have filled the newspapers of the world, we may refer to a little corner of the late King's interests that no other journal is likely to touch upon. King Edward, as is well known, was keenly alive to the importance of geographical discovery, and his comparatively frequent attendance at the meetings of the Royal Geographical Society made this quite clear; but he was not without some personal interest in the methods of the scientific study of the ocean and atmosphere. When he inspected the *Discovery*, before her departure in 1901 on the great Antarctic expedition under Captain Scott, he went fully into all the equipment on board, and his questions and comments showed clearly that he understood the working of the apparatus and took pleasure in watching it. His late Majesty came into still closer touch with the particular studies of our readers when he gave instructions for rain gauges to be established at those of the royal residences where they did not already exist, and for the records to be sent regularly for publication in "British Rainfall." At the same time, after the nature and methods of the British Rainfall Organization had been fully laid before him, the King was pleased to express his approval by becoming an annual subscriber, an honour which we believe is without precedent in the case of any voluntary association whose work has a purely scientific as apart from a philanthropic or charitable aim. While the King could not of course be a constant reader, he has looked on this Magazine with a kindly eye, and we may perhaps mention that he was much amused by the frontispiece to Volume 43, representing an imaginary invasion of England by balloons in 1804. Indeed, he appreciated the picture so much that a message was sent asking that some separate copies might be sent to Buckingham Palace. We know on good authority that he watched the development of the art of aviation with keen interest, and took note of the efforts to advance the scientific study of the free air.

The magnitude of the loss to the nation and to the world through

the withdrawal of the King's dominating and tactful personality from the affairs of State, both domestic and international, rightly occupies the foremost place in our thoughts; but the loyal affection of all who have come in contact with the King has ever been kindled rather by his kindness than by his greatness; this was put with unconscious emphasis in the remark of a foreign man of science who had been received in a deputation at Buckingham Palace: "I was afraid that I should not know how to meet so great a King, but when I felt his handshake and saw his smile I forgot that I was not speaking to an old friend."

The loyalty of the people of the British Isles is based on something deeper and more rational than mere personal affection, but to know that even when carrying out observations which are not very highly regarded by ordinary people, the King's subjects were within reach of a sympathetic glance from the Throne was an encouragement to many humble folk, and added a cord to those which bind together the whole nation in one body politic.



## THE INTERNATIONAL BALLOON ASCENTS.

In recent years means have been devised whereby the temperature of the air up to heights of ten or more miles above the surface can be ascertained. A small free balloon carrying a very light recording apparatus is sent up, and attached to it is a label offering a reward to the finder if he will return the apparatus. A very fair number of records from places scattered over Europe and America are thus obtained on certain pre-appointed days. The work is arranged by an International Commission, which also publishes the results. The date of publication is naturally somewhat late, because time must be allowed for the finding of the balloons, and a record is not looked upon as hopelessly lost until at least a year has elapsed.

The investigation has established the following facts:—

The temperature decreases more or less steadily up to a certain height that may range from 5 to 9 miles, at this height it has got down to at least  $-40^{\circ}$  F. and possibly to  $-100^{\circ}$  F., and in the tropics to an even lower value. Above this point there is comparatively little change, but the change, such as it is, is usually towards a higher temperature. This upper part of the atmosphere has received various names, its lowest portion is called the "upper inversion," the region itself the "isothermal layer," the "stratosphere," the "isothermal column," or the "advective region."

The results obtained have added to rather than decreased the unsolved puzzles of meteorology, but they are of great interest, and, for the convenience of those who only read English, it is proposed to give monthly a brief abstract of each set of figures as they are published.

Some fifteen balloons are sent up on each appointed day, but as a rule not more than ten records reaching into the isothermal column

are obtained, since some balloons are never found, some burst prematurely, and in some cases the record has failed.

A table will give the following data for such records as are available for the purpose :—

1. The height of the barometer at the stations reduced to sea level.
2. The height of the upper inversion, and the temperature at its beginning.
3. The maximum height reached and the temperature at that height.
4. The distance and bearing of the falling point of the balloon from the starting point.

The following particulars must be added. The results when published by the International Aeronautical Commission\* are in kilometers and degrees centigrade, but here they will be changed to miles and degrees Fahrenheit, to be more readily grasped by English readers. The Commission takes no responsibility for their accuracy, but it is probable that the temperatures are correct within a few degrees F. Heights above 12 miles must be more or less doubtful.

Ascents on the Continent last about 90 minutes, in England as a rule about two hours.

Our publication of the results of these ascents will begin next month.

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## THE GENESIS AND FUNCTION OF THE DEW-POND.

By HERBERT GIBSON.

For the purpose of this brief article it is assumed that readers are already familiar with the theory popularly associated with the supply of these ponds, which has given rise of late to suggestions, offered in all seriousness, that waterless and rainless districts can be provided with a sufficient water supply for man and beast by the construction of large concave pans, with beds made either of puddled clay insulated from the soil by a layer of straw, or constructed of other materials similarly calculated to absorb and radiate heat more rapidly than the surrounding earth, and thus set up an artificial dew-point in order to condense dew upon the surface of the pan and create a regular supply of water.

Such is popularly believed to be the function of the so called dew-pond, found throughout the whole Down country of England. The subject lends itself to researches of interest in the field of dew-precipitation and evaporation at various altitudes, in various surroundings, and on or from liquid and solid surfaces. There is, however, an *a priori* assumption that the dew-pond owes its form of construction to an application of a knowledge of these meteorological phenomena, attributing to neolithic man high scientific attainments.

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\* These publications can be obtained from the Meteorological Office, 63, Victoria Street, London, S.W.

In these discussions the practical origin and usefulness of the dew-pond seems to be wholly lost sight of.

What are the premisses? On the Downs where these ponds are made there are neither streams, springs, nor lakes. There is, however, a rainfall varying from 28 to 40 inches distributed fairly evenly throughout the year. Here and there natural depressions collect water in rainy periods. By evaporation and percolation the water collected in these concavities soon disappears again. The uncertain supply of these water holes leads the primitive pre-dew-pond man to improve upon them. He observes that where the hoofs of his live stock have puddled the sides and bottom of the depression the water remains for a longer period. He conceives the idea of artificially puddling the bed of the water hole. He advances a stage and excavates a water hole in a suitable spot and puddles it. This is the genesis of the "dam" in every country of the world.

The early Down-pond builder finds that clay and lime form an excellent puddle, but a new difficulty arises. If his clay bed is not immediately covered with water the rays of the sun crack it, and it ceases to be water-tight. He gathers rough herbage and covers his newly made clay pan to protect it. Still he had another obstacle to overcome. His water hole was not a meteorological station; it was there to collect an element necessary to him and his beasts, and the hoofs of his thirsty kine—perhaps the survivors of the now extinct *bos primogenius*—broke through the clay on the slopes. He gathered flint and chalk rubble, and over the rough herbage strewn in the water-tight shell he laid a loose floor to protect it from damage by his cattle's hoofs. Now indeed he had out-manceuvred the causes of loss from percolation, and his water hole, fed by the rain from heaven, subject though it was to the loss caused by evaporation, was sufficient to meet the requirements of the Downsman and his four-footed charges.

Here then are the constituents of the dew-pond, and why are they there? The clay and lime bed is to make a water-tight bottom. The layer of straw, sometimes below but much more usually placed *above* the clay bed, is, in either case, to avoid cracks made by solar heat. The rubble is to protect the clay bed from damage by animals running down its slopes to drink. The modern dew-pond, the result of practical experience and observation, is constructed to diminish, if not to arrest, the loss by evaporation. Its surface plane is square, or a rectangular parallelogram, the sides sloping to form in the first case an inverted square pyramid, in the second a prism. This construction reduces the loss from evaporation. Without mathematical demonstration, for which there is not space within the limits of this article, it is sufficiently obvious that a water hole of square pyramidal or prismoidal form offers, with relation to each unit of rainfall precipitated upon the plane of its superior or surface base, an area of water exposed to evaporation always less than the area of the superior plane, the relation of the one to the other becoming more approximate

as the collection of water accumulates, until, when the cavity is filled to the brim, they become equal.

Although the dew-pond on the high level of the down only receives for its supply the rain water precipitated directly upon the plane of its surface, its construction is the same as that of the pond in the valley, "coomb," or "bottom." The latter theoretically receives its supply not only from the rain water precipitated directly on its surface plane, but from the larger catchment area of the surrounding land whose slopes descend towards the pond. At first sight it would appear that the latter is more abundantly fed. The surface area of the pond is usually 300 to 350 square yards. An inch of rainfall on this surface would add 1,400 to 1,630 gallons to its contents. The low level pond, with a catchment area from the surrounding slopes of five to ten acres, theoretically receives an additional 113,000 to 226,000 gallons for each inch of rainfall. But seldom does this rainfall reach the pond. Only when a torrential downpour occurs does the soil become so saturated that runnels and streams are formed descending to the pond. When this happens the silt carried with the water is deposited in the pond, fouling it and filling it. This general experience has induced pond-builders, even when constructing them in the "bottoms" of the Downs, to raise the lip of the pond above the level of the surrounding land so that its supply is limited to the rainfall precipitated directly on its surface as effectively as that of the high-level pond. Occasionally drain pipes are trained to the low-level pond to collect water from a larger catchment area, acting as syphons and preventing the deterioration of the water-tight clay shell.

It may still be suggested that the pond builder, himself ignorant of absorption, radiation and dew-point, had unconsciously created an artificial dew distiller, and that the process of dew condensation on the surface of a body cooling more rapidly than the surrounding earth, feeds his pond and keeps it from running dry.

An investigation of this hypothesis was made by Mr. Harry Pool Slade in the year 1876. He selected for the purpose a dew pond built in 1836 on the Thorpe Downs of Berkshire, 450 ft. above sea level. "In shape it resembled a shallow rain gauge without the vertical brim. Its greatest diameter was  $69\frac{1}{2}$  ft. The straight sides met nearly at a point 80 inches below the surface level, with which they formed an angle of  $11^{\circ} 21'$ . A layer of clay about 12 inches thick, mixed with lime to stay the progress of earth worms, and covered over with first a coating of straw (to prevent the sun cracking the clay) and finally with loose rubble, made up its waterproof bed."

Mr. Slade's observations extended over a period of eight months, from June, 1876, to February, 1877. In addition to taking the barometrical, hygrometrical and thermometrical readings daily, he observed the temperature of the water in the pond at depths of 3 inches, 1 ft., and 3 ft.; the temperature of the air in sun and wind at the top of the slope; direction and force of wind; sunshine, rain-

fall, rise and fall of water level in the pond extended to gallons ; dewfall ; evaporation recorded simultaneously from the pond and from copper pans containing water and placed on the slope of the pond's side and on the level above the pond's surface ; and finally the absorption of dew moisture in a piece of cotton wool measuring  $6\frac{1}{2}$  in.  $\times$  6 in.  $\times$   $\frac{1}{4}$  in.

Mr. Slade found that dew contributed nothing to the pond's supply. In August, for example, from the 11th to 13th there were heavy dews. On the 11th  $2\frac{1}{2}$  grains per square inch were deposited on the cotton wool (this is equal to .01 inch). During these three days the water level in the pond fell 0.42 inch, a loss of 316 gallons. Again on June 26th to 28th there were heavy morning dews. The water level fell 1.01 inch, a loss of 1,096 gallons, these days being cloudless with little wind.

The following comments on dew supply were made by the same investigator. The statement that ponds gather dew more readily upon high grounds is incorrect. Draughts of air so prevalent there oftentimes evaporate it as speedily as it is formed, and in every case retard its action. The maximum deposition will never be found in the hills but in the secluded valleys. With regard to the temperature of the water in the pond, he points out the fact (it scarcely needed his observations to prove it) that the water is much warmer in the night than the surrounding air. To produce dew it should be colder. Therefore condensation is impossible. There remains the unsubmerged part of the slopes formed of the "radiating" clay pan. Allowing that so much as 0.02 inch of dew is deposited on these on exceptional nights, the water is held by tension to the uneven surface and dissipated again before noon. One final comment. "In the early morning hours of August the 12th, a thick mist arose from the pond's basin and rolled away over the downs, leaving a strong dew deposition in its track." Here with a vengeance is the mist of the shepherd's fable ! The cooler morning air becomes saturated from the warm surface of the pond, and passing over the still cooler surface of the surrounding down precipitates on the latter what it has taken up from the former.

Mr. Slade's observations of evaporation are of equal value and interest, but they can only be referred to very briefly. Sheep drinking at the pond, as well as birds, constituted a difficulty in determining the loss by evaporation, but a series of observations enabled him to determine with relative accuracy the quantity they consumed. There was a loss by evaporation during the night as well as during the day. For the four months, June to September, 11.708 inches of rain fell, contributing 14,945 gallons to the pond. This rainfall multiplied by the surface area of the pond is equal to 23,071 gallons, so that 8,116 gallons or 35% were retained on the slopes by saturation and adhesion, and subsequently evaporated. During the same period the evaporation from the volume in the pond was 15,243 gallons. Evaporation exceeded rainfall during these months, but it

would not have done so had there been no loss from saturation and adhesion on the unsubmerged slopes ; the net gain would have been about 5,000 gallons. In summer the water level in the pond sinks, and the supply is replenished in winter.

The loss by evaporation and from the slopes which retain and dissipate one-third of the rainfall precipitated on the horizontal surface of the pond is remarkable. Mr. Slade's figures, subject even to a liberal discount on the score of sheep drinking and other non-physical causes of depletion, clearly prove this. One hundred and eighty sheep were watered occasionally at the pond. He recorded each occasion when they drank and estimated their consumption. The estimate could only be approximate. Admitting a margin for this uncertain quantity, evaporation still takes back one-third of the annual rainfall precipitated in the pond, and its watertight bed arrests only one of the two sources of loss. In hotter countries, where the rainfall is less frequent, the loss by evaporation would be still greater.

The term dew-pond is a misnomer. It is a rain pond. It might with propriety be called a down-pond. Possibly at one time it was so termed. If the Belgae constructed ponds, and here we are on very conjectural ground, they might have called them *dun-ponds* or *dūponds*. When does the term dew-pond first occur ? Has it been so called for ten centuries—five centuries—two centuries ? The word dew-pond is not in Sir James A. H. Murray's Dictionary, but its etymology is worth investigation.

For the economy of the collection and storage of rain water evaporation must be arrested. This cannot be done in a surface-exposed pond. A catchment area of galvanized corrugated iron upon a wooden frame, with a roofed reservoir to collect and store the water, would undoubtedly prove a more economical and securer, as well as a more sanitary, method than the most ingenuous "dew-pond" ever constructed.

### ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, April 20th, at the Institution of Civil Engineers, Mr. H. Mellish, President, in the chair.

The discussion on the paper by Mr. R. G. K. Lempfert and Mr. R. Corless on "Line Squalls and Associated Phenomena," which was read at the Manchester meeting of the Society, on February 23rd, occupied the whole evening. Mr. Lempfert introduced the subject by giving a summary of the paper.

The line squalls specially discussed were those of February 8th, 1906 ; August 2nd, 1906 ; February 19th—20th, 1907 ; August 31st—September 1st, 1908 ; and October 14th, 1909. Maps were given showing, by isochronic lines, the direction of front, and rate of advance of the various storms across the country. The authors stated that a general description of the motion of air in a line squall may be something like the following :—

## Symons's Meteorological Magazine.

A current from a southerly direction in its progress from warmer latitudes, is invaded by a colder current coming from more northern regions. The course of events leading up to this state is not accurately known. In some cases, as in that of October 14th, 1909, it is natural to associate the two currents with the front and rear of a depression, but a similar connection is not always apparent. The tendency will be for the cold, and therefore heavy, current to force its way under the warm and humid, and therefore light, current, forcing the latter into upper regions. Having once started the ascent of air, the condition of stability of the line of separation is probably assured within certain limits. For the ascent of the humid air is accompanied by a diminution of its pressure, and therefore of its temperature, saturation is rapidly reached, condensation occurs, and rain falls. A large amount of heat is liberated in this process, which heat tends to diminish the rate of vertical fall of temperature, but at the same time to diminish the density of the ascending air, and therefore to continue the upward motion. Consequently, *if a constant stream of warm air is available*, the conditions are favourable for the continuation of the process. The condition for a constant supply of warm air is that the component velocity of the surface wind at right angles to the linear front must be less than the velocity of propagation of the line itself in the same direction. As soon as these velocities become equal, vertical motion becomes impossible.

At the surface the cold north-west current began to force its way under the southerly current. At the line of separation between the two, the velocity component of the surface wind normal to the line may be either equal to or less than the normal component of the warm surface current in front of the line. But if the system is to preserve its character the velocity of propagation of the line must be greater than the normal component of the surface winds on the front side of the line. The conclusion is that downward motion takes place in the North-west current to supply the deficiency of air which would ensue if the normal component of the surface current was less than that of the line itself. If the two are equal, no downward motion need take place. The wind vector diagrams show, however, that as a rule there is no great change in the normal component of velocity on the two sides of the line, and therefore, considerable downward motion apparently takes place.

The following took part in the discussion :—Mr. E. Gold, Dr. W. N. Shaw, Col. H. E. Rawson, Mr. J. E. Clark, Mr. F. J. Brodie, Mr. L. C. W. Bonacina, Dr. H. N. Dickson, Mr. W. Marriott, Mr. C. Salter, Mr. W. W. Bryant, Capt. A. Carpenter and Mr. J. S. Dines. Mr. Corless and Mr. Lempfert replied.

The following ladies and gentlemen were elected Fellows of the Society, viz. :—Mrs. Buckley, Mr. W. J. Conn, Mr. H. J. Gardiner, Mr. W. A. Harwood, M.Sc., Mr. F. Jones, Mr. H. C. Jones, Mr. C. H. Knowles, B.Sc., Capt. W. C. Leader, Mr. F. G. Millar, Mr. J. Orr, L.R.C.P., Mr. A. A. G. Phillips, Mr. W. Pilkington, and Miss M. White, B.Sc.



## Correspondence.

*To the Editor of Symons's Meteorological Magazine.*

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## HAIL STORM OF APRIL 16th, 1910.

ON the 16th there was a severe storm here as elsewhere, with much lightning overhead, many flashes not a mile away. It was accompanied by very heavy hail, which blocked the drains and prevented the water from getting away. A lot of damage was done to fruit trees, knocking off the blossom, buds and leaves. There were one or two small showers during the day, which I should estimate did not exceed .10 in. The heavy storm began about 5 p.m., and at 6.15 I measured the fall, finding 1.24 in. ; therefore about 1.14 in. fell in 75 minutes. It was still raining, but not so hard, and next morning I had collected .28 in. more, making 1.52 in. for the day. The hail must have been about 2 inches deep, and all the country was white with it. It was not all melted in sheltered places by the afternoon of 17th.

HENRY ELLIS.

*Inglefield, Little Heath, Potter's Bar, 19th April, 1910.*

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PROBABLY the account of the thunderstorm, accompanied with a very remarkable hail storm, which occurred here yesterday, will be welcome to you.

It began to rain yesterday afternoon about 20 minutes to 4, and I noticed a distant flash of lightning and faint thunder at 3.45, when I was sheltering from the rain at the corner of Beddington Gardens and Woodcote Road. The rain became less violent and I reached here about 4.10. It was still raining slightly. At about 4.40 it began to rain heavily, and then the thunderstorm began with a brilliant flash of orange coloured lightning, followed by a loud clap of thunder. This was the beginning of the hailstorm, which lasted till about 6 o'clock. It is many years since I have seen such hail. Most of the hailstones were round and as near as possible half-an-inch in diameter. The hail covered the ground to the depth of at least 2 inches. During the hailstorm there were several flashes of lightning, one of which was rose-pink in colour and another was blue, accompanied by violent claps of thunder. The storm seems to have been very local, and I have been told that it was just like a wall close by the school at Bandon Hill, and at Carshalton on the western side there was only a heavy shower. My gardener, who was watching the storm, tells me that there were two storms, one from the south and the other from the west, which seemed to meet over the Manor Road. Great damage has been done, for the hail accumulated in the valleys between the double roofs of the houses, melted and brought down ceilings in many of the houses. When the hail ceased rain came on, and continued as far as I can learn till about 2 a.m. this

morning. I have two rain gauges here, one an 8 in. gauge, 1 ft. above ground, had at 9 a.m. this morning, 1·37 in., and the other, a 5 in. one, 4 ft. above ground, 1·33 in. As may be imagined, the tulips and hyacinths are considerably cut up, and with respect to the fruit trees, it is at the present moment difficult to say what damage has been done. As showing the violence of the storm, a doctor informed me this morning that he was going in his motor car along the Stafford Road, when there was a brilliant flash of lightning. This so frightened a woman on the pathway that she rushed across the road in front of the car. The horn could not be blown, being filled with hail. How the woman escaped the doctor does not know.

I understand that there was also a violent thunderstorm at Epsom, which is about 7 miles distant, but I have no particulars. At Croydon there was only heavy rain. F. CAMPBELL-BAYARD.

*Cotswold, Maldon Road, Wallington, Surrey, 17th April 1910.*

THE storm here on Saturday, April 16th, was remarkable in severity. Two disturbances, one from the N.W., the other from the S.W., appeared to meet over this district and remain stationary.

Distant and occasional thunder was heard during the afternoon, the whole sky became overcast and heavy rain appeared to be falling to the N.W. About 5 p.m. the thunder approached and large drops of rain commenced to fall. The rain quickly changed to hail which poured down until the ground was covered to a depth of about 2 inches. A second thunderstorm, meanwhile, approached from the S.W.; the lightning was extremely vivid and the thunder almost simultaneous. Rain continued to fall during the evening in a steady downpour. So rapid was the fall of hail that it collected in the V of the roof to a depth of nearly a foot, and thus preventing the subsequent rain from flowing off caused it to pour in a stream through the ceilings.

The limits of the heavy rain can be inferred from the following records, the measurement being made at 9 a.m. on the 17th :—

Muswell Hill.....	2·23 in.	Finchley .....	·46 in.
Highbury .....	1·55 „	Tottenham.....	·46 „
Potters Bar .....	1·52 „	Ponders End.....	·37 „
Camden Square .....	1·19 „	Hampstead .....	·23 „
Enfield .....	·68 „	Mill Hill.....	·19 „

DONALD S. SALTER.

*3, Midhurst Avenue, Muswell Hill, London, N.*

[The accompanying map of the rainfall of the month in the Thames Valley shows a curiously patchy distribution, due in the main to the heavy fall of the 16th. The small area of rainfall above 3 inches in the north of London corresponds exactly with the heaviest splash of the thunderstorm referred to.—ED. S.M.M.]



# RAINFALL OF THAMES VALLEY — APRIL, 1910.



Isolythals  
Rainfall stations reporting

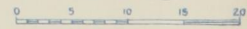
Watershed of River Thames above Teddington, and River Lee above Feltham Weir.

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ALTITUDE  
SCALE



SCALE OF MILES



## REVIEWS.

*The Rainfall of Rhodesia* by the REV. E. GOETZ, S.J., M.A., F.R.A.S.  
Proceedings of the Rhodesia Scientific Association, Vol. 8, Pt. 3.  
Issued 1909. Price 5s.

THE excellent meteorological work of Father Goetz in Bulawayo is well known to our readers, and no one could be better fitted to deal with the rainfall of the great territory of which he writes. He has collected all the records that could be found, and publishes the monthly totals. The data are of course scanty as the country has only recently been open for settlement, but four records of more than ten years' duration were available, 17 of more than five years, and about 40 of two years' or more. The year is taken from July to June, so as to keep the whole of each rainy season (October to April) together, little or no rain falling between May and August or September. After discussing the applicability of the usual method for reducing short records to their equivalent for a longer period, the author decides in favour of the reduction, and he produces a map of Rhodesia showing approximate isohyetal lines, the details of which are not however fully worked out. Generally speaking, the rainfall increases from 15 inches on the Transvaal border in the south towards the north-east, reaching 25 inches about Bulawayo, and 40 inches beyond Salisbury, and along the Portuguese boundary the 45 inch line appears. There is an indication of increasing rainfall again about the line of the Zambesi river in the north-west, where a portion of the isohyetal of 30 inches appears. The data are worked up in order to throw light on the dry and wet seasons, the relation of rainfall to the position of the sun, the occurrence of droughts, the relative frequency of rain with various winds, and the diurnal periodicity of rainfall in Bulawayo. This shows that least rain falls between 6 and 8 a.m., and most between 2 and 6 p.m. The result is to show that 53% of the rain falls in the daytime (6 a.m. to 6 p.m.), and 47% by night (6 p.m. to 6 a.m.); but only 27% of the daily rainfall occurs between midnight and noon, while 73% falls between noon and midnight.

We congratulate Father Goetz on the successful completion of an exceedingly difficult and laborious piece of work, the importance of which to the rapidly developing country with which it deals it would be difficult to overrate, and it says much for his devotion to science that he has been able in the intervals of his more onerous duties to perform so great a service to the State with so small a prospect of adequate recognition or reward.

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A report on *The Influence of Forests on Climate and on Floods*, by WILLIS L. MOORE, LL.D., Sc. D., Chief of the U. S. Weather Bureau, Washington. 1910. Size, 9 x 6. Pp. 38.

THIS report made by Dr. Willis Moore to a Committee of Congress is interesting because of the clearness with which the author asserts

that forests are without influence either on the amount of rainfall or the occurrence of floods. He was led to this conclusion, which is in opposition to his former views, by a careful study of the data bearing on the case. He finds that floods are due to meteorological rather than geographical causes, and as to fluctuations in annual rainfall he states his conclusions as follows :—

(1.) Any marked climatic changes that may have taken place are of wide extent and not local, are appreciable only when measured in geologic periods, and evidence is strong that the cutting away of the forests has had nothing to do with the creating or the augmenting of droughts in any part of the world.

(2.) Precipitation controls forestation, but forestation has little or no effect on precipitation.

(3.) Any local modification of temperature and humidity caused by the presence or absence of forest covering, the buildings of villages and cities, &c., could not extend upward more than a few hundred feet, and in this stratum of air saturation rarely occurs, even during rainfall, whereas precipitation is the result of conditions that exist at such altitudes as not to be controlled or affected by the small thermal irregularities of the surface air.

(4.) During the period of accurate observations, the amount of precipitation has not increased or decreased to an extent worthy of consideration.



## THE WEATHER OF APRIL.

By FRED. J. BRODIE.

THE proverbially changeable character of our April weather was perhaps never more fully exemplified than in the month under review. Throughout nearly the whole time this country, and indeed a very large portion of Europe, was exposed to the attacks of cyclonic systems, advancing at first from the southward or south-westward, and afterwards from the north-westward or northward. The general conditions were, therefore, extremely unsettled, more especially in the second week when the gradual extension of a large and complex area of low pressure from the Atlantic was marked by heavy rains in nearly all districts. In the north of Scotland the contribution to the monthly total which was supplied by a heavy downpour lasting, with but little interruption, from about the 12th to the 16th, resulted in many places in an aggregate rainfall in excess of anything previously observed in April for more than 40 years.

At the opening of the month the country remained under the influence of the large anticyclone which prevailed in the latter half of March, and on the nights of the 1st and 2nd a sharp frost was experienced in many districts. On the latter occasion the sheltered thermometer fell below  $25^{\circ}$  in several parts of England, and touched  $21^{\circ}$  at Cambridge and  $22^{\circ}$  at Swarraton ; while on the surface of the



grass readings below  $20^{\circ}$  were equally general, the exposed instrument sinking to a minimum of  $10^{\circ}$  at Cambridge, and  $14^{\circ}$  at Llangammarch Wells. A shallow depression was at this time beginning to spread up from southern Europe, and for the next few days northerly and north-easterly winds cold changeable weather prevailed very extensively, with heavy rain in the south of England on the 6th. On the 7th and 8th the influence of the low pressure system was replaced by that of an anticyclone, which advanced over the country from the north-westward. Brisk solar and terrestrial radiation now set in, the days being bright and fairly warm, but the nights cold and frosty. Between the 8th and 10th the thermometer touched  $60^{\circ}$  in several isolated parts of the United Kingdom, a reading of  $61^{\circ}$  being recorded at Cullompton, at Crieff and at Killarney. On the nights of the 9th and 10th about  $10^{\circ}$  of frost were, however, registered on the grass at several western and northern stations.

In the second week of the month, when the country was affected by the large Atlantic low pressure system already noted, the prevailing winds over England were mainly southerly and south westerly, and on the 13th the thermometer rose above  $60^{\circ}$  in many places, a reading as high as  $64^{\circ}$  being recorded at Greenwich. In Ireland and Scotland, where the winds were more commonly from north or north-east, the weather was distinctly cold, with sharp frosts between the nights of the 13th and 15th. Thunderstorms occurred in the east and south-east of England on the 13th and in many parts of that country on the 15th and 16th, the storm of the 16th being very severe on the northern and eastern outskirts of the metropolis where an extremely heavy fall of rain and hail was experienced. On the 18th, when southerly and south westerly winds became general, the thermometer rose decidedly in the west and north, shade maxima of  $60^{\circ}$  and upwards being recorded in Ireland and the north-west of England, and a reading of  $64^{\circ}$  at Dublin and Killarney.

For the remainder of the month the weather was influenced for the most part by large cyclonic systems which moved from Iceland to Scandinavia, and by secondary disturbances which passed eastwards across the United Kingdom. With these conditions the wind alternately backed and veered between south-west and north-west, and temperature fluctuated considerably, the nights being, however, usually cold, with occasional sharp ground frosts. Over England the highest temperatures of the month were recorded on the 21st, when the thermometer rose to between  $60^{\circ}$  and  $65^{\circ}$  in most places, and touched  $66^{\circ}$  at Greenwich. The sharpest frosts occurred on the nights of the 25th and 26th, when the thermometer on the grass fell below  $25^{\circ}$  in several districts, and reached  $20^{\circ}$  at Cambridge, and  $21^{\circ}$  at Hereford and West Linton.

In the north the absence of genial spring warmth during the month was very striking. At Leith the thermometer did not rise above  $59^{\circ}$  (the absolute maximum being the lowest recorded in April

since the inclement season of 1879), and at some places in the north of Scotland it did not exceed  $55^{\circ}$ . The mean temperature for the month was nearly everywhere below the average, but in the south and east of England the deficit was small.

Most places reported less than the average amount of sunshine, but the deficiency was as a rule slight; in London (at Westminster) the total duration, 110 hours, was only 3 hours below the normal.

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## WIND WAVES IN WATER, SAND AND SNOW.

UNDER the auspices of the Royal Geographical Society, Dr. Vaughan Cornish delivered a series of three lectures on wind waves in water, sand and snow, in the Theatre, Burlington Gardens, in January last.

The first lecture was devoted to Wind Waves in Water, and Dr. Cornish described the size, length and period of waves which he had observed on Plymouth Sound, on the pond in Kensington Gardens, on Coniston Water, and on the Lake of Geneva. The earliest observations of value on waves at sea were made by Dr. Scoresby in 1840, in the North Atlantic. In a heavy storm when off the Newfoundland coast he had seen waves most of which exceeded 30 feet in height, and some attained a height of 40 feet. The development of these great sea waves is caused in the advance of a cyclone across the Atlantic at that point where the wind direction coincides with the direction of advance of the cyclone. So long as the depression maintains itself, the strong wind blowing across the crest of the waves intensifies them until a considerable steepness is attained. Dr. Cornish connected in a most graphic manner a heavy sea in the English Channel on February 1st, 1899, with a cyclonic disturbance in Mid-Atlantic two days earlier. At his house between Bournemouth and Poole the lecturer had noted unusually heavy breakers, but the barometrical charts of the North Atlantic, prepared by the Meteorological Office showed nothing which could account for this unusual occurrence on either that day or the previous day. On January 30th however, an unusually steep cyclone was experienced in mid-North Atlantic, and the waves which were developed by the W.S.W. wind on the southern side of the depression must have increased in size and ultimately broke with great violence on the northern shores of the English Channel.

Referring to the Pacific Ocean, Dr. Cornish stated that there was no evidence which would enable him to say that the steep waves on the steamship track from Victoria to Yokohama were larger or even as large as those which occur in the North Atlantic. It is in the Southern Ocean that waves reach their greatest height and magnificence. The height, however, when compared with the waves of the North Atlantic, is not so striking as the much greater length from crest to crest. The difficulty of studying this subject from most of the available observations is that little is generally known as to the



methods under which the observations are taken, and so there is necessarily a wide margin of error. The late Mr. Ralph Abercromby reported waves 46 feet high in the neighbourhood of Cape Horn, but when the observations are critically examined it is found that the margin of error is 4 feet in either direction, so that they may have been only 42 feet or as much as 50 feet in height. From carefully made observations Dr. Cornish had deduced the fact that the speed of waves is not only dependent on the wind velocity but also on the rate of progress of the cyclone. Waves had been observed travelling at a speed of 43 miles per hour when the velocity of the wind was 46 miles per hour, but the rate of travel was seldom more than half the wind velocity.

*(To be continued.)*

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## METEOROLOGICAL NEWS AND NOTES.

THE INTERNATIONAL HYGIENIC EXHIBITION which will be opened in Dresden about the 1st May, 1911, will include exhibits relating to all meteorological and climatological investigations which have any bearing on questions of health. On account of the close relation between climate and the weal or woe of the human race almost the whole field of climatology falls within the scope of the exhibition. Objects suitable for exhibition include instruments of every kind used for meteorological observations, both on the earth's surface and in the free atmosphere, and climatological diagrams or maps relating to any of the features of climate which are associated with health. Prof. Dr. Paul Schreiber, who has charge of this department of the exhibition, will be glad to hear from intending exhibitors. Letters may be addressed to him at the Königl. sächs. Landes-Wetterwarte, Dresden-Neustadt, Germany.

THE PRIZE OF TWENTY POUNDS recently offered by the Scottish Meteorological Society for the best essay on a meteorological subject has been awarded by the Council of the Society to Mr. David MacOwan, of Edinburgh University, for an essay on "Atmospheric Electricity." The competition, it may be recalled, was open to students of the Scottish Universities and to graduates of not more than five years' standing.

THE WEATHER OF LONDON, as represented by Camden Square, is characterised by two constants which cannot readily be forgotten—the average temperature for 50 years is 50°·0 F., and the average rainfall for the same period is 25·0 inches, or in other units the average temperature is 10°·0 C., and the average rainfall 635 millimetres.

## RAINFALL TABLE FOR APRIL, 1910.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH.	
					Aver. 1875— 1909. in.	1910. in.
Camden Square.....	London.....	51 32	0 8	111	1'74	2'24
Tenterden.....	Kent.....	51 4	*0 41	190	1'77	1'37
Steyning.....	Sussex.....	50 53	0 20	80	1'93	2'09
Southampton (Cadland) ...	Hampshire.....	50 50	1 22	52	1'98	...
Hitchin.....	Hertfordshire.....	51 57	0 17	238	1'67	2'28
Oxford (Magdalen College)...	Oxfordshire.....	51 45	1 15	186	1'67	2'38
Bury St. Edmunds (Westley) ..	Suffolk.....	52 15	*0 40	226	1'62	2'74
Geldeston [Beccles].....	Norfolk.....	52 27	*1 31	38	1'55	1'66
Polapit Tamar [Launceston] ..	Devon.....	50 40	4 22	315	2'34	2'67
Rousdon [Lyme Regis].....	„.....	50 41	3 0	516	2'39	1'79
Stroud (Upfield).....	Gloucestershire..	51 44	2 13	226	2'09	2'44
Church Stretton (Wolstaston)..	Shropshire.....	52 35	2 48	800	2'20	2'23
Coventry (Kingswood).....	Warwickshire....	52 24	1 30	340	1'96	1'78
Market Overton.....	Rutland.....	52 44	0 41	475	1'87	1'92
Boston.....	Lincolnshire.....	52 58	0 1	25	1'57	1'91
Worksop (Hodsock Priory)...	Nottinghamshire	53 22	1 5	56	1'62	1'49
Macclesfield.....	Cheshire.....	53 15	2 7	501	2'02	4'46
Southport (Hesketh Park)...	Lancashire.....	53 38	2 59	38	1'84	2'20
Wetherby (Ribston Hall) ...	Yorkshire, W.R.	53 59	1 24	130	1'85	2'79
Arneliffe Vicarage.....	„ „.....	54 8	2 6	732	3'73	4'18
Hull (Pearson Park).....	„ E.R.....	53 45	0 20	6	1'69	2'08
Newcastle (Town Moor) ...	Northumberland	54 59	1 38	201	1'84	2'20
Borrowdale (Seathwaite) ...	Cumberland.....	54 30	3 10	423	6'91	9'32
Cardiff (Ely).....	Glamorgan.....	51 29	3 13	53	2'50	3'31
Haverfordwest (High Street) ..	Pembroke.....	51 48	4 58	95	2'82	2'25
Aberystwyth (Gogerddan)...	Cardigan.....	52 26	4 1	83	2'48	5'03
Llandudno.....	Carnarvon.....	53 20	3 50	72	1'79	3'41
Cargen [Dumtries].....	Kirkcudbright...	55 2	3 37	80	2'50	4'01
Marchmont House.....	Berwick.....	55 44	2 24	498	2'28	2'64
Girvan (Pinnore).....	Ayr.....	55 10	4 49	207	2'81	3'79
Glasgow (Queen's Park) ...	Renfrew.....	55 53	4 18	144	1'86	4'50
Inveraray (Newtown).....	Argyll.....	56 14	5 4	17	3'69	6'85
Mull (Quinish).....	„.....	56 36	6 13	35	2'98	4'96
Dundee (Eastern Necropolis) ..	Forfar.....	56 28	2 57	199	1'93	2'08
Braemar.....	Aberdeen.....	57 0	3 24	1114	2'30	3'70
Aberdeen (Cranford).....	„.....	57 8	2 7	120	2'23	3'07
Cawdor.....	Nairn.....	57 31	3 57	250	1'62	5'45
Fort Augustus (S. Benedict's) ..	E. Inverness.....	57 9	4 41	68	2'22	6'15
Loch Torridon (Bendamph) ..	W. Ross.....	57 32	5 32	20	4'70	7'22
Dunrobin Castle.....	Sutherland.....	57 59	3 56	14	2'02	3'23
Wick.....	Caithness.....	58 26	3 6	77	1'89	4'42
Killarney (District Asylum) ..	Kerry.....	52 4	9 31	178	3'46	3'17
Waterford (Brook Lodge)...	Waterford.....	52 15	7 7	104	2'68	2'57
Nenagh (Castle Lough).....	Tipperary.....	52 54	8 24	120	2'54	3'14
Miltown Malbay.....	Clare.....	52 52	9 26	400	2'69	3'61
Gorey (Courtown House) ..	Wexford.....	52 40	6 13	80	2'37	2'74
Abbey Leix (Blandsfort).....	Queen's County..	52 56	7 17	532	2'54	3'61
Dublin (Fitz William Square)...	Dublin.....	53 21	6 14	54	2'03	2'20
Mullingar (Belvedere).....	Westmeath.....	53 29	7 22	367	2'37	2'68
Ballinasloe.....	Galway.....	53 20	8 15	160	2'37	2'94
Crossmolina (Enniscoe).....	Mayo.....	54 4	9 18	74	3'13	2'44
Collonee (Markree Obsy.)...	Sligo.....	54 11	8 27	127	2'52	2'65
Seaforde.....	Down.....	54 19	5 50	180	2'76	1'99
Bushmills (Dundarave).....	Antrim.....	55 12	6 30	162	2'08	2'77
Omagh (Edenfel).....	Tyrone.....	54 36	7 18	280	2'50	2'40

RAINFALL TABLE FOR APRIL, 1910—*continued.*

RAINFALL OF MONTH ( <i>con.</i> )					RAINFALL FROM JAN. 1.				Mean Annual 1875-1909.	STATION.
Diff. from Av. in.	% of Av.	Max. in 24 hours.		No. of Days	Aver. 1875-1909.	1910.	Diff. from Aver. in.	% of Av.		
		in.	Date.		in.	in.			in.	
+ '50	129	1.19	16	18	6.93	7.74	+ '81	112	25.11	Camden Square
— '40	77	.23	23	20	7.76	9.56	+1.80	123	27.64	Tenterden
+ '16	108	.75	6	17	9.68	13.51	+3.83	139	33.58	Steyning
...	...	...	...	...	9.18	...	...	...	31.87	Cadland
+ '61	137	.53	16	17	6.68	7.66	+ '98	115	25.16	Hitchin
+ '71	143	.72	16	19	6.52	6.85	+ '33	105	24.58	Oxford
+1.12	170	.73	16	18	6.62	7.57	+ '95	114	25.40	Westley
+ '11	107	.53	4	16	6.06	6.45	+ '39	106	23.73	Geldeston
+ '33	114	.62	12	19	11.62	16.97	+5.35	146	38.27	Polapit Tamar
— '60	75	.35	12	19	10.13	9.50	— '63	94	33.54	Rousdon
+ '35	117	.50	21	22	8.55	9.19	+ '64	107	29.81	Stroud
+ '03	101	.36	24†	23	9.07	8.43	— '64	93	32.41	Wolveston
— '18	91	.32	28	18	8.08	7.51	— '57	93	28.98	Coventry
+ '05	103	.30	24†	20	7.29	7.62	+ '33	105	27.10	Market Overton
+ '34	122	.56	16	20	6.11	6.30	+ '19	103	23.35	Boston
— '13	92	.31	16	15	6.66	5.74	— '92	86	24.46	Hodsock Priory
+2.44	221	.86	16	19	9.48	11.11	+1.63	117	34.73	Macclesfield
+ '36	120	.20	15‡	21	8.57	9.93	+1.36	116	32.70	Southport
+ '94	151	.45	14	19	7.37	10.45	+3.08	142	26.87	Ribston Hall
+ '45	112	.61	24	20	20.04	28.35	+8.31	141	61.49	Arnccliffe
+ '39	123	.43	14	20	7.01	6.34	— '67	90	26.42	Hull
+ '36	120	.47	4	17	7.47	8.57	+1.10	115	27.94	Newcastle
+2.41	135	2.18	12	25	41.94	56.57	+14.63	135	129.48	Seathwaite
+ '81	133	.75	6	22	12.11	15.70	+3.59	130	42.28	Cardiff
— '57	80	.43	13	17	14.09	13.13	— '96	93	46.82	Haverfordwest
+2.55	203	.93	19	23	12.52	16.34	+3.82	131	45.46	Gogerddan
+1.62	190	.60	13	21	8.54	11.63	+3.09	136	30.36	Llandudno
+1.51	160	1.50	12	15	13.35	19.47	+6.12	146	43.47	Cargen
+ '36	116	.46	16	16	9.47	8.38	—1.09	88	33.76	Marchmont
+ '98	135	.50	20	22	15.08	21.14	+6.06	140	49.77	Girvan
+2.64	242	1.10	16	19	10.70	14.30	+3.60	134	35.97	Glasgow
+3.16	186	1.13	11	23	22.15	29.05	+6.90	131	68.67	Inveraray
+1.98	166	.94	11	22	17.26	21.14	+3.88	123	56.57	Quinish
+ '15	108	.48	12§	11	7.91	6.83	—1.08	86	28.64	Dundee
+1.40	161	...	...	...	10.64	15.06	+4.42	141	34.93	Braemar
+ '84	138	.80	16	19	9.60	9.22	— '38	96	32.73	Aberdeen
+3.83	336	1.41	13	14	8.31	11.26	+2.95	136	29.33	Cawdor
+3.93	278	1.16	13	19	15.79	20.47	+4.68	130	44.53	Fort Augustus
+2.52	154	.70	23	23	28.78	38.01	+9.23	132	83.61	Bendamp
+1.21	160	.64	16	18	9.99	8.93	—1.06	89	31.90	Dunrobin Castle
+2.53	234	1.20	13	24	8.84	9.72	+ '88	110	29.88	Wick
— '29	92	.54	21	25	18.90	25.05	+6.15	133	54.81	Killarney
— '11	96	.53	12	18	12.28	10.98	—1.30	89	39.57	Waterford
+ '60	124	.48	21	20	12.30	17.66	+5.36	144	39.43	Castle Lough
+ '92	134	.76	18	20	13.02	16.41	+3.39	126	45.11	Miltown Malbay
+ '37	116	.47	12	20	10.59	10.09	— '50	95	34.99	Courtown Ho.
+1.07	142	.57	21	21	10.83	14.32	+3.49	132	35.92	Abbey Leix
+ '17	108	.48	19	19	8.08	9.87	+1.79	122	27.68	Dublin
+ '31	113	.45	19	19	10.78	13.62	+2.84	127	36.14	Mullingar.
+ '57	124	.42	14	22	10.88	13.92	+3.04	128	36.64	Ballinasloe
— '69	78	.36	26	18	17.04	21.96	—4.92	129	52.87	Enniscoie
+ '13	105	.45	27	21	12.92	18.82	+5.90	146	42.71	Markree
— '77	72	.41	12	19	11.82	11.31	— '51	96	38.91	Seaforde
+ '69	133	.40	27	19	10.56	14.42	+3.86	137	37.56	Dundarave
— '10	96	.41	27	18	11.62	15.04	+3.42	129	39.38	Omagh

† and 28. ‡ and 23, 28. § and 16.

## SUPPLEMENTARY RAINFALL, APRIL, 1910.

Div.	STATION.	Rain inches	Div.	STATION.	Rain. inches
II.	Warlingham, Redvers Road	2.09	XI.	Llangyhanfal, Plâs Draw....	3.49
„	Ramsgate .....	2.32	„	Dolgelly Bryntirion .....	5.14
„	Hailsham .....	2.04	„	Bettws-y-Coed, Tyn-y-bryn	3.66
„	Totland Bay, Aston House.	1.85	„	Lligwy .....	3.03
„	Stockbridge, Ashley .....	2.95	„	Douglas, Woodville .....	...
„	Grayshott .....	2.14	XII.	Stoneykirk, Ardwell House	3.29
„	Reading, Calcot Place.....	1.95	„	Dairy, The Old Garroch ...	4.26
III.	Harrow Weald, Hill House.	1.38	„	Langholm, Drove Road.....	3.58
„	Pitsford, Sedgebrook .....	1.21	„	Moniaive, Maxwellton House	3.68
„	Huntingdon, Brampton .....	1.85	XIII.	St Mary's Loch, Cramilt Ldge	4.44
„	Woburn, Milton Bryant.....	1.84	„	Edinburgh, Royal Observty.	3.15
„	Wisbech, Monica Road.....	1.89	XIV.	Maybole, Knockdon Farm..	3.43
IV.	Southend Water Works.....	.96	XV.	Campbeltown, Witchburn...	3.56
„	Colchester, Lexden .....	1.45	„	Glenreadell Mains.....	4.87
„	Newport .....	2.01	„	Ballachulish House.....	6.29
„	Rendlesham .....	1.54	„	Islay, Eallabus .....	3.81
„	Swaffham .....	2.37	XVI.	Dollar Academy .....	2.54
„	Blakeney .....	1.68	„	Balquhider, Stronvar .....	7.52
V.	Bishops Cannings .....	2.37	„	Coupar Angus .....	2.56
„	Winterbourne Steepleton ...	2.19	„	Blair Atholl.....	3.04
„	Ashburton, Druid House ..	3.11	„	Montrose, Sunnyside Asylum	2.22
„	Honiton, Combe Raleigh ...	2.52	XVII.	Alford, Lynturk Manse ...	4.00
„	Okehampton, Oaklands.....	3.04	„	Keith Station .....	3.94
„	Hartland Abbey .....	2.59	XVIII.	Glenquoich, Laon .....	14.80
„	Lynmouth, Rock House .....	2.78	„	Skye, Dunvegan.....	6.24
„	Probus, Lamellyn .....	2.53	„	N. Uist, Lochinaddy .....	4.64
„	North Cadbury Rectory .....	2.62	„	Alvey Manse .....	4.62
VI.	Clifton, Pembroke Road ...	2.85	„	Loch Ness, Drumnadrochit.	6.67
„	Ross, The Graig .....	2.33	„	Glencarron Lodge .....	10.76
„	Shifnal, Hatton Grange.....	2.02	„	Fearn, Lower Pitkerrie.....	3.32
„	Blockley, Upton Wold .....	3.60	XIX.	Invershin .....	4.88
„	Worcester, Boughton Park.	2.15	„	Altnaharra .....	...
VII.	Market Rasen .....	2.02	„	Bettyhill .....	6.04
„	Bawtry, Hesley Hall.....	2.04	XX.	Dunmanway, The Rectory..	2.40
„	Derby, Midland Railway ...	1.85	„	Cork .....	1.66
„	Buxton.....	4.78	„	Mitchelstown Castle .....	2.86
VIII.	Nantwich, Dorfold Hall.....	2.58	„	Darrynane Abbey .....	4.19
„	Liscard .....	2.72	„	Glenam [Clonmel] .....	2.07
„	Chatburn, Middlewood .....	3.41	„	Nenagh, Traverston .....	2.92
„	Cartmel, Flookburgh .....	2.74	„	Newmarket-on-Fergus, Fenloe	3.06
IX.	Langsett Moor, Up. Midhope	3.49	XXI.	Laragh, Glendalough .....	3.37
„	Scarborough, Scalby .....	2.19	„	Moynalty, Westland .....	2.31
„	Ingleby Greenhow .....	2.90	„	Athlone, Twyford .....	2.73
„	Mickleton.....	2.46	XXII.	Woodlawn .....	2.71
X.	Bardon Mill, Beltingham ...	2.54	„	Westport, St. Helens .....	2.57
„	Ilderton, Lilburn Cottage...	1.86	„	Achill Island, Dugort .....	4.02
„	Keswick, The Bank .....	3.84	„	Mohill .....	1.95
XI.	Llanfrechfa Grange.....	2.79	XXIII.	Enniskillen, Portora .....	2.54
„	Treherbert, Tyn-y-waun ...	5.87	„	Dartrey [Cootehill].....	2.50
„	Carmarthen, The Friary.....	3.89	„	Warrenpoint, Manor House	1.90
„	Castle Malgwyn [Llechryd].	3.66	„	Banbridge, Milltown .....	2.54
„	Plynlimon .....	9.00	„	Belfast, Springfield .....	2.98
„	Crickhowell, Ffordlas.....	3.50	„	Glenarm Castle .....	2.39
„	New Radnor, Ednol .....	3.70	„	Londonderry, Creggan. Res.	3.17
„	Rhayader, Tyrmynydd .....	4.93	„	Killybegs .....	4.17
„	Lake Vyrnwy .....	4.23	„	Horn Head .....	2.52

## METEOROLOGICAL NOTES ON APRIL, 1910.

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 dry, sunny weather of March continued until 3rd when an absolute drought of 16 days ended. Thereafter the conditions were of a showery type but some considerable amounts of bright sunshine were recorded. A severe TS with heavy R and H occurred on 16th, between 5 and 7 p.m., the total fall, 1.19 in., being the heaviest recorded since 7th January, 1908. Duration of sunshine, 114.8\* hours, and of R 27.9 hours. Mean temp. 47°·6 or 0°·5 below the average. Shade max. 65°·7 on 21st; min. 25°·9 on 3rd, and with two exceptions the lowest temp. recorded in April in 53 years F 2, f 15.

TENTERDEN.—Dull, cold and showery, but no heavy R. Duration of sunshine, 134.0† hours. Shade max. 65°·0 on 21st; min. 29°·0 on 3rd. F 3, f 15.

TOTLAND BAY.—Duration of sunshine, 139.8\* hours, and the smallest April amount since 1905. Shade max. 59°·0 on 28th; min. 30°·4 on 3rd. F 1, f 10.

PITSFORD.—R .63 in. below the average. Mean temp. 46°·3. Shade max. 62°·3 on 21st; min. 24°·5 on 3rd. F 5.

NORTH CADBURY.—A disagreeable April with considerable and very harsh winds. Shade max. 63°·0 on 10th; min. 29°·5 on 1st and 3rd. F 3, f 13.

ROSS.—Shade max. 63°·7 on 21st; min. 25°·6 on 3rd. F 3, f 6.

HODSOCK PRIORY.—Shade max. 60°·2 on 21st; min. 23°·8 on 2nd. F 9, f 16.

SOUTHPORT.—Duration of sunshine 135.7\* hours, or 41.4 hours below the average. Duration of R 64.3 hours. Mean temp. 45°·1 or 0°·8 below the average. Shade max. 59°·2 on 18th; min. 26°·3 on 1st. F 2, f 10.

HULL.—The winds were often cold and squally, and the weather generally unsettled throughout. Shade max. 62°·0 on 21st; min. 28°·0 on 2nd, 3rd and 10th. F 4, f 15.

HAVERFORDWEST.—Duration of sunshine 145.1\* hours. Shade max. 56°·0 on 10th; min. 25°·1 on 2nd. F 4, f 8.

BETTWS-Y-COED.—Duration of sunshine 104.0\* hours. Shade max. 59°·0 on 15th and 21st; min. 25°·0 on 1st. F 4, f 5.

CARGEN.—Cold, damp and cheerless with mean temp. 2°·3 below the average of 50 years. Vegetation and farm work backward. Shade max. 56°·0 on 5 days; min. 25°·0 on 2nd. F 4.

EDINBURGH.—Shade max. 56°·7 on 30th; min. 31°·7 on 2nd. F 1, f 8.

COUPAR ANGUS.—R .71 in. above the average. Mean temp. 42°·1. The month closed with a cold period. Shade max. 62°·0 on 30th; min. 25°·5 on 2nd.

FORT AUGUSTUS.—Shade max. 58°·4 on 30th; min. 26°·6 on 16th. F 8.

WATERFORD.—Shade max. 62°·0 on 30th; min. 25°·5 on 1st. F 5.

DUBLIN.—Cold and showery with prevailing N.W. and N. winds. Frequent H showers, especially on 23rd and following days. Mean temp. 45°·9, or 1°·7 below the average. Shade max. 64°·0 on 18th; min. 32°·0 on 1st. F 1, f 8.

MARKREE.—Shade max. 58°·9 on 18th; min. 26°·9 on 17th. F 4, f 14.

WARRENPOINT.—Shade max. 59°·0 on 20th; min. 37°·0 on 16th. F 0, f 12.

\* Campbell-Stokes.

† Jordan.

## Climatological Table for the British Empire, November, 1909.

STATIONS.  (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain		Aver. Cloud.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
London, Camden Square	54°·9	3	29°·1	21	47°·1	36°·3	38°·6	0·100 90	79°·6	22°·9	inches ·74	11	6·1
Malta ... ..	73°·8	19	49°·0	26	66°·7	52°·6	53°·4	74	134°·5	...	3°·27	15	5·7
Lagos ... ..	91°·0	11*	72°·0	6	87°·9	75°·6	75°·6	73	155°·0	70°·0	2°·50	7	8·1
Cape Town ... ..	101°·0	23	47°·6	12	75°·8	57°·3	54°·2	64	...	...	°·50	5	4·6
Durban, Natal ... ..	89°·3	25	53°·8	22	77°·5	62°·8	...	...	142°·3	...	4°·19	19	6·3
Johannesburg ... ..	86°·5	27	40°·0	22	74°·6	52°·4	51°·1	69	147°·1	37°·0	3°·60	14	2·2
Mauritius ... ..	87°·8	27	60°·6	11	84°·1	66°·6	63°·7	68	158°·3	52°·9	°·70	9	6·2
Calcutta ... ..	89°·9	2	58°·8	24	84°·3	65°·8	64°·5	71	147°·3	54°·4	°·20	1	1·7
Bombay ... ..	91°·2	10	68°·5	25	87°·6	72°·8	68°·8	71	136°·6	62°·1	°·00	0	0·7
Madras ... ..	93°·9	2	67°·2	12	88°·9	72°·9	70°·7	76	145°·8	63°·8	3°·92	6	4·4
Kodaikanal ... ..	64°·7	25	46°·0	12	59°·9	49°·5	50°·4	89	127°·2	35°·5	3°·77	14	6·9
Colombo, Ceylon ... ..	89°·6	6, 29	70°·8	27	87°·1	74°·0	72°·7	79	152°·8	66°·1	10°·68	14	5·2
Hongkong ... ..	82°·8	9	54°·8	25	75°·5	65°·4	57°·2	62	138°·8	...	°·07	3	5·7
Melbourne ... ..	96°·3	8	39°·5	2	74°·7	50°·2	45°·3	53	155°·0	33°·8	°·61	9	4·7
Adelaide ... ..	102°·2	7	40°·8	2	75°·4	53°·5	49°·3	58	157°·7	31°·5	2°·76	12	5·0
Coolgardie ... ..	99°·0	3	42°·0	8	83°·2	55°·3	48°·4	48	166°·0	40°·0	1°·12	4	3·2
Perth ... ..	86°·1	23	45°·0	8	72°·2	51°·1	52°·1	68	141°·2	38°·2	°·49	2	2·9
Sydney ... ..	96°·6	10	49°·5	2	75°·0	59°·0	55°·3	65	133°·5	41°·1	2°·45	16	4·2
Wellington ... ..	71°·0	28	42°·0	3	63°·3	52°·1	50°·2	76	122°·0	35°·0	1°·22	11	7·2
Auckland ... ..	74°·0	30	48°·5	8	68°·0	55°·0	43°·5	76	156°·0	46°·0	3°·44	16	6°·0
Jamaica, Kingston ... ..	88°·7	1	62°·4	...	84°·1	68°·8	68°·0	78	...	...	30°·45	9	5°·8
Grenada ... ..	88°·0	25	70°·0	20	84°·4	75°·3	75°·5	81	140°·2	...	5°·03	16	4°·5
Toronto ... ..	63°·8	11	13°·7	24	48°·4	32°·8	...	84	77°·7	9°·4	3°·36	15	6°·7
Fredericton ... ..	59°·8	23	18°·0	19	44°·3	29°·2	...	84	...	...	3°·72	9	6°·7
St. John's, N.B. ... ..	57°·8	25	21°·0	19	46°·8	33°·9	...	76	...	...	5°·55	15	6°·6
Victoria, B.C. ... ..	55°·1	3	25°·4	16	48°·1	40°·2	...	87	...	...	11°·50	21	8°·0
Dawson ... ..	28°·0	1	—45°·0	25	—4°·9	—14°·0	...	...	...	...	°·67	11	6°·8

\* and 13. || and 27.

MALTA.—Mean temp. of air 58°·3. Average bright sunshine 3·9 hours per day.

Johannesburg.—Bright sunshine 295·6 hours.

Mauritius.—Mean temp. of air 0°·3, of dew point 0°·6, and R 1·18 in., below averages. Mean hourly velocity of wind 8·6 miles, or 2·1 below average.

KODAIKANAL.—Bright sunshine 150 hours.

COLOMBO.—Mean temp. of air 78°·6 or 1°·2 below, of dew point 0°·4 above, and R 1·24 in. below, averages. Mean hourly velocity of wind 5·5 miles. TSS on 5 days.

HONGKONG.—Mean temp. of air 70°·4, bright sunshine 187·1 hours. Mean hourly velocity of wind 12·6 miles. R 1·38 in. below average.

Melbourne.—Mean temp. of air 1°·2 above, and R 1·63 in. below, averages.

Adelaide.—Mean temp. of air 2°·7 below, R 1·75 in. above, averages. The min. temp., 40°·8 on 2nd, was the lowest ever recorded in November, and the total R was the greatest on record for the month.

Sydney.—Mean temp. of air 0°·2 above, and R ·54 in. below, averages.

Wellington.—Mean temp. of air 0°·7 above, R 2·35 in. below, averages. Bright sunshine 215·1 hours.

Auckland.—Mean temp. slightly below, and R ·21 in. above, average.

Jamaica, Kingston.—Floods in the eastern part of Jamaica through excessive R.