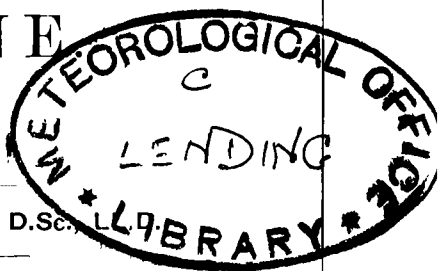


SYMONS'S  
METEOROLOGICAL  
MAGAZINE

Edited by HUGH ROBERT MILL, D.Sc.



VOLUME THE FORTY-FIFTH.

~~~~~  
1910.  
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LONDON :  
EDWARD STANFORD, 12, 13, 14, LONG ACRE, W.C.  
—  
1911.

London :  
SHIELD AND SPRING, PRINTERS,  
LANCELOT PLACE,  
BROMPTON ROAD, S.W.

1383  
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No. 529.

FEBRUARY, 1910.

VOL. XLV.

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## PROPOSED IMPERIAL METEOROLOGICAL ORGANIZATION.

At the meeting of the British Association in Winnipeg, in 1909, the meteorologists who happened to be present met in an informal conference, and a small but representative committee, consisting of Dr. W. N. Shaw, Director of the British Meteorological Office, Mr. R. F. Stupart, Director of the Canadian Meteorological Service, and Mr. J. Patterson, Imperial Meteorologist to the Government of India, were appointed to draw up a circular to the various government meteorological authorities of the Empire inviting co-operation in contributing data on a common plan for publication by a central agency. Some particulars regarding the draft circular appeared in the London press in October last ; but as the source of the information was not indicated we deferred mentioning the matter until we had an opportunity of seeing the proposals in question.

As our pages have for more than thirty years contained, month by month, comparison of the climate of different parts of the British Empire, so far as we know, the only tables of the kind compiled, we are deeply interested in any proposals to expand and render more systematic the work which, in the small way possible to us, we have been not proposing but carrying out, unnoticed and practically unknown so far as the great public is concerned, for so long a time. In making this small contribution to the comparative meteorology of the Empire we are dependent on the generous and ungrudging co-operation of the heads of meteorological observatories and government departments in 27 widely scattered places, representing originally 18 different units of government, though now reduced by the confederation of Australia and about to be farther reduced by the unification of South Africa. No one will welcome more heartily than we the establishment of a more general system with all the wider means of obtaining for it public attention which the authority of official organization conveys, because no one realizes more fully the advantages to meteorological study which should result from such a scheme.

The draft letter to which we have referred recapitulates the facts

known to our readers as to the summoning by the Royal Society of Canada of an Imperial Meteorological Conference at Quebec, in 1908,\* and states that "the death of Sir J. Eliot and the inability of a number of the important Colonial Governments to send representatives made it necessary to postpone the meeting."

The letter, which we understand has been forwarded to the heads of the Meteorological Departments of India, the Commonwealth of Australia, Ceylon, the Transvaal Colony, Cape Colony, New Zealand and the Straits Settlements, deals as follows with the various matters involved in "the exchange on an organized basis of meteorological data between the different portions of the British Empire."

1. *Data required*.—Primarily, information is required as to pressure, temperature and rainfall, and their fluctuations from the normal.

It is suggested that the form adopted by the Solar Commission of the International Meteorological Committee should be followed, giving :—

*Pressure :—*

- (a) Mean of the month derived from daily observations at a fixed specified hour reduced to 32° F. and 45° lat. for station level.
- (b) Variation from normal.

*Temperature :—*

- (a) Mean of the daily maximum temperatures in the shade for the month.
- (b) Absolute maximum shade temperature for the month and the date of its occurrence.
- (c) Mean of the daily minimum for the month.
- (d) Mean of the maximum and minimum for the month (or of readings at fixed hours) corrected to give the true 24-hour mean temperature.
- (e) Variation of the last from normal.

*Rainfall :—*

- (a) Total fall for the month.
- (b) Variation from normal.

2. *Number and Distribution of Stations*.—In accordance with the scheme of publication of terrestrial and solar data adopted by the Solar Commission the limit to the number of stations required for data as to pressure and temperature may be set at two for each square of ten degrees of latitude and longitude.

In the case of rainfall the information conveyed by the total fall at the stations which also give results for pressure and temperature should be supplemented by a more general statement applicable to the districts represented.

If, in the ordinary course of the work of the Department with which the station is connected, pressure is reduced to sea level, or to some other level, such as that of 1,000 metres, the reduced mean of the values for the month should be given *in addition*, with a reference to the mode of making the reduction in each case.

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\* See this Magazine, Vol. 43, pp. 19, 57, 119.

It is to be noted that the scheme provides for entering the variations from the normal of the several meteorological elements. The columns provided for these entries can only be filled for the stations for which appropriate normal values have been obtained. The normal values referred to should, if practicable, be the monthly averages for the 25 years ending with 1905. When other normals are used a reference to the normals should be given. When no normals have been obtained for a station, a note to that effect should be given, and the columns for the variations should be left blank.

Also the figures for the true mean daily temperature are desired. These are computed either from :—

- (a) hourly readings ;
- (b) readings at fixed hours suitably selected ;
- (c) readings of maximum and minimum thermometers with an appropriate correction.

The determination of the appropriate correction requires special investigation, and if the determination has not been made, the means for the fixed hours of observation should be given.

[Here follows a list of stations in the various ten degree squares, the number named being about 130 ; and § 3 which refers to the government organizations which collect meteorological data at present and the suggestion that the Meteorological Office in London should collect those not already dealt with.]

4. *Publication of the Information.*—It is understood that the Solar Commission is engaged upon a scheme of publication of meteorological data for the whole Globe, of which the data for the various British Possessions would form part. Since the headquarters of the Commission is at the present time in London, in connection with the Solar Physics Observatory at South Kensington, it may be understood that the data contributed to the London Office in accordance with the foregoing suggestion, or a copy of them, would be passed on to the Solar Commission to be included in that publication. But in case it is found that the monthly information can be exchanged sufficiently early to afford information to the public concerning the course of the seasons in the various parts of the Empire, it may be desirable to arrange for the monthly publication of a short report with that object in view.

5. *Units of Measurement for Publication.*—It is evident that in present circumstances a collection of meteorological data for the Globe will bring into prominence the diversity of practice between different countries in regard to the units employed to represent the meteorological elements. The meeting at Winnipeg expressed an opinion in favour of the use of absolute units for pressure on the centimetre-gramme-second system already adopted for all electrical work, and of centigrade degrees measured from 273° below the freezing-point of water—"absolute temperature"—for temperature, as being likely to tend to a final understanding for a common system for the Globe. Units based upon this system have been employed by the London Meteorological Office for the publication of the results of the investigation of the upper air since 1st January, 1909.

The suggestion is one of special importance to meteorologists of the English speaking countries, because their present practice is not only at



variance with that of other countries, but also with that of other sciences in their own countries.

For the present, however, in view of the fact that there is little difference of practice as regards the units of measurement for meteorological elements in the different parts of the empire, it is not necessary to ask the various authorities to come to any final decision upon the point.

We sincerely hope that the effort now being made will have a happy outcome. The only matter we would prefer not to see raised is that of introducing a new system of expressing meteorological observations. In a science the data for which must be collected in largest measure by voluntary observers it seems to us unwise to introduce what must be and remain to the majority of these humble but zealous helpers an unknown tongue. It would surely suffice for those to whom the new units would afford assistance in their discussions or calculations to translate for themselves from the units which have meaning for the general educated reader, and in which the observations for many years to come must necessarily be made, since practically all the meteorological instruments in use in the British Empire are graduated in inches or Fahrenheit degrees.

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## THE WEATHER OF JANUARY.

By FRED. J. BRODIE.

THE extreme changeability, which seems likely to prove the distinguishing feature in the weather of the present winter, was as much in evidence in January as in December. For about 10 days, commencing with the 8th, the type of pressure distribution over these islands was pretty constantly south-westerly or westerly. At other times no clearly defined type was in existence for more than three or four days at a time, the changes in wind direction and the consequent fluctuations in temperature being frequent, and often very considerable.

The month opened with a flow of mild south-westerly air, and on the 2nd the thermometer rose slightly above  $55^{\circ}$  at many places situated in the eastern parts both of Great Britain and Ireland. A large anticyclone, which subsequently extended over the country from the southward, was accompanied by much cloud, so that while the day temperatures were lower than during the prevalence of the former equatorial current, the nights were not unduly cold for the time of year. After the 7th the anticyclone receded south-eastwards to central and southern Europe, and for the next 10 or 11 days the weather was influenced by large cyclonic depressions which extended down from the neighbourhood of Iceland. The prevailing winds were, therefore, westerly or south-westerly, with a gale at frequent intervals, and temperature was usually above the average, the highest readings being observed on the 9th, when the thermometer rose to  $55^{\circ}$ , or a trifle above it in nearly all districts. During a temporary shift o

# RAINFALL OF THAMES VALLEY — JANUARY. 1910.



ALTITUDE SCALE Below 250 feet 250 to 500 feet 500 to 1000 feet Above 1000 feet

SCALE OF MILES 0 5 10 15 20



wind to the north-westward, which occurred on the 11th and 12th, the thermometer fell very decidedly, and sharp frost occurred either in the screen or on the surface of the ground in most districts. By the sheltered thermometer readings as low as  $20^{\circ}$  were recorded at Balmoral and West Linton, and  $21^{\circ}$  at Fort Augustus; while on the grass a reading of  $14^{\circ}$  was observed at West Linton and a reading of  $15^{\circ}$  at Cambridge.

After the 18th a northerly type of weather set in, and wintry weather became general, hard frost occurring over north Britain on the 21st and 22nd. At a large number of Scottish stations the sheltered thermometer on one or other of these dates fell below  $20^{\circ}$ , a reading as low as  $11^{\circ}$  being recorded at Balmoral and West Linton. On the grass readings below  $15^{\circ}$  were equally common in the north, and were observed also at a few of the more central stations in England and Wales, the exposed thermometer at Balmoral falling to  $9^{\circ}$ . The sharpest weather of the whole month was experienced, however, in the interval between the passage of two deep cyclonic disturbances which traversed these islands respectively on the 24th and 28th. The progress of each system was marked by gales on nearly all coasts, with heavy rains in the south and snowstorms further north, the latter being especially severe on the 28th, in the northern parts of England and Ireland. The frost which occurred between the nights of the 25th and 27th was in many places of unusual intensity. In the south-east of England the sheltered thermometer scarcely fell below  $15^{\circ}$ , and in the east of England and the south of Ireland it did not quite reach that level. In all the more northern and north-western parts of the kingdom, however, readings below  $10^{\circ}$  were common, and readings below  $5^{\circ}$  fairly numerous. At Fort Augustus the thermometer fell to  $2^{\circ}$ , at Buxton to  $1^{\circ}$ , and at Balmoral and Kilmarnock to zero, while at West Linton it sank  $5^{\circ}$  below zero. On the surface of the grass readings below zero were recorded at many northern stations, Buxton recording a reading as low as  $-9^{\circ}$ , and West Linton  $-8^{\circ}$ . In the closing days of the month the strong wind which blew in the rear of the disturbance of the 28th gradually subsided, and with the appearance of a new low pressure system over Iceland on the 30th it backed to west and south-west, with a decided rise of temperature.

Owing very largely to the spell of severe cold just noted, the mean temperature of January was below the average in north Britain and in many parts of Ireland, the deficit being large in the north of Scotland. Over eastern, central and southern England, there was a slight excess of warmth. In spite of so much unsettled weather, the total duration of bright sunshine for the month was above the average in all but the south-western districts; in London (at Westminster) the aggregate of 35 hours was as many as 16 hours in excess. Thunder and lightning were unusually prevalent for the time of year.



## THE GREAT PARIS FLOOD OF 1910.

It has been found impossible to obtain data as to the meteorological conditions which led to the widespread floods in France during the last ten days of January in time for a satisfactory account of the disaster in the present issue. We hope to deal with the subject at a later date. It is curious that in the many columns devoted daily by the London press to the spread of the floods, the amount of the rainfall has not been definitely stated, and it remains for the present a matter of speculation. Heavy and continuous rains had fallen for some days before January 21st, and rivers were in flood all over France, but public attention was naturally concentrated on the state of matters in Paris, where damage was done on a scale unequalled in human memory. Indeed, the flood may prove to have been the highest on record. At the Pont Royal the height of floods in the Seine has been recorded for many years, and we quote, on the authority of the Paris correspondent of *The Times*, the following extreme measurements of the height of the river at this point—in 1615 over 32 feet, in 1802 nearly 30 feet, in 1876 about 26 feet, and on January 29th, 1910, over 31 feet. The height of the great flood of 1658 at the Pont de la Tournelle was 29 feet, and that of 1876 was about 21 feet. If we may take 5 feet as the difference in level between the two datum marks it would appear that the present flood fell slightly short of that of 1658.

If data of scientific value have been scanty in the English press, descriptions of the extent of the inundations on both sides of the Seine and of the damage done have been bewilderingly abundant. While the waters were rising traffic was stopped over many of the bridges; but although only a few inches of the central arch of the Pont d'Alma remained above water, none of the bridges collapsed, and traffic was resumed before the flood abated. It is said that 200,000 people were seriously affected by the flood, being either driven from their homes or thrown out of work in consequence of the stoppage of factories or the closing of shops. The low-lying parts of the underground railway system were completely filled with water, and several of the great railway termini were cut off and closed for traffic. This was the case with the Gare de Lyon and the Gare d'Orleans; the traffic to the Mediterranean coast through Paris was suspended, and Mr. Asquith made his way to Nice after the General Election by a roundabout route through Bâle and Genoa. More than 15,000 telephone subscribers in Paris were cut off, and most of the telegraph wires out of Paris also failed for a time. Water invaded many public buildings, and divers were employed to rescue the archives of the Palais de Justice from under 8 feet of water. The Louvre was seriously threatened, and the spread of the flood was only controlled by the exertions of troops with bags of cement, sand and stones torn from the pavements, which were used to form barricades against the water. Sailors and boats from the Navy were hurried to Paris to



save the inhabitants of the inundated streets, and there was practically no loss of life, thanks to the admirable organization shown in dealing with the situation. The extent of the damage is unknown at the time of writing, and must amount to many million pounds. The chief danger is to the stability of buildings by subsidences in the streets as the water goes down, and to health by the accumulation of sewage from the burst sewers. It is probably not too much to say that the flood has been more widespread and productive of distress than any previously known in Europe, though, considering its extent, it has been singularly free from loss of life.

The complete disorganization of the life of a great city in consequence of some unfortunate combination of meteorological conditions is very rarely seen, and it has been pointed out in Paris that the area inundated would have been far less and the resulting suffering not nearly so great if the quay-walls along the river had not been so frequently cut in recent years for facilitating traffic, and if the system of underground railways had not been so greatly developed.

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### SCOTTISH METEOROLOGICAL SOCIETY.

A MEETING of this Society was held in the Natural Philosophy Class Room of Edinburgh University on the evening of 24th January, Mr. E. M. Wedderburn, W.S., in the chair.

The resources of the Physics Laboratory of the University of Edinburgh had been placed at the disposal of the Society, and Dr. George A. Carse delivered a lecture, with experimental illustrations, on "Ions in relation to Atmospheric Phenomena." The lecture covered a field even wider than that suggested by its title. The properties of ions as produced by various ionising agents, such as Röntgen rays, radium and ultra-violet light, were first of all described and illustrated, and the question of the efficiency of ions, positive and negative, as condensers of water vapour was considered experimentally. Passing to the phenomenon of lightning, a number of points were touched on from the days of Franklin's experiments to the Report of the Lightning Research Committee of 1905. Finally the various methods of detecting and measuring atmospheric electricity were described, from Volta's burning match to Kelvin's water-dropper, and the later apparatus of Elster and Geitel, Ebert and C. T. R. Wilson. The results of recent observations were discussed, including a series made by the lecturer at Edinburgh; various theories were examined, and Simpson's latest results at Simla as regards the charge carried by snow and rain were described.

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## ROYAL METEOROLOGICAL SOCIETY.

THE annual general meeting of this Society was held on January 19th at the Institution of Civil Engineers, Great George Street, Westminster, Mr. H. Mellish, President, in the chair.

The Council in their report stated that they had forwarded a memorial to the Royal Commission, which is now enquiring into the work of the University of London, urging that the time is fully ripe for placing the study of meteorology on a more satisfactory basis, and for its inclusion among the subjects for Degree Examinations. The researches into the meteorological conditions of the upper atmosphere by means of balloons had been continued, under the auspices of the Joint Committee appointed by the British Association and the Society. This committee has sent out to Barbados two specially constructed theodolites, together with a supply of balloons and hydrogen, for use by some gentlemen who have agreed to carry out observations on the drift of the currents in the upper air.

The report was adopted, and the thanks of the Society were given to the Council for their services during the past year, and also to the President and Council of the Institution of Civil Engineers for permitting the meetings to be held in the rooms of the Institution.

The President then presented to Dr. W. N. Shaw, F.R.S., the Symons Gold Medal for 1910, which had been awarded to him by the Council in consideration of his distinguished work in connection with meteorological science, and Dr. Shaw replied.

Mr. H. Mellish, in his presidential address, referred to some relations of meteorology with agriculture. The close dependence of agriculture upon climate, and upon the periodical variations of the weather, has been recognised from the earliest times, but the relations are of such a complicated character, and the difficulty of separating the effects of the different factors is so considerable, that as much progress as might have been expected has perhaps not been made in applying the data of meteorology to the purposes of agriculture. The President first referred to the writings of various authors on the subject of temperature and rainfall as affecting the wheat and other crops, and then proceeded to deal with such questions as the liability of some crops, and especially of fruit, to injury from frosts; the influence exercised by forests upon climate, and especially upon rainfall; and the study of phenology. He next considered what steps meteorologists could take to further the application of the data of their science to the various problems of agriculture. For most statistical enquiries the meteorological information available was far more complete than the agricultural. He said that during the winter months perhaps the feature of the weather which is most important to all interests in the country is that of frost or thaw. A difference of a few degrees in the neighbourhood of the freezing point is of far more consequence than very much larger differences in any other part of the thermometer scale, and yet we rarely find either

word mentioned in the daily Reports and forecasts. It is doubtful whether farmers make as much use of the forecasts and Weather Reports as they might. Possibly this may arise because they are not familiar with the technical terms in which the reports are necessarily couched. This might be remedied in the course of time if instruction on the subject could be worked into the courses at the agricultural schools and colleges. The Royal Meteorological Society has lost no opportunity of urging the importance of the subject to farmers, and also the inclusion of meteorology under the head of Nature Study in the schools, and there are reasons to think that this is having some effect. Mr. Mellish, in conclusion, said that "from the opportunities which their life throws in their way, farmers should make the best of observers, and if they once become familiar with the teaching of our science and of its importance to their affairs, we may hope to derive considerable advantages from their co-operation, while we may look to the staffs of the agricultural colleges, when adequate funds are available to enable them to fill the place they ought to in this country, to encourage and direct research in the application of meteorology to the practical needs of agriculture."

A hearty vote of thanks was passed to Mr. Mellish for his address, and the following gentlemen were then elected on the Council :—

*President*—Henry Mellish. *Vice-Presidents*—W. W. Bryant, H. N. Dickson, D.Sc., F. Druce, Capt. M. W. C. Hepworth, C.B. *Treasurer*—C. Theodore Williams, M.D. *Secretaries*—F. C. Bayard, LL.M., Capt. W. F. Caborne, C.B. *Foreign Secretary*—R. H. Scott, D.Sc., F.R.S. *Councillors*—F. J. Brodie, C. J. P. Cave, W. H. Dines, F.R.S., E. Gold, R. H. Hooker, R. Inwards, R. G. K. Lempfert, Capt. C. H. Ley, Capt. H. G. Lyons, F.R.S., Col. H. E. Rawson, C.B., C. Salter, Capt. R. C. Warden.

During the evening the following new Fellows were elected :—Mr. A. C. Brown, Prof. R. J. H. De Loach, Mr. G. Drake, Mr. J. S. Fowler, Capt. A. S. Gibb, Mr. W. Hayhurst, Mr. W. S. Hill, Lieut. A. E. House, R.N., Prof. C. W. Peake, Mr. W. Sotheby, Capt. H. G. Staunton ; and Miss E. G. R. Taylor.

### FLOODS IN JAMAICA, NOVEMBER, 1909.

IN connection with the rainfall of November, 1909, in Jamaica, we have received the following note from Mr. P. R. A. Willoughby, C.E. :—

Fortunately the floods were confined to the eastern end of the island, the centre of heaviest rainfall being at Hagley Gap in the Blue Mountains. There 135 inches fell in nine days, and chiefly during the last six. Falls of 108 and 115 inches respectively at Clifton Beach and Radnor are authentic, as a demi-john was substituted for the ordinary receiver. At King's House, Kingston, we had 40 inches in six days, the average year's fall being 36 inches. It has cost my department £25,000 to make good the damage, and many coffee planters suffered severely.



## NOTES ON A WATER SPOUT.

By LIEUTENANT G. K. GANDY, R.N.R.

DURING a recent cruise of the *Dunottar Castle* in the Mediterranean, we had a magnificent view of a waterspout, sketches and details of which may be of interest. The rough sketches here reproduced are my own handiwork, but Mr. Charles Dixon, an artist who was on board, made a very good sketch of the waterspout, which I have sent together with my log to the Meteorological Office.

The waterspout took place in latitude  $39^{\circ} 57' N.$ , longitude  $12^{\circ} 45' E.$ , on our way from the Straits of Messina to the Straits of Bonifacio. The following are the observations recorded in the log-book :—

October 17th, 1909.

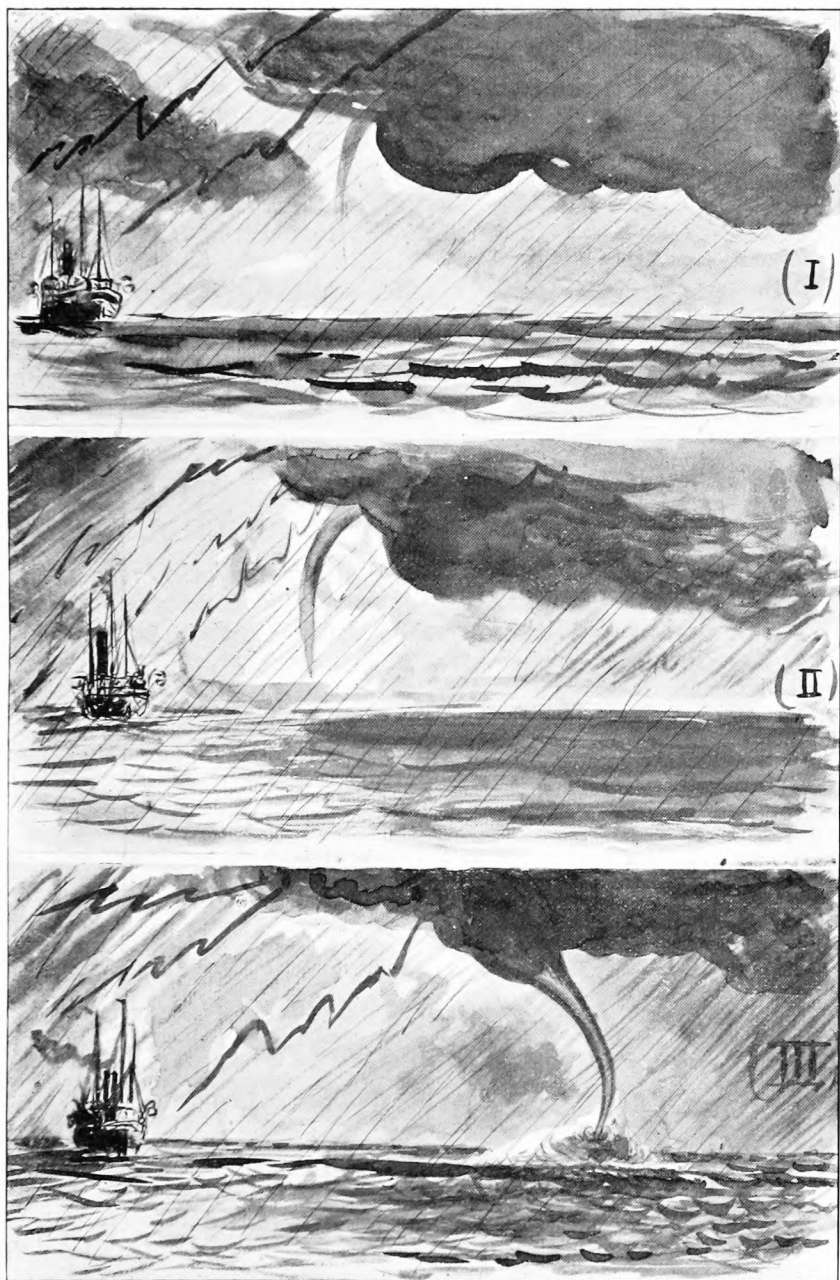
	Bar.	Dry Ther.	Wet Ther.	Wind.	Force.	Clouds.	Remarks.
Noon...	29.86	70°	67°	S.W.	2	Cirrus and Stratus.	Light breeze, cloudy but fine, sea slight.
4 p.m...	29.81	69°	66°	Var.	2	Stratus and Nimbus.	Light breeze, overcast, heavy thunder and lightning.
8 p.m...	29.80	66°	65°	Var.	0	Nimbus.	Light variable wind, and dull rainy weather.

Course steered, N.  $52^{\circ}$  W. Corr. to Aneroid Bar., + .12.

*At 4 p.m.*—Observed heavy rain clouds coming up from the southward. Wind light and variable.

*At 5 p.m.*—Very heavy rain squall from S.E., with vivid lightning and crackling thunder, passed over the ship; a deluge of rain (equal, as far as I could judge, to my Panama record of 2 inches in twenty minutes); the sea a seething mass of white mist, occasioned by the force of the rain falling on the surface of the water.

*At 5.10 p.m.*—Rain somewhat clearing, when we observed a waterspout forming on the starboard bow, bearing about north, distance from the ship about one mile; altered course to west to avoid it. The waterspout appeared first as in sketch I. It then gradually extended itself from a very heavy rain cloud until it was prolonged nearly to the sea surface (sketch II.). The wind at the time was variable both in force and direction, from about force 2 to 7. The spout when formed kept altering its shape continually in various forms from the perpendicular (sketch III.), as if contrary currents of air affected the apex and base. I and my officers observed no circular movement in the spout, only a sort of wavy motion in its constant change. The sea at the base of the spout was whitened as if from very heavy rain falling on it, the spume rising a considerable height, as is observed at the base of waterfalls.



WATER SPOUT AS OBSERVED ON BOARD R.M.S. "DUNOTTAR CASTLE,"  
OCTOBER 17TH, 1909.

The spout lasted fully twenty minutes, and was gradually lost to view in a drizzly rain that set in and shut out this most interesting phenomenon. I almost imagine that the spout passed over the ship at five o'clock when the lightning was very vivid, and by the thunder-claps and intervals between flashes must have been quite near and overhead. The spout was denser at the sides than in the centre, giving it a cylindrical appearance, and through the centre there appeared to be an attenuated streak of light. We observed no mass of water rising from the sea to meet the spout, only after the spout was formed was the sea observed to be in a turmoil and very much agitated. As one of the passengers observed to me, it appeared to be like a very heavy shower bath with big holes in it.

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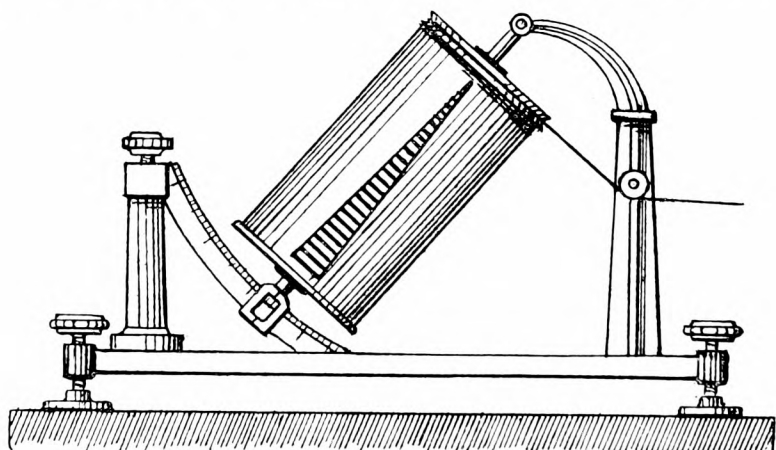
### Correspondence.

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

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#### THE EARLIEST SUNSHINE RECORDER.

I WAS interested to read in this month's *Meteorological Magazine* the letters of Mr. Wilson Fox and Mr. R. H. Curtis in connection with the above subject. With reference to Mr. Curtis's observations, it may be of interest to point out that the "Heliograph" instrument invented by my father, Mr. T. B. Jordan, in 1838, was, in the following year, considerably modified, and the details of its reconstruction were described in the seventh annual report of the



Royal Cornwall Polytechnic Society in 1839 (pp. 115-116). The main object of the alteration in the form of the instrument was to reduce its indications to a scale, so that the ever-varying activity of solar light might be more definitely expressed. This was done by the adoption of a triangular aperture cut down the whole length of

the outer revolving cylinder, which carried with it the scale of the instrument. This scale was composed of a sheet of metal foil divided into one hundred parts longitudinally, every other part being cut out to admit the light to the prepared paper placed on an inner fixed cylinder. The lengths of the extreme divisions, measuring round the cylinder, were proportioned to each other as one to one hundred, consequently the lower division would be one hundred times longer in passing over its own length than the upper one over its own length. The number of lines marked on the paper (resulting from the revolution of the aperture) thus furnished a comparative measure of the actinic power of diffused light at every moment, which would be registered as so many degrees on the scale of the instrument, in the same way that we now register the degrees of a thermometer.

Mr. Curtis states that "the instrument appears never to have come into use." In this connection, I may quote a remark made in a work by the late Mr. Robert Hunt, F.R.S., entitled "A Manual of Photography," published by John Griffin & Co., London, in 1853. After describing the heliograph, Mr. Hunt observes: "An instrument of this kind was made by me for the British Association, and experiments were carried on with it at intervals for some years. Many of the results were very curious, but the instrument being placed in the Observatory at Kew, the observations were unfortunately discontinued." Mr. Hunt's report on the subject was made to the meeting of the British Association held at that time in Edinburgh.

Since then all knowledge of this apparently useful instrument seems to have been lost. I am not aware if anything was done with it at the Kew Observatory.

The sketch given above was made from my father's own drawing, it may perhaps be of interest to your readers.

JAMES B. JORDAN.

*"Hayfield," Hythe, Kent, January 20th, 1910.*

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## FEBRUARY'S SPRING DAYS.

FEBRUARY often provides one or two days on which we experience a delightful foretaste of spring. There is a soft southerly breeze and a shade temperature of  $57^{\circ}$  to  $62^{\circ}$ . Nothing can be more pleasant than a walk into the fields on such an inviting afternoon. The novelty of so genial an atmosphere coming immediately upon wintry weather makes a genuine spring day in February more impressively attractive than the sunny days of April or May. The latter months offer so many favours of this kind that we cannot appreciate them as we do in February when just a few hours of the blush of early spring awaken sensations of a most enjoyable kind.

I have collected a few recorded maximum temperatures, as under :—

1878, February 17	.....	59°·6	W.F.D., Bristol.
„ „ 18	.....	60°·5	Royal Observatory.
1885 „ 24	.....	59°·5	W.F.D., Bristol.
„ „ „	.....	59°·0	R. F. Sturge, Clifton.
1891 „ —	.....	62°·0	„ „
1899 „ 10	.....	58°·8	H. H. Harding, Bristol.
1900 „ 23	.....	58°·4	W.F.D., Bristol.
1903 „ 19	.....	59°·5	„ „

These are only quoted as examples. Meteorological records must contain many other instances of comparatively high maximum readings in February, and some may have occurred during the last few years, but I have been occupied more with astronomy than with its kindred science meteorology.

W. F. DENNING.

*Bristol, February 1st, 1910.*

### RAINFALL MEASUREMENTS.

MAY I point out that the Rainfall Rule No. 11 quoted on p. 227 of your last volume does not provide for every case which may occur? We are instructed what to do when the measurement is either more or less than ·005 in., but not how to treat a measurement which appears to be exactly that amount. Realising that there must always be a loss from wetting of surfaces in the gauge, I have for 35 years, when in doubt as to the measurement being more or less than ·005 in., entered it as ·01 in., and in the few returns carried to three places of decimals which I receive from the numerous rainfall observers of Hertfordshire, I consider that all entries of ·005 ought to have been entered ·01, and that they therefore represent a day of rain.

In the recent correspondence on this subject one observer (p. 184) states that by keeping the measuring-glass in the gauge, except during severe frosty weather, “every drop of a small fall is secured for record,” but this is not the case; some is always lost on the inner surface of the funnel—probably more than in the usual receiving vessel\*, owing to the much larger surface wetted. From the amount shown by experiments (p. 226) to be lost, I feel fully justified in continuing my present procedure, and I venture to suggest that in Rule 11, in order to provide for apparent measurements of ·005 in., the words “more than” in the second line be read “at least,” otherwise while most observers probably enter that amount as ·01, others may neglect it.

JOHN HOPKINSON.

*Weetwood, Watford, February 5th, 1910.*

[We deprecate further correspondence on this subject. It is impossible to deal with such small quantities of rainfall as ·005 in. with any certainty of exact measurement, nor is it required. Mr.

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\* This, in my 5 in. Snowdon gauge, is a copper can 2½ ins. in diameter.

Hopkinson's rule introduces no serious error, though it differs from the rule which has been adopted for use in the British Rainfall Organization. Our experience is that an observer can always read to the nearest hundredth of an inch if he wishes to, and we believe that the rule introduced by Mr. Symons is the fairest and best that can be adopted. At the same time those Observers who prefer to dissent from the rules, which are of course only in the nature of recommendations, are quite at liberty to do so, only they are earnestly requested to mention the fact of their dissent, so that their records may either be omitted from comparative discussions or brought into conformity with the practice of the overwhelming majority.

—ED. S.M.M.]

### REVIEW.

*Handbuch der Klimatologie*, von DR. JULIUS HANN, Professor an der Universität Wien. Band II. Klimatographie. I. Teil Klima der Tropenzone. Mit 7 Abbildungen im Text. Dritte, wesentlich umgearbeitete und vermehrte Auflage. [Handbook of Climatology, by Dr. Julius Hann, Professor in the University of Vienna. Vol. II., Climatology. Part I., Climate of the Tropical Zone. With 7 illustrations in the text. Third Edition, thoroughly revised and enlarged.] Stuttgart: J. Engelhorn, 1910. Size  $9 \times 6\frac{1}{2}$ . Pp. xii + 426. Price 14 marks.

PROFESSOR HANN is, we believe, unique amongst men of science, and very certainly amongst meteorologists, for the ease with which he combines a prodigious capacity for detail with the clear deduction of general principles. The former gift is naturally most apparent in the volume before us, which deals with the climate of tropical Africa and America, southern Asia, northern Australia and the islands of the tropical oceans; but the latter gift also finds place in the short but inspiring general chapter on tropical climate. The body of the work is essentially a compendium of observed facts, and by the index one can turn up a concise statement of all that is known of the climate of every country, island and province in the tropics; while the innumerable footnotes give the titles of the voluminous literature which Professor Hann has concentrated and bottled in his pages for handy reference.

The introductory chapter deals first with the limits of the Tropical Zone, which are taken to be not the mathematical lines of the tropics, but the boundaries of the typical tropical climate, which may be taken practically as the annual isotherm of  $20^{\circ}$  C. ( $68^{\circ}$  F.); then the conditions of temperature, pressure, wind, rainfall, cloudiness and humidity characteristic of the zone are summarized, and finally a short but deeply interesting section on the action of tropical climate on mankind. The general section is short, for it is only required as an introduction to the mass of organized detail which makes this volume a treasure-house of facts regarding tropical climate.

## RAINFALL TABLE FOR JANUARY, 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	1'83	1'57
Tenterden.....	Kent.....	51 4	*0 41	190	2'14	3'09
Stevington.....	Sussex.....	50 53	0 20	80	3'08	3'46
Southampton (Cadland) ..	Hampshire.....	50 50	1 22	52	2'75	3'24
Hitchin.....	Hertfordshire ..	51 57	0 17	238	1'74	1'68
Oxford (Magdalen College).	Oxfordshire.....	51 45	1 15	186	1'78	1'46
Bury St. Edmunds (Westley)	Suffolk.....	52 15	*0 40	226	1'70	1'84
Geldeston [Beccles].....	Norfolk.....	52 27	*1 31	38	1'53	1'85
Polapit Tamar [Launceston]	Devon.....	50 40	4 22	315	3'59	6'30
Rousdon [Lyme Regis].....	".....	50 41	3 0	516	2'94	3'23
Stroud (Upfield).....	Gloucestershire..	51 44	2 13	226	2'33	2'20
Church Stretton (Wolstaston)..	Shropshire.....	52 35	2 48	800	2'51	2'47
Coventry (Kingswood) .....	Warwickshire ..	52 24	1 30	340	2'22	2'37
Market Overton ..	Rutland.....	52 44	0 41	475	1'94	2'04
Boston.....	Lincolnshire.....	52 58	0 1	25	1'54	1'16
Workshop (Hodsock Priory).	Nottinghamshire	53 22	1 5	56	1'70	1'91
Macclesfield.....	Cheshire.....	53 15	2 7	501	2'66	3'00
Southport (Hesketh Park)..	Lancashire.....	53 38	2 59	38	2'55	3'48
Wetherby (Ribston Hall) ..	Yorkshire, W.R.	53 59	1 24	130	1'89	4'05
Arneliffe Vicarage.....	".....	54 8	2 6	732	6'26	11'27
Hull (Pearson Park) .....	"..... E.R.	53 45	0 20	6	1'70	1'78
Newcastle (Town Moor) ..	Northumberland	54 59	1 38	201	1'90	3'28
Borrowdale (Seathwaite) ..	Cumberland.....	54 30	3 10	423	13'44	15'31
Cardiff (Ely).....	Glamorgan.....	51 29	3 13	53	3'65	5'65
Haverfordwest (High Street)	Pembroke.....	51 48	4 58	95	4'69	4'24
Aberystwyth (Gogerddan)..	Cardigan.....	52 26	4 1	83	3'91	4'53
Llandudno.....	Carnarvon.....	53 20	3 50	72	2'51	3'61
Cargen [Dumtries].....	Kirkcudbright...	55 2	3 37	80	4'10	3'49
Marchmont House.....	Berwick.....	55 44	2 24	498	2'40	2'19
Girvan (Pinmore).....	Ayr.....	55 10	4 49	207	4'78	4'36
Glasgow (Queen's Park) ..	Renfrew.....	55 53	4 18	144	3'53	3'95
Inveraray (Newtown) .....	Argyll.....	56 14	5 4	17	7'34	9'76
Mull (Quinish).....	".....	56 36	6 13	35	5'55	5'54
Dundee (Eastern Necropolis)	Forfar.....	56 28	2 57	199	2'01	1'73
Braemar.....	Aberdeen.....	57 0	3 24	1114	2'92	4'03
Aberdeen (Cranford) .....	".....	57 8	2 7	120	2'36	1'77
Cawdor.....	Nairn.....	57 31	3 57	250	2'28	3'26
Fort Augustus (S. Benedict's)	E. Inverness ..	57 9	4 41	68	5'58	7'23
Loch Torridon (Bendamph)	W. Ross.....	57 32	5 32	20	9'26	12'45
Dunrobin Castle.....	Sutherland.....	57 59	3 56	14	2'75	3'33
Wick.....	Caithness.....	58 26	3 6	77	2'48	2'14
Killarney (District Asylum)	Kerry.....	52 4	9 31	178	5'94	6'35
Waterford (Brook Lodge)...	Waterford.....	52 15	7 7	104	3'78	2'22
Nenagh (Castle Lough).....	Tipperary.....	52 54	8 24	120	3'88	5'31
Miltown Malbay.....	Clare.....	52 52	9 26	400	4'01	4'50
Gorey (Courtown House) ..	Wexford.....	52 40	6 13	80	3'19	2'07
Abbey Leix (Blandsfort)....	Queen's County..	52 56	7 17	532	3'15	3'77
Dublin (Fitz William Square)	Dublin.....	53 21	6 14	54	2'14	2'99
Mullingar (Belvedere) .....	Westmeath.....	53 29	7 22	307	3'10	4'41
Ballinasloe.....	Galway.....	53 20	8 15	160	3'35	3'76
Crossmolina (Enniscoe).....	Mayo.....	54 4	9 18	74	5'35	7'64
Collooney (Markree Obsy.).	Sligo.....	54 11	8 27	127	3'87	5'18
Seaforde.....	Down.....	54 19	5 50	180	3'41	2'12
Bushmills (Dundarave).....	Antrim.....	55 12	6 30	162	3'19	4'65
Omagh (Edenfel).....	Tyrone.....	54 36	7 18	280	3'46	4'64

RAINFALL TABLE FOR JANUARY, 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. in.	1910. in.	Diff. from Aver. in.	% of Av.		
		in.	Date.					in.	
— .26	86	.37	23	14	...	...	...	25.11	Camden Square
+ .95	144	.64	23	18	...	...	...	27.64	Tenterden
+ .38	112	.62	23	16	...	...	...	33.58	Steyning
+ .49	118	.68	23	20	...	...	...	31.86	Cadland
— .06	97	.60	27	15	...	...	...	25.16	Hitchin
— .32	82	.37	27	16	...	...	...	24.58	Oxford
+ .14	108	.30	24	18	...	...	...	25.40	Westley
+ .32	121	.31	11	20	...	...	...	23.73	Geldeston
+2.71	175	1.17	23	25	...	...	...	38.27	Polapit Tamar
+ .29	110	.83	23	23	...	...	...	33.54	Roundon
— .13	94	.54	27	18	...	...	...	29.81	Stroud
— .04	98	.45	10	21	...	...	...	32.41	Wolstaston
+ .15	107	.39	23	16	...	...	...	28.98	Coventry
+ .10	105	.50	23	19	...	...	...	27.10	Market Overton
— .38	75	.26	23	20	...	...	...	23.35	Boston
+ .21	112	.38	24	16	...	...	...	24.46	Hodsock Priory
+ .34	113	.49	23	18	...	...	...	34.73	Macclesfield
+ .93	137	.76	23	18	...	...	...	32.70	Southport
+2.16	214	.78	27	22	...	...	...	26.87	Ribston Hall
+5.01	180	2.88	15	22	...	...	...	61.49	Arnccliffe
+ .08	105	.52	27	19	...	...	...	26.42	Hull
+1.38	173	.91	27	22	...	...	...	27.94	Newcastle
+1.87	114	3.15	15	23	...	...	...	129.48	Seathwaite
+2.00	155	.85	23	21	...	...	...	42.28	Cardiff
— .45	90	.54	27	26	...	...	...	46.82	Haverfordwest
+ .62	116	.57	15, 23	24	...	...	...	45.46	Gogerddan
+1.10	144	.58	15	21	...	...	...	30.36	Llandudno
— .61	85	.56	8	17	...	...	...	43.47	Cargen
— .21	91	.34	15	20	...	...	...	33.76	Marchmont
— .42	91	.80	19	24	...	...	...	49.77	Girvan
+ .42	112	.68	13	16	...	...	...	35.97	Glasgow
+2.42	133	1.26	13	20	...	...	...	68.67	Inveraray
— .01	100	.73	15	25	...	...	...	56.57	Quinish
— .28	86	.30	10	17	...	...	...	28.64	Dundee
+1.11	138	...	...	...	...	...	...	34.79	Braemar
— .59	75	.24	24	21	...	...	...	32.73	Aberdeen
+ .98	143	.52	16	16	...	...	...	29.33	Cawdor
+1.65	130	1.03	8, 13	23	...	...	...	44.53	Fort Augustus
+3.19	134	2.42	8	24	...	...	...	83.61	Bendamph
+ .58	121	.44	13	17	...	...	...	31.90	Dunrobin Castle
— .34	86	.20	24	24	...	...	...	29.88	Wick
+ .41	107	.65	24	23	...	...	...	54.81	Killarney
—1.56	59	.53	27	22	...	...	...	39.57	Waterford
+1.43	137	.63	27	20	...	...	...	39.43	Castle Lough
+ .49	112	.57	10	26	...	...	...	45.11	Miltown Malbay
—1.12	65	.53	27	19	...	...	...	34.99	Courtown Ho.
+ .62	120	.65	27	22	...	...	...	35.92	Abbey Leix
+ .85	140	1.31	27	17	...	...	...	27.68	Dublin
+1.31	142	.75	10	18	...	...	...	36.14	Mullingar.
+ .41	112	.49	10	21	...	...	...	36.64	Ballinasloe
+2.29	143	.95	15	25	...	...	...	52.87	Enniscoe
+1.31	134	.60	17	25	...	...	...	42.71	Markree
—1.29	62	.30	17, 23	21	...	...	...	38.91	Seaforde
+1.46	146	.86	23	25	...	...	...	37.56	Dundarave
+1.18	134	.49	17	21	...	...	...	39.38	Omagh



## SUPPLEMENTARY RAINFALL, JANUARY, 1910.

Div.	STATION.	Rain inches	Div.	STATION.	Rain. inches
II.	Warlingham, Redvers Road	2.86	XI.	Llangyhanfal, Plás Draw....	2.34
„	Ramsgate .....	2.62	„	Dolgelly Bryntirion .....	5.70
„	Hailsham .....	3.70	„	Bettws-y-Coed, Tyn-y-bryn	7.26
„	Totland Bay, Aston House.	...	„	Lligwy .....	3.68
„	Stockbridge, Ashley .....	3.00	„	Douglas, Woodville .....	4.22
„	Grayshott.....	3.21	XII.	Stoneykirk, Ardwell House	1.77
„	Reading, Calcot Place.....	2.08	„	Dalry, The Old Garroch ...	6.02
III.	Harrow Weald, Hill House.	1.97	„	Langholm, Drove Road.....	5.17
„	Pitsford, Sedgebrook.....	2.10	„	Moniaive, Maxwellton House	4.48
„	Huntingdon, Brampton.....	1.50	XIII.	Cramilt Lodge.....	3.95
„	Woburn, Milton Bryant.....	1.57	„	Edinburgh, Royal Observty.	2.78
„	Wisbech, Monica Road.....	1.71	XIV.	Maybole, Knockdon Farm..	3.70
IV.	Southend Water Works.....	1.43	„	Muirkirk, Glenbuck .....	...
„	Colchester, Lexden.....	1.30	XV.	Campbeltown, Witchburn...	4.43
„	Newport .....	1.72	„	Glenreadell Mains.....	4.56
„	Rendlesham .....	1.27	„	Ballachulish House.....	10.62
„	Swaffham .....	2.14	„	Islay, Ballabus .....	5.22
„	Blakeney .....	2.61	XVI.	Dollar Academy .....	3.04
V.	Bishops Cannings .....	2.80	„	Balquhider, Stronvar .....	9.64
„	Winterbourne Steepleton ..	4.65	„	Coupar Angus .....	2.92
„	Ashburton, Druid House ...	6.39	„	Blair Atholl.....	5.24
„	Honiton, Combe Raleigh ...	4.58	„	Montrose, Sunnyside Asylum	1.54
„	Okehampton, Oaklands.....	7.06	XVII.	Alford, Lynturk Manse ...	2.01
„	Hartland Abbey .....	3.89	„	Keith Station .....	2.44
„	Lynmouth, Rock House ...	6.00	XVIII.	Laon .....	18.20
„	Probus, Lamellyn .....	4.92	„	N. Uist, Lochmaddy .....	4.65
„	North Cadbury Rectory ...	3.76	„	Alvey Manse .....	3.51
VI.	Clifton, Pembroke Road ...	3.75	„	Loch Ness, Drumnadrochit.	4.28
„	Ross, The Graig .....	2.66	„	Glencaron Lodge .....	9.55
„	Shifnal, Hatton Grange.....	1.81	„	Fearn, Lower Pitkerrie.....	1.99
„	Blockley, Upton Wold .....	2.64	XIX.	Invershin .....	2.89
„	Worcester, Boughton Park.	2.28	„	Altnaharra .....	6.24
VII.	Market Rasen .....	2.26	„	Bettyhill .....	4.30
„	Bawtry, Hesley Hall.....	1.69	XX.	Dunmanway, The Rectory..	6.43
„	Derby, Midland Railway ...	2.47	„	Cork .....	2.79
„	Buxton.....	4.41	„	Mitchelstown Castle .....	3.77
VIII.	Nantwich, Dorfold Hall.....	...	„	Darrynane Abbey .....	6.44
„	Liscard .....	3.18	„	Glenam [Clonmel] .....	2.65
„	Chatburn, Middlewood .....	7.90	„	Nenagh, Traverston .....	5.33
„	Cartmel, Flookburgh .....	4.96	„	Newmarket-on-Fergus, Fenloe	3.57
IX.	Langsett Moor, Up. Midhope	4.75	XXI.	Laragh, Glendalough .....	5.91
„	Scarborough, Scalby .....	4.45	„	Moynalty, Westland .....	3.60
„	Ingleby Greenhow .....	2.48	„	Athlone, Twyford .....	3.21
„	Mickleton.....	3.00	XXII.	Woodlawn .....	4.74
X.	Bardon Mill, Beltingham ...	4.37	„	Westport, St. Helens .....	4.52
„	Ilderton, Lilburn Cottage...	1.83	„	Dugort .....	8.30
„	Keswick, The Bank .....	6.03	„	Mohill .....	3.41
XI.	Llanfrefcha Grange.....	5.78	XXIII.	Enniskillen, Portora .....	3.87
„	Treherbert, Tyn-y-waun ...	11.28	„	Dartrey [Cootehill].....	3.47
„	Carmarthen, The Friary.....	4.47	„	Warrenpoint, Manor House	2.78
„	Castle Malgwyn [Llechryd].	3.59	„	Banbridge, Milltown .....	1.80
„	Plynlimon.....	11.10	„	Belfast, Springfield .....	3.88
„	Crickhowell, Ffordlas.....	5.10	„	Glenarm Castle.....	4.86
„	New Radnor, Ednol .....	5.23	„	Londonderry, Creggan. Res.	4.48
„	Rhayader, Tyrmynydd .....	7.00	„	Killybegs .....	6.48
„	Lake Vyrnwy .....	8.30	„	Horn Head ...	5.5

## METEOROLOGICAL NOTES ON JANUARY, 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.—Dull, sunless conditions with temp. much above the normal occurred in the first half, but some considerable amounts of sunshine were recorded in the latter half with a low temp. Duration of sunshine 49·5\* hours, and of R 33·8 hours. Mean temp. 39°·8 or 1°·2 above the average of 50 years. Shade max. 55°·7 on 2nd, the highest temp. recorded in January since 1899; shade min. 19°·6 on 27th. F 11, f 21.

TEXTERDEN.—Duration of sunshine, 70·0† hours. Shade max. 52°·0 on 10th and 14th; min. 20°·5 on 26th. F 11, f 16.

PITSFORD.—R 44 in. above the average. Mean temp. 37°·6. Shade max. 54°·5 on 2nd; min. 17°·6 on 27th. F 12.

LYNMOUTH.—Shade max. 54° on 2nd and 9th; min 19° on 26th and the lowest temp. recorded since observations began in 1896. F 5.

NORTH CADBURY.—A high barometer with intense calm and deep gloom prevailed in the first week. The rest of the month was rather boisterous with frequent though not deep S. Shade max. 55° on 2nd; min. 17° on 27th. F 11, f 18.

WORCESTER.—Shade max. 57° on 4th; min 14° on 26th. F 12, f 21.

HODSOCK PRIORY.—Shade max. 57°·0 on 2nd; min. 12°·5 on 27th. F 12, f 23.

SOUTHPORT.—R 78 in. above the average of 35 years. Duration of sunshine 63·4\* hours, or 18·6 hours above the average. Duration of R 83·9 hours. Mean temp. 38°·8. Shade max. 53°·3 on 9th; min. 16°·0 on 26th. F 8, f 15.

ILDERTON.—Mild and fine in the first half, then colder. Very stormy on 28th and 29th with considerable S fall. The roads and railways were much blocked in the south of Northumberland and in Durham.

HAVERFORDWEST.—Duration of sunshine 43·7\* hours. Shade max. 51°·4 on 3rd; min. 16°·4 on 27th. F 3, f 9.

LLANDUDNO.—Shade max. 55°·2 on 8th; min. 22°·5 on 27th. F 7.

DOUGLAS.—Stormy and generally cold with an unusual number of frosts, but with a considerable excess of bright sunshine. S fell heavily on 23rd, 27th and 28th.

CARGEN.—The mild weather of the first three weeks was followed by 10 days of severe frost, causing serious loss to the potato and turnip crops. Drake's comet was clearly seen between 5.30 and 6 p.m. on 24th and several days following. Shade max. 54°·0 on 2nd; min. 10°·0 on 26th. F 12.

EDINBURGH.—Shade max. 55°·1 on 2nd; min. 16°·6 on 27th. F 14, f 17.

COUPAR ANGUS.—A succession of slight S storms occurred in the latter half, and a noteworthy feature was the sudden and capricious changes of temp. Mean temp. 33°·3 or 2°·3 below the average. Shade max. 53°·5 on 2nd; min. -6° on 28th, and the lowest temp. registered since January, 1899.

FORT AUGUSTUS.—Shade max. 53°·1 on 1st; min. 1°·9 on 28th. F 16.

WATERFORD.—Shade max. 51°·5 on 8th and 9th; min. 23°·0 on 26th. F 11.

DUBLIN.—The first week was fine and mild but the remainder of the month was broken, often cold and a violent S storm occurred on 28th. Mean temp. 40°·9. Shade max. 56°·4 on 2nd; min. 24°·1 on 27th. F 8, f 14.

MARKREE.—Shade max. 55°·0 on 9th; min. 7°·0 on 27th. F 10, f 19.

WARRENPOINT.—Shade max. 53° on 1st, 2nd and 9th; min. 28° on 26th. F 7, f 12.

\* Campbell-Stokes.

† Jordan.

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

STATIONS.  (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
	86°4	12	45°1	3	73°3	53°4	55°9	81	130°6	41°0	1·46	10	5·3
London, Camden Square	86°4	12	45°1	3	73°3	53°4	55°9	81	130°6	41°0	1·46	10	5·3
Malta ... ..	91°4	2	67°5	6	82°2	71°7	65°6	72	147°6	...	·66	2	2·4
Lagos ... ..	88°0	23*	71°0	23	83°7	73°8	74°2	81	159°0	69°0	1·40	17	8·6
Cape Town ... ..	72°0	20	41°0	14	65°8	48°1	49°3	82	...	...	7·32	17	6·2
Durban, Natal ... ..	99°9	31	50°4	17	76°3	56°4	...	...	140°1	...	·11	7	3·5
Johannesburg ... ..	74°6	24	26°9	16	66°5	44°7	37°5	59	124°8	24°2	1·39	2	1·1
Mauritius ... ..	76°7	21	56°4	11	74°6	61°6	59°8	76	145°6	46°8	2·39	21	5·9
Calcutta... ..	92°3	13	74°0	14	88°1	77°9	77°6	87	158°9	72°5	15·17	20	8·3
Bombay... ..	88°0	14	74°8	1	85°1	77°2	75°6	85	133°5	73°6	7·82	22	7·4
Madras ... ..	96°5	1, 2	73°2	20†	91°5	76°9	75°9	84	141°3	72°3	5·07	16	5·4
Kodaikanal ... ..	65°5	6	50°7	1	62°0	52°8	53°5	89	138°4	42°3	16·01	29	7·8
Colombo, Ceylon ... ..	86°2	19	71°8	12	84°6	75°9	73°6	81	158°3	70°1	7·48	24	7·4
Hongkong ... ..	90°5	2	74°9	8	87°5	78°8	76°4	81	141°1	...	8·34	17	6·4
Melbourne ... ..	67°4	19	32°5	25	56°6	43°2	41°8	75	121°4	26°7	3·59	24	7·2
Adelaide ... ..	67°4	18	36°3	5	59°2	45°6	45°1	78	136°5	29°3	5·59	20	6°5
Coolgardie ... ..	70°0	15	34°0	23‡	59°8	42°3	40°9	68	140°0	31°0	1·82	13	5·6
Perth ... ..	63°7	14	40°5	11	62°9	48°2	47°8	75	130°0	35°4	9·93	17	5·5
Sydney ... ..	71°6	12	39°1	4	61°7	46°6	43°7	74	105°8	26°1	2·16	23	4·6
Wellington ... ..	66°0	28	36°0	9	55°6	45°7	40°2	68	108°0	27°0	5·46	19	7·4
Auckland ... ..	63°5	1	39°0	18	58°3	47°8	49°4	87	121°0	34°0	7·13	22	6°1
Jamaica, Kingston ... ..	92°8	22	69°9	25	88°8	73°1	72°5	76	...	...	4·11	14	...
Trinidad ... ..	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada ... ..	88°8	15	70°8	18	85°1	74°6	74°5	78	140°6	...	7·70	24	4°0
Toronto ... ..	96°0	25	46°0	30	79°0	59°0	...	...	114°0	41°0	1·33	5	...
Fredericton ... ..	92°0	8	43°0	16	76°0	52°0	...	75	...	...	5·07	12	5°1
St. John's, N.B. ... ..	82°0	2	46°0	31	71°0	55°0	...	...	...	...	2·86	11	4°3
Victoria, B.C. ... ..	76°0	28	44°0	23	69°0	50°0	...	73	...	...	·47	3	4°0
Dawson ... ..	80°0	2	26°0	28	66°0	41°0	...	...	...	...	·81	12	5°2

\* and 31. † and 22. ‡ and 29.

MALTA.—Mean temp. of air 76°·5. Average bright sunshine 12·1 hours per day. *Johannesburg*.—Bright sunshine 302·5 hours. Snow on 17th and 18th, depth 12 inches. No such fall since Johannesburg was founded in 1886–7.

*Mauritius*.—Mean temp. of air 0°·3 below, of dew point 0°·4 above, and R ·08 in. above, averages. Mean hourly velocity of wind 10·8 miles or 1·6 below average.

KODAIKANAL.—Bright sunshine 106 hours. A record rainfall.

COLOMBO.—Mean temp. of air 77°·6 or 3°·1 below, of dew point 0°·3 above, and R 3·86 in. above, averages. Mean hourly velocity of wind 7 miles. TS on 11th.

HONGKONG.—Mean temp. of air 82°·8, or 1°·5 above average. Bright sunshine 215·3 hours. Mean hourly velocity of wind 7·8 miles. R 5·86 in. below average.

*Melbourne*.—Mean temp. of air 1°·0 below, and R 1·79 in. above, averages.

*Adelaide*.—A cold and wet month, one of the wettest in the history of South Australia.

*Sydney*.—Mean temp. 0°·6 and R 1·11 in. below, averages.

*Wellington*.—Bright sunshine 147·1 hours. TS on 5th.

*Auckland*.—Wet and stormy, R nearly double previous 40 years' average.

# Symons's Meteorological Magazine.

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No. 530.

MARCH, 1910.

VOL. XLV.

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**Sir Charles Todd, K.C.M.G., F.R.S.**

ISLINGTON, 7th JULY, 1826.—ADELAIDE, 29th JANUARY, 1910.

CHARLES TODD commenced life as a computer in Greenwich Observatory at the age of fourteen, and by hard work gained an increasing knowledge of astronomy and meteorology which were to the end his special hobbies as well as the objects of his more serious studies. In 1848 he was appointed an assistant astronomer in the Cambridge University Observatory, but was recalled to Greenwich by Sir George Airy, the Astronomer Royal, who gave him charge of the newly established electrical time-signals in 1854. He thus acquired a practical knowledge of telegraphy, and when the alarm created by the outbreak of the Crimean war brought home to the Australian colonies the importance of developing telegraphic communications, Charles Todd was recommended by Sir George Airy for the post of Superintendent of Telegraphs and Government Astronomer of South Australia. On the day when Todd landed at Port Adelaide, in 1855, the first telegraph line in the colony was opened, a private wire between the capital and the port. The extension of telegraphs immediately became the passion of his life, and he was happy in being able to secure not only the linking up of Adelaide with the systems of Victoria on the east, and Western Australia on the west; but also the connecting link in South Australia itself, which first made possible telegraphic communication between the Australian colonies and the mother-country. It is scarcely possible now to realize how vast an undertaking the over-land telegraph was when it was completed in 1872, joining Adelaide and Port Darwin across 2,000 miles of scarcely explored country, a great part of it arid desert, a great part trackless forest, and a considerable portion inhabited by the wildest and strongest tribes of Australian aborigines. Todd inspected the whole line before it was opened, and when long afterwards he was asked what were the proudest moments of his successful career, he replied:—"The proudest moment of my life was the day of my marriage to the daughter of Mr. Edward Bell, of Cambridge, who bravely consented to share my lot in a new and strange land.

Probably the next proudest moment of my life was, when returning overland from the Northern Territory, I sat on the ground near Central Mount Stuart on a cold night, with a little pocket relay connected with the wires, and communicated with Port Darwin and Adelaide."

To the office of Superintendent of Telegraphs that of Postmaster-General was added in 1869, and as the colony grew the labours of those positions grew also, and but for the fact that astronomy and meteorology were always a delight to him, Sir Charles Todd might have remained content with the position of one of the leading public men in Australia.

None of the Australian states is more dependent on climatic conditions than South Australia, and the rapid reduction of rainfall as one goes north from Adelaide makes the exact measurement of precipitation of supreme importance in determining the value of the land for agriculture or stock raising. Sir Charles Todd placed the official observations in South Australia on a satisfactory footing from the outset, and his annual reports were always both valuable and interesting. He forwarded the record at Adelaide regularly for publication in our pages from the beginning of the appearance of the Climatological Table for the British Empire. From time to time he communicated articles of general interest, the latest being that on the coldest spring on record in South Australia, which appeared in this Magazine for 1905 (vol. 40, pp. 219-221), the year when Sir Charles retired from his various offices to pass the remainder of his days in the society of his many friends in Adelaide.

Although he contributed little to scientific literature beyond his official reports, Sir Charles Todd throughout his career, kept pace as a man of science with the developing colony in which his lot was cast, and did more to forward the best interests of science in public life than many writers of weighty monographs.

We have been favoured by several correspondents in South Australia with notices from the local press which show how deeply the genial qualities of the veteran had endeared him to the people of his State. They even dwell with pleasure on the facility he showed in making puns, some specimens of which were quoted, and certainly reach above the average of this little-appreciated variety of wit.

On the retirement of Sir Charles Todd, in 1905, the offices he held were divided, and Mr. Griffiths, now Chief Assistant to the Commonwealth Meteorologist at Melbourne, became Acting-Government Astronomer at Adelaide, where Mr. G. F. Dodwell is now the Government Astronomer.







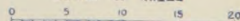
RAINFALL OF THAMES VALLEY FEBRUARY, 1910.



ALTITUDE  
SCALE

[illegible]

SCALE OF MILES



Symons's Meteorological Magazine.

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

**Isohyetals** — Stations reporting —

## THE RAINFALL OF FEBRUARY, 1910.

OF all the fragments of proverbial quotation "February Fill-Dyke" has buzzed about us for years as the most irritating. Everyone remembers and quotes the first words, no two are agreed as to the remainder; but popular imagination cherishes the illusion that February is the wettest of the months, whereas the truth is that in most parts of the British Isles it is the driest month of the year when the rainfall of each month is averaged over a long period, and in none does a long period show it to be the wettest.

This year February has been drier than its dry average in the extreme north-east of Scotland, where less than one inch of rain fell; but over most of the British Isles it has been a month of excessive, and in a few instances of enormous, rainfall. In the Thames valley and surrounding regions our map shows that the rainfall was considerably in excess of the average, but that it was distributed in a manner characteristic of the frequent and steady rains of winter. The daily falls of rain were moderate and usually small, but rain fell on almost every day in the month, and in such conditions we expect to see the correspondence of precipitation with the form of the land well brought out. It will be noticed that the isohyetal of three inches outlines all the higher land of the Thames valley, and the isohyetal of four inches runs inside it on the still higher ground of the Cotteswolds, the Marlborough Downs, and the Hampshire and Surrey Downs. In the south rainfall exceeding five inches appears.

The remarkable rains of the month occurred in the hilly regions of the West Highlands, the Southern Uplands of Scotland, the Lake District, the Pennine Chain and Wales. In each of these there were great tracts of country over which more than ten inches of rain fell. We have not been favoured with any observations from Snowdonia, but in the heart of the English Lake district more than 20 inches fell, the figure for Seathwaite being 22·18 in., and that for the Styne being returned as the enormous total of 45·10 inches.

In Ireland there are few rain gauges so placed as to record the rainfall of such typically wet spots as are provided with observers in England, but 14·61 in. were reported from Caragh in Kerry, 13·10 in. from Fofanny, Co. Down, 10·56 in. from Dugort, on Achill Island, and 8·94 in. from Glendalough in the Wicklow Hills, and, as our Notes on the Month show, the rainfall at one or two stations in Ireland had never been exceeded in February in the case of very long records.

In spite of these great figures there was not a very large area of the country with more than twice the rainfall normal to the month, and in many places the recorded sunshine was greatly in excess of the average, while the temperature was high for the season and strong winds unusually prevalent.





## THE WEATHER OF FEBRUARY.

By FRED. J. BRODIE.

THE type of weather last month was almost continuously cyclonic ; and, as the centres of low pressure passed in most instances across the Iceland-Faëroe region, the prevailing winds in this country were from a south-westerly quarter. With such conditions the mean temperature was above the average in all districts excepting the north of Scotland, where the equatorial current was usually less pronounced than in places further south. At no time, however, did the thermometer rise to any unusual height for the time of year, the absolute maxima being such as are commonly experienced at some time or another in any ordinary winter month. The periods of greatest warmth occurred respectively about the 5th and 6th and between the 16th and 18th, the thermometer rising on each occasion to  $55^{\circ}$  or a trifle above it in many parts of England, Wales and Ireland. On the 5th a maximum of  $58^{\circ}$  was recorded at Cahir, and a reading of  $59^{\circ}$  at Foynes, near Limerick, and on the 6th a reading of  $58^{\circ}$  at Hawarden Bridge ; on the 17th the highest values were attained in the east and south-east of England, a maximum of  $56^{\circ}$  being registered at Greenwich and Westminster, and also at Cambridge and Geldeston. In Scotland the thermometer did not once rise much above  $50^{\circ}$ . No severe frosts were experienced in England or Ireland, the sharpest occurring on the 9th and 10th during the temporary extension of an anticyclone from the south-westward. In the screen there were very few readings below  $25^{\circ}$ , but on the surface of the grass the thermometer in many places fell below  $20^{\circ}$ , and at Cambridge it sank to  $15^{\circ}$ . In central Scotland the weather at the time was more severe, the thermometer at Balmoral falling early on the 9th to  $9^{\circ}$  in the screen and to  $5^{\circ}$  on the grass. On the 15th and 16th and again on the 27th and 28th the sheltered thermometer in the same district fell below  $20^{\circ}$ , the screen and grass readings at Balmoral on the 27th being respectively  $14^{\circ}$  and  $12^{\circ}$ .

The large cyclonic systems in the far north were accompanied in numerous instances by secondary depressions, mostly of a "V-shaped" character, which passed eastwards across the United Kingdom. Rain was therefore unusually frequent (at many places in the west and south-west a measureable quantity was recorded daily), but no snow-falls of any consequence were reported in any part of the Kingdom. Between the 16th and 20th of the month the primary disturbances which had hitherto kept well away to the northward or north-westward of these islands, pursued a more southerly course, their centres moving rapidly in a north-north-easterly direction along our Atlantic seaboard. A period of exceedingly rough weather was, therefore, experienced ; strong southerly gales being experienced over England and Ireland on the 17th and 19th, and a storm of unusual severity between the 20th and 21st. On the latter occasion the wind blew in gusts with the force of a hurricane on many parts of our west and

south-west coasts, an extreme velocity of 85 miles an hour being attained at Southport, 86 miles at Scilly and 87 miles at Pendennis Castle (Falmouth). During this boisterous spell thunder and lightning occurred in many places—very generally over England during the violent gale which was blowing on the evening of the 20th.

In spite of so much disturbed weather there were, in nearly all parts of the Kingdom, many fine intervals, the total duration of bright sunshine for the month being in excess of the normal in most places. In London (at Westminster) the aggregate of 54 hours was as many as 20 hours in excess of the February average for the 25 years, 1881-1905.

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*Erratum.*—In the report on the Weather of January the temperature observed at Balmoral on the night of the 27th was quoted as zero; the minimum reading was, it appears, 10° below zero.

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## ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, February 16th, at the Institution of Civil Engineers, Great George Street, Westminster, Mr. Henry Mellish, President, in the chair.

Mr. E. Mawley presented his Report on the Phenological Observations for last year. He pointed out that the most noteworthy features of the weather of the phenological year ending November, 1909, as affecting vegetation, were the brief but severe frost at the end of December, 1908, several keen frosts in May, the low temperatures and frequent rainfall of the summer, and the continued warm and wet weather in October. During the whole year wild plants came into blossom behind their usual time, the departures from the average being greatest in March and April. The swallow, cuckoo and nightingale, made their appearance rather earlier than usual. The only deficient farm crops were beans, peas and hay. On the other hand, the yield of wheat, barley, oats, turnips, mangolds and potatoes, was well above the average, barley and turnips more so than the others. The crop of apples, pears and plums, was under the average, whereas that of raspberries, gooseberries, currants and strawberries taken together, was fairly good. As regards the farm crops, this was the fourth year in succession in which the yield has been above the average.

Mr. J. E. Clark, Mr. W. W. Bryant, Mr. R. H. Hooker, Mr. F. C. Bayard, Col. H. E. Rawson, Mr. W. W. Hamley, Dr. W. N. Shaw, Mr. W. B. Tripp and the President took part in the discussion, and Mr. Mawley replied.

Colonel H. E. Rawson read a paper on "The North Atlantic Anticyclone: tracks of the centres of high areas, 1882-3." He said that much work has been done of late years in charting the tracks of the centres of high areas as they pass over the land, and interest in those

which they follow over the oceans has recently been stimulated by the publication of additional facts regarding the progressive movements of anticyclonic systems from west to east in the southern hemisphere. The view of the late Mr. H. C. Russell, has been revived and advocated, that there is a succession of such systems travelling round the world at a rate of about 400 miles a day, and that it might be possible to follow one completely round, ever changing its form and intensity, but never losing its individuality, from day to day. They are regarded as crossing the southern oceans from land to land as individual systems.

Col. Rawson has now turned his attention to the movements of the anticyclones in the northern hemisphere. He has examined the "Synchronous Weather Charts of the North Atlantic," published by the Meteorological Office for the months of September, 1882, to August, 1883, and has made an analysis of the tracks of the centres of high pressure areas during that period. It is very rare for an individual system, which has traversed the American continent, to cross the ocean from land to land. The few cases which occur are restricted to the months, October, November, December, January and February. In every month centres of high pressures which have drifted across America, and have travelled out on to the ocean, are found coalescing there with one another or with the centre of the persistent Atlantic anticyclone. From April to July systems cannot be traced crossing the Atlantic and moving eastwards into Europe, nor do those which form over the ocean leave it and pass away eastwards. From mid-February to mid-September the charts indicate that on arrival on our coasts systems extend westwards, and their centres then reverse their easterly movement and drift to the west. In June and July centres of high areas form over the ocean, within the Atlantic anticyclone, instead of drifting into it from the American continent. March differs from all other months in the wide range in latitude which the tracks cover.

The following new Fellows were elected: Mr. R. S. Adair, Mr. A. Ballantine, Mr. J. S. Brownhill, J. P., Mr. J. F. Brennan, Mr. R. R. Dastidar, Mr. R. J. Garratt, Mr. N. R. Gopalan, Mr. F. S. Granger, Mr. W. Maughan, Mr. K. C. Mookerjee, B.A., Mr. R. J. Mules, Rev. J. C. Ross, Dr. J. E. Thomson, Rev. A. Thornley, M.A., and Mr. I. M. Xavier, Assoc.M.Inst.C.E.

#### MEETING AT MANCHESTER.

The Society held its first meeting out of London on Wednesday, 23rd February, when a large number of Fellows and others interested in meteorological matters were present in the Physical Laboratory of the University of Manchester.

The President, Mr. H. Mellish, having explained that Manchester had been chosen for this meeting on account of the valuable meteorological work done in the University, and having given some account of the Society, the Vice-Chancellor (Dr. A. Hopkinson) expressed on

behalf of the University of Manchester the great gratification which they felt in receiving the Fellows of the Royal Meteorological Society. What had been accomplished at the University in Meteorology was mainly by the work that had been initiated and liberally supported by Dr. Schuster, formerly Professor of Physics.

Prof. Schuster joined in welcoming the Society, and referred to the work that had been done not only within the walls of the University, but also at Glossop. Last July and August they attempted to fly kites continuously day and night for six weeks, an effort that could only be made by having many helpers, and he did not think it would be possible to get volunteers for such work except in institutions like the Universities, where young men could talk together and arouse one another's interest in the matter. In this way the experiment not only became a notable contribution to scientific work, but it was of high educational value.

The first paper read, on the "Investigation of the Electrical State of the Upper Atmosphere, made at the Howard Estate Observatory, Glossop," was the joint work of Dr. W. Makower, Mr. A. J. Makower, and Miss Margaret White.

The method of experimenting consisted in flying the kite at the end of a steel wire, the other extremity of which could be attached to a long thick piece of ebonite securely attached to the ground. At the end of the kite-wire, just above the ebonite, was fixed a wire connected to one pole of a Kelvin-White high potential electrostatic voltmeter, reading to 100,000 volts, the other pole of which was earthed. As in the previous experiments the kite-wire was made up in sections, which could be separately detached from the winding-drum and insulated, so that the kite could be let out at the end of wires of various lengths. The potential taken up by the kite was read directly on the voltmeter. When there was insufficient wind a balloon was substituted for the kite. The height above the ground was determined by measuring the length of wire let out and the angle of the kite above the horizon. The method thus depends on the assumption that the kite takes up the potential of the air surrounding it, and that there is no appreciable current flowing out from the wire into the air at lower levels through which it passes on its way to the ground. It is difficult to test the correctness of this assumption, and experiments have not yet been carried out to verify it with certainty; but having regard to the very large collecting surfaces of the kites used, the assumption is probably correct. After each measurement of the potential of the kite, the lead connecting the kite-wire to the voltmeter was detached, and the kite earthed through the galvanometer, in order to measure the current flowing from the kite to earth. This was done to see whether any connection existed between the potential of the insulated kite and the current flowing down the kite-wire when earthed. It was found that generally the voltage and current vary together, a high reading of the potential corresponding to a high reading of the current and *vice-*

*versâ*. The potential gradient falls off with height, the value falling from about 0.7 volt per centimetre near the ground to about 0.3 volt per centimetre at 2,500 feet.

An interesting discussion followed in which Mr. F. C. Bayard, Prof. Rutherford, Mr. E. Gold, Prof. Petavel, Col. H. E. Rawson, Mr. J. S. Dines, and Mr. J. R. Gibbs took part, and Dr. Makower replied.

The second paper was on the "Results of twenty-five Registering-Balloon Ascents made from Manchester, June 2nd and 3rd, 1909," by Mr. W. A. Harwood. The paper was based on 18 satisfactory records. The points on which it was hoped that the experiments would throw some light were: Diurnal variation of temperature (if any) at great altitudes; the relation of horizontal temperature distribution to the surface pressure distribution; the lag (or otherwise) of variations at high altitudes behind those at lower altitudes; and the magnitude of the effect of solar radiation on the records of the instruments. A decided diurnal temperature variation was observed at the ground, but this disappeared between 2 and 3 kilometres. Although, unfortunately, the pressure variation was such as to produce an apparent diurnal effect on first examination, closer study showed that already at a height of 3 kilometres the temperature had begun to increase at 1 a.m., while the sun did not rise until 3.50 a.m. No decided change was noticeable in the curves at the time of sunrise. Moreover the two maxima of temperature which occurred at the higher levels were recorded at 9 a.m. and 4 p.m., while at the extreme heights noon was marked by a minimum of temperature. The pressure distribution on the days in question consisted of an anticyclone with its centre to the north-west of Ireland and a cyclone which was developing over France and Spain. The variations of the barometer were slight and were caused by the alternate advance and withdrawal of the anticyclone. Subsequently the cyclone over France commenced to extend steadily northwards over the British Isles. The plotting of the temperature at various levels and the ground level pressures showed a distinct correspondence in spite of the fact that the pressure variations were so slight. Each rise of the barometer was accompanied by a fall of temperature at almost all heights, and *vice versâ*. The minima of temperature corresponding to the maxima of pressure were more marked at the extreme heights. The variations of temperature at 10 kilometres showed a lag of about two hours behind the variations of pressure. In one case they occurred later than the variations at lower altitudes; but in another, preceded them.

Dr. W. N. Shaw described this series of ascents as unique and one of the boldest experiments ever made in meteorology.

The last paper was on "Line Squalls and Associated Phenomena," by Mr. R. G. K. Lempfert and Mr. R. Corless. Line-squalls are associated with the displacement of an air current moving from south-west by a colder current moving from north-west. Several notable squalls were investigated by the authors.

The discussion on this paper will be taken at the meeting of the Society on April 20th.

The Fellows and their friends subsequently dined together at the University Refectory.

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### SCOTTISH METEOROLOGICAL SOCIETY.

A MEETING of the Society was held at 5, St. Andrew's Square, Edinburgh, on 25th February, at 4 p.m., when Mr. W. B. Wilson, W.S., presided over a large attendance.

Mr. Ralph Richardson communicated a paper "On the occurrence of great cold throughout Scotland during November and December, 1909, and January, 1910." Considering only records from thermometers exposed in Stevenson screens, it was recalled that exceptionally cold weather had been experienced at the end of October, whilst during the three following months there had been four periods of very acute cold. In November the weather conditions during the third and part of the fourth week were altogether abnormal; a reading of only  $3^{\circ}$  above zero was recorded at Balmoral on the 18th, and the Royal Caledonian Curling Club, founded in 1847, had for the first time in its history been able to play the North v. South match in the month of November. In December two cold periods occurred, from the 6th to the 9th and from the 19th to the 22nd, with a zero reading at Balmoral on the 7th. January opened with very mild weather, which was in extraordinary contrast to the great cold experienced towards the end of the month, when readings as low as  $10^{\circ}$  below zero occurred at Balmoral and Logie Coldstone on the night of the 27th to 28th. Slightly lower readings were experienced in January, 1881, but with that exception last month's records were the lowest for January since observations were organised in 1856. Readings below zero had occurred in January, 1910, also at Loanhead (Logie Coldstone), Lednathie, Kettins, Perth, Ballendrick, Duncrub, Stronvar, Buchlyvie and West Linton.

A valuable note was submitted of all the occasions from 1856 onwards during which temperatures below zero had occurred in Scotland, and of the extreme readings at these times. The lowest reading ever officially recorded in the British Isles was one of  $17^{\circ}$  below zero at Braemar, in January, 1895.

Taking a general view of the statistics for the last three months, it was clear that the lowest temperatures were experienced at inland stations, and that height above sea-level was not in itself a determining factor of climatic extremes, for at the two highest stations reporting to the Society, Tillypronie and Leadhills, both above 1,000 feet, relatively high minimum readings were recorded. In conclusion, an interesting report was submitted on the effect of the cold weather on agricultural and horticultural interests.

Messrs. Cadell, Moncur, Williamson, Watt and Davidson-Smith, took part in a discussion of the paper.

A paper by Mr. Herbert Bell discussed "The Daily Variation of Wind Velocity at Blackford Hill Observatory, Edinburgh, and at some higher and lower levels." It was well-known that at low-level stations, wind-force was on the average greatest in the early afternoon, and that the reverse was the case on mountain summits, where the night hours were the windiest, these distinctions being most marked in summer. The transition from the low-level to the high-level type was already well marked on the summit of the Eiffel Tower, in Paris, which was rather less than 1,000 feet high. Examining the Blackford Hill wind records (440 ft.), it was found that in summer the daily curve of wind velocity was that characteristic of low-level stations, but with a somewhat late afternoon maximum. In winter, however, the curve appeared to be intermediate in type between those of high and of low-levels, and, if strong winds alone were considered, to approximate to the high level type. The neutral plane, where there was no diurnal range of wind-force, appeared in Scotland to be at a lower level in winter than in summer. The accepted Espy-Köppen theory did not explain all the phenomena in question. It did not, for example, explain the curious fact that at sea-level in the South Orkneys the winter curve of wind-force was of the high-level type, though the summer curve had the characteristic low-level afternoon maximum. Considerations were submitted, which indicated that diurnal variations in the humidity of the air accounted at least in part for some of the peculiarities discussed.

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### Correspondence.

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

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#### THE GALE AND SQUALLS OF FEBRUARY 20th, 1910.

DURING the southerly gale prevailing on February 20th, two wind squalls of exceptional violence were recorded, and from the particulars I have been able to gather all the damage wrought by the gale appears to be attributed to those two squalls. Rain commenced to fall at 1.30 p.m., a steady southerly gale blowing at the time. The first squall took place as nearly as possible at 3.30 p.m. At this hour a large plate glass shop front, measuring 18 ft. by 12 ft., was blown in, considerable damage to chimney pots and slates also occurring at this time. At Woodcote Park, distant about half-a-mile in a S.W. direction, a large elm was uprooted, and two valuable shire horses were killed by the falling tree. The second squall took place at 8.54 p.m., and the only damage that I have been able to ascertain with any degree of certainty was to timber. All the trees uprooted in this squall are lying in a N.W. to N. direction. In the rear of the second squall, at 9.10 p.m., vivid sheet lightning was seen to the S., being followed in 20 seconds by rolling thunder to

S.W., a distant thunderstorm prevailed to 9.26 p.m., the shortest time interval between the lightning and thunder occurring at 9.20 p.m. (15 secs.). The lightning (mainly sheet) worked round rapidly through S.E. to E., and faded quickly in colour; occasional sheet lightning was still visible to E. at 10.5 p.m.

The heaviest rain splashes were entirely independent of the wind squalls, the largest amount recorded being between 5.35 p.m. and 5.46 p.m., .30 in., and a second heavy splash at 8 p.m., .15 in., falling in three minutes.

The pressure trace until the first wind squalls (3.30 p.m.) had been running steadily for about an hour at 29.08 in. (corrected); on the commencement of the squalls a fresh fall set in. During the second squall (8.54 p.m.) pressure, which had decreased to 29.00 (corrected), jumped .04 in. The changes in temperature connected with both squalls were sudden, but very small, decreases of  $1^{\circ}$  and  $2^{\circ}$  respectively being recorded.

Both squalls were accompanied by a temporary easting of the southerly wind, a permanent change to S.W. taking place in the rear of the thunderstorm at 9.30 p.m.

SPENCER C. RUSSELL.

*Epsom, Surrey, February 26th, 1910.*

[The gale on February 20th did serious damage to property in many parts of the country. About 2 p.m. a terrific squall at Aspley Guise, Bedfordshire, snapped off a magnificent Scots pine the trunk of which was found to be hollow. About 2.30 p.m. a similar squall carried the roof off a stable near Mill Hill Station on the Midland Railway, and blew over about 35 feet of a brick wall 10 feet high, forming the northern boundary of the garden at the Hollies, Mill Hill.—Ed. *S.M.M.*]

## AN UNUSUAL ANEMOMETER.

WE are favoured by the Meteorological Office with the following interesting extract from an observer's remarks:—

*November 12th, 1909.*—The day was fine but very windy. In the evening as it shifted from S.W. to about W.S.W. it became very strong indeed—I estimated it at 9—and stopped the Pyton Ferry (too rough on river), whilst it rang Heddon Church bell for a long while. This seldom occurs, and only I think when a whole gale or more is blowing from W.S.W. or W. by S. The church stands about E.N.E. and W.S.W., and the bell turret gets the full sweep of the W.S.W. wind through it. It is a fairly heavy bell, and I think it is rung by the wind swinging the tongue. I don't know of any other church where this happens—though there may be other cases.

W. G. PRINGLE.

*The Vicarage, Heddon-on-the-Wall, Northumberland.*



## THE PRESERVATION OF RAINFALL RECORDS,

I THINK it would be of interest to other observers than myself to know something of what happens to our yearly records when they have reached Camden Square. May I therefore be bold to ask whether they are preserved intact, or if the totals only are kept? Would it be possible for an inquirer to learn from you what rain fell at his station on a day 10 years ago—supposing his record to have been kept so long?

AGNES FRY.

*Failand, near Bristol.*

[We are glad of this opportunity of explaining to Rainfall Observers that every record sent to Camden Square during the last fifty years has been preserved and is always available for reference. The British Rainfall Organization has been conducted under no more formal guarantee than the personal sense of responsibility of an individual who recognizes that the records sent to him, though often taken from habit or as a recreation by Observers, are not only of scientific but also of national importance as bearing on one of the richest of the natural resources of the country; but that sense of responsibility has led to the records being preserved as scrupulously and discussed as completely as if they had been confided to a Government Department or a learned society. It frequently happens that Observers lose their early records and have the loss made good on application to Camden Square. It too often happens, on the other hand, that records of great value are totally lost because only one copy has been in existence, and that in the hands of the Observer, at whose death it has been destroyed as of no importance.—ED. S.M.M.]

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## THE PAST WINTER.

ATTENTION may be called to the persistent low barometer during the past winter. Here the mean pressure, reduced to sea level, for the three months, December to February, was 29·66, or ·30 below the average, which appears to be an unusually large deficiency for so long a period.

H. MELLISH.

*Hodsock Priory, Worksop, 4th March, 1910.*

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## WHY ARE ATMOSPHERIC TIDES INCONSPICUOUS?

MAY I ask for an answer in your Magazine to a question which has been puzzling me? Aerial tides must, I suppose, be very considerable. Why does not their ebb and flow influence the barometer? I do not know where to find any information about this, and no one that I have asked can give me any.

T. H. PHILPOTT.

*Hedge End, Botley, Hants, Jan. 30th, 1910.*

## RECORDS OF THE CONDENSATION OF AQUEOUS VAPOUR IN FORMS OTHER THAN "RAIN."

WHILST not claiminig either the exceptionally good instruments or the incredible watchfulness referred to in the Editorial Note on the "Units of Rainfall Measurement" (Vol. 44, p. 227), I feel sufficiently confident to extract from what I believe is a careful rain register, in conjunction with the observations from a daily register of weather and weather phenomena, a record for the five years, 1905 to 1909, of the precipitation of water in a form other than that commonly described as "rain."

Dew days, hoar frost days, fog-precipitation days, snow days, and hail days have been taken from the weather register, and the accompanying precipitation allocated from the rain register. It must, of course, be understood that the tables show only the days when measurable condensation accompanied the particular phenomenon referred to.

The snow days are those on which the precipitation was in the form of snow, and snow only; a fall of snow accompanied at some time or another by rain or hail, or a change to one or the other, would not be classed as a snow day.

The hail days may be dismissed summarily, only on one occasion during the period has a day of hail alone been recorded, viz.: the 11th of February, 1906, the accompanying deposition of moisture amounting to .03 in. A fall of hail not preceded or succeeded by rain or snow is a very rare phenomenon.

SPENCER C. RUSSELL.

*Epsom, Surrey, February 17th, 1910.*

### *Dew Days.*

	1905.	1906.	1907.	1908.	1909.	TOTAL.
	No. of days. in.	No. of days. in.	No. of days. in.	No. of days. in.	No. of days. in.	No. of days. in.
Jan. ....	...	...	1 .02	1 .02	...	2 .04
Feb. ....	...	...	...	...	...	...
March ...	...	...	1 .01	...	...	1 .01
April .....	...	...	...	...	1 .01	1 .01
May .. ...	...	1 .01	...	1 .01	...	2 .02
June .....	...	...	1 .01	...	...	1 .01
July .....	1 .01	...	...	...	1 .01	2 .02
August ...	...	...	...	...	...	...
Sept. ....	...	2 .02	...	1 .01	...	3 .03
Oct. ....	...	...	...	2 .03	...	2 .03
Nov. ....	1 .01	1 .01	...	1 .01	...	3 .03
Dec. ....	1 .01	...	...	1 .01	...	2 .02
Total ...	3 .03	4 .04	3 .04	7 .09	2 .02	19 .22

*Hoar Frost Days.*

	1905.	1906.	1907.	1908.	1909.	TOTAL.
	No. of days. in.	No. of days. in.	No. of days. in.	No. of days. in.	No. of days. in.	No. of days. in.
Jan. ....	2 '02	...	1 '01	1 '01	...	4 '04
Feb. ....	...	1 '01	1 '01	1 '01	...	3 '03
March ...	...	1 '01	...	1 '01	...	2 '02
April .....	...	...	...	...	...	...
May .....	...	...	...	...	...	...
June .....	...	...	...	...	...	...
July .....	...	...	...	...	...	...
August ...	...	...	...	...	...	...
Sept. ....	...	...	...	...	...	...
Oct. ....	2 '02	...	...	...	...	2 '02
Nov. ....	2 '02	...	2 '02	...	...	4 '04
Dec. ....	1 '01	1 '01	1 '02	2 '03	...	5 '07
Total...	7 '07	3 '03	5 '06	5 '06	...	20 '22

*Fog-Precipitation Days.*

	1905.	1906.	1907.	1908.	1909.	TOTAL.
	No. of days. in.	No. of days. in.	No. of days. in.	No. of days. in.	No. of days. in.	No. of days. in.
Jan. ....	...	...	2 '03	4 '06	...	6 '09
Feb. ....	...	...	...	1 '02	...	1 '02
March ...	...	...	...	...	...	...
April .....	...	...	...	...	...	...
May .....	...	...	...	...	...	...
June .....	...	...	...	...	...	...
July .....	...	...	...	...	...	...
August ...	...	...	...	...	...	...
Sept. ....	...	3 '04	1 '01	...	...	4 '05
Oct. ....	1 '01	...	1 '02	6 '09	...	8 '12
Nov. ....	1 '01	2 '02	3 '06	1 '01	2 '03	9 '13
Dec. ....	3 '03	...	...	...	...	3 '03
Total...	5 '05	5 '06	7 '12	12 '18	2 '03	31 '44

*Snow Days.*

	1905.	1906.	1907.	1908.	1909.	TOTAL.
	No. of days. in.	No. of days. in.	No. of days. in.	No. of days. in.	No. of days. in.	No. of days. in.
Jan. ....	1 '10	...	2 '05	2 '03	...	5 '18
Feb. ....	4 '06	5 '14	4 '11	...	4 '42	17 '73
March ...	...	6 '44	...	2 '06	6 1'40	14 1'90
April .....	1 '04	1 '01	...	1 '08	...	3 '13
May .....	...	...	...	...	...	...
June .....	...	...	...	...	...	...
July .....	...	...	...	...	...	...
August ...	...	...	...	...	...	...
Sept. ....	...	...	...	...	...	...
Oct. ....	...	...	...	...	...	...
Nov. ....	...	...	...	...	...	...
Dec. ....	...	5 '90	...	4 '46	...	9 1'36
Total...	6 '20	17 1'49	6 '16	9 '63	10 1'82	48 4'30

[These tables are interesting because they are maximum values of the frequency of precipitation other than ordinary rain obtained by an exceptionally careful Observer. We say these records show the maximum values, for unless Mr. Russell sat up all night he can hardly have been sure that there was not a slight shower of ordinary rain in the darkness, which may have produced some of the precipitation assigned to dew or fog. They show that at most .85 in. resulted at Epsom from fog, hoar-frost and dew in five years, *i.e.*, only .17 in. per annum; but we know of some stations where the amounts must be very much larger.—ED., *S.M.M.*]



## METEOROLOGICAL NEWS AND NOTES.

THE EFFECT OF SUNSHINE and high altitudes on biological and medical processes is the subject of investigation by an international expedition to the Peak of Tenerife, which sailed from Southampton on March 13th. Dr. J. Barcroft, of Cambridge, is one of the British representatives on the expedition, and Germany, France and Austria are also represented. The preliminary meteorological discussion has been carried out by Professor Hergesell, and the object of the expedition is to repeat and extend the observations made by Professor Zuntz on Monte Rosa at greater altitudes and in a different zone of climate.

THE METEOROLOGICAL OFFICE announce that from April onwards weather forecasts will be issued, when the conditions warrant it, for periods longer than twenty-four hours in advance. It is not anticipated that the occasions of such extended forecasts will, at first at any rate, be very numerous.

ERRORS IN NEWSPAPERS on the subject of meteorology are less common than might be expected, and it is unkind to refer to those which arise from mere inadvertence; but when we find the enclosed paragraph in the *Globe* of February 1st calmly stating that because the mean temperature of January, 1910, was  $1^{\circ}4$  above the average of 60 years, it was therefore the "hottest" in that period, a warning to the public seems to be invited. The paragraph we refer to (with one clause italicized) is:—

### THE HOTTEST JANUARY FOR 60 YEARS.

Despite the cold spells, the past January has been, on an average, warmer, drier, and more sunny than the month usually is. The mean temperature for the month at Greenwich was  $39^{\circ}8$ , which is  $1^{\circ}4$  warmer than the average for the previous 60 years. The aggregate rainfall was 1.72 in., which is 0.16 in. less than the normal. The sun was shining for 51 hours, which is ten hours more than the average.

## RAINFALL TABLE FOR FEBRUARY, 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	1'66	2'96
Tenterden.....	Kent .....	51 4	*0 41	190	1'90	3'59
Steyning .....	Sussex .....	50 53	0 20	80	2'42	6'33
Southampton (Cadland) ...	Hampshire .....	50 50	1 22	52	2'28	3'66
Hitchin .....	Hertfordshire .....	51 57	0 17	238	1'58	2'75
Oxford (Magdalen College).	Oxfordshire .....	51 45	1 15	186	1'62	2'47
Bury St. Edmunds (Westley)	Suffolk .....	52 15	*0 40	226	1'59	1'92
Geldeston [Beccles].....	Norfolk.....	52 27	*1 31	38	1'41	1'99
Polapit Tamar [Launceston]	Devon .....	50 40	4 22	315	2'95	6'97
Rousdon [Lyme Regis] .....	" .....	50 41	3 0	516	2'50	3'71
Stroud (Upfield) .....	Gloucestershire..	51 44	2 13	226	2'12	3'86
Church Stretton (Wolstaston)..	Shropshire .....	52 35	2 48	800	2'17	2'92
Coventry (Kingswood) .....	Warwickshire ...	52 24	1 30	340	2'01	3'12
Market Overton .....	Rutland .....	52 44	0 41	475	1'79	2'62
Boston .....	Lincolnshire.....	52 58	0 1	25	1'53	2'58
Worksop (Hodsock Priory).	Nottinghamshire	53 22	1 5	56	1'64	1'80
Macclesfield .....	Cheshire .....	53 15	2 7	501	2'30	2'85
Southport (Hesketh Park)..	Lancashire .....	53 38	2 59	38	2'07	3'22
Wetherby (Ribston Hall) ...	Yorkshire, W.R.	53 59	1 24	130	1'71	2'77
Arnccliffe Vicarage .....	" .....	54 8	2 6	732	4'88	10'61
Hull (Pearson Park) .....	" E.R. ....	53 45	0 20	6	1'78	1'72
Newcastle (Town Moor) ...	Northumberland	54 59	1 38	201	1'63	2'66
Borrowdale (Seathwaite) ...	Cumberland.....	54 30	3 10	423	10'96	22'18
Cardiff (Ely).....	Glamorgan .....	51 29	3 13	53	3'07	5'50
Haverfordwest (High Street)	Pembroke .....	51 48	4 58	95	3'42	4'93
Aberystwyth (Gogerddan)..	Cardigan .....	52 26	4 1	83	3'09	5'12
Llandudno .....	Carnarvon .....	53 20	3 50	72	2'11	3'69
Cargen [Dumries] .....	Kirkcudbright...	55 2	3 37	80	3'42	7'39
Marchmont House .....	Berwick.....	55 44	2 24	498	2'15	2'46
Girvan (Pinmore).....	Ayr .....	55 10	4 49	207	3'87	10'01
Glasgow (Queen's Park) ...	Renfrew .....	55 53	4 18	144	2'70	3'83
Inveraray (Newtown) .....	Argyll .....	56 14	5 4	17	5'71	8'96
Mull (Quinish).....	" .....	56 36	6 13	35	4'45	7'00
Dundee (Eastern Necropolis)	Forfar .....	56 28	2 57	199	1'91	1'93
Braemar .....	Aberdeen .....	57 0	3 24	1114	2'55	4'60
Aberdeen (Cranford) .....	" .....	57 8	2 7	120	2'36	2'83
Cawdor .....	Nairn .....	57 31	3 57	250	2'06	1'11
Fort Augustus (S. Benedict's)	E. Inverness ...	57 9	4 41	68	4'20	4'37
Loch Torridon (Bendamph)	W. Ross .....	57 32	5 32	20	7'53	9'74
Dunrobin Castle .....	Sutherland .....	57 59	3 56	14	2'58	1'36
Wick .....	Caithness .....	58 26	3 6	77	2'23	1'73
Killarney (District Asylum)	Kerry .....	52 4	9 31	178	4'99	8'77
Waterford (Brook Lodge)...	Waterford .....	52 15	7 7	104	3'18	4'14
Nenagh (Castle Lough).....	Tipperary.....	52 54	8 24	120	2'89	6'35
Miltown Malbay.....	Clare .....	52 52	9 26	400	3'21	5'28
Gorey (Courtown House) ..	Wexford .....	52 40	6 13	80	2'75	3'16
Abbey Leix (Blandsfort)...	Queen's County..	52 56	7 17	532	2'55	4'78
Dublin (Fitz William Square)	Dublin .....	53 21	6 14	54	1'93	3'76
Mullingar (Belvedere) .....	Westmeath .....	53 29	7 22	367	2'67	4'86
Ballinasloe .....	Galway .....	53 20	8 15	160	2'50	4'86
Crossmolina (Enniscoe).....	Mayo.....	54 4	9 18	74	4'20	8'19
Collooney (Markree Obsy.).	Sligo .....	54 11	8 27	127	3'20	7'24
Seaforde .....	Down.....	54 19	5 50	180	2'81	5'22
Bushmills (Dundarave).....	Antrim .....	55 12	6 30	162	2'56	4'52
Omagh (Edenfel).....	Tyrone .....	54 36	7 18	280	2'68	5'80

## RAINFALL TABLE FOR FEBRUARY, 1910—continued.

RAINFALL OF MONTH (con.)				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. in.	1910. in.	Diff. from Aver. in.	% of Av.		
+1.30	178	.39	14	21	3.49	4.53	+1.04	130	25.11 Camden Square
+1.69	189	.58	14	23	4.04	6.68	+2.64	165	27.64 Tenterden
+3.91	262	1.46	20	22	5.50	9.79	+4.29	178	33.58 Steyning
+1.38	161	.60	22	22	5.03	6.90	+1.87	137	31.86 Cadland
+1.17	174	.63	14	23	3.32	4.43	+1.11	133	25.16 Hitchin
+ .85	152	.37	22	22	3.40	3.93	+ .53	116	24.58 Oxford
+ .33	121	.34	14	18	3.29	3.76	+ .47	114	25.40 Westley
+ .58	141	.26	14	24	2.94	3.84	+ .90	131	23.73 Geldeston
+4.02	236	.84	20	27	6.54	13.27	+6.73	203	38.27 Polapit Tamar
+1.21	148	.59	1	25	5.44	6.94	+1.50	128	33.54 Roundon
+1.74	182	.58	14	24	4.45	6.06	+1.61	136	29.81 Stroud
+ .75	135	.35	24	24	4.68	5.39	+ .71	115	32.41 Wolstaston
+1.11	155	.63	4	24	4.23	5.49	+1.26	130	28.98 Coventry
+ .83	146	.47	24	25	3.73	4.66	+ .93	125	27.10 Market Overton
+1.05	169	.40	22	24	3.07	3.74	+ .67	122	23.35 Boston
+ .16	110	.28	14	23	3.34	3.71	+ .37	111	24.46 Hodsock Priory
+ .55	124	.48	20	22	4.96	5.85	+ .89	118	34.73 Macclesfield
+1.15	155	.39	20, 25	26	4.62	6.70	+2.08	145	32.70 Southport
+1.06	162	.45	20	23	3.60	6.82	+3.22	189	26.87 Ribston Hall
+5.73	217	1.75	20	26	11.14	21.88	+10.74	197	61.49 Arnelcliffe
— .06	97	.25	14	23	3.48	3.50	+ .02	101	26.42 Hull
+1.03	163	.66	7	22	3.53	5.94	+2.41	168	27.94 Newcastle
+1.22	202	3.60	20	27	24.40	37.49	+13.09	153	129.48 Seathwaite
+2.43	179	.86	6	27	6.72	11.15	+4.43	166	42.28 Cardiff
+1.51	144	.51	14	28	8.11	9.17	+1.06	113	46.82 Haverfordwest
+2.03	166	.63	6	26	7.00	9.65	+2.65	138	45.46 Gogerddan
+1.58	175	.74	20	27	4.62	7.30	+2.68	158	30.36 Llandudno
+3.97	216	.92	17	26	7.52	10.88	+3.36	145	43.47 Cargen
+ .31	114	.49	7	21	4.55	4.65	+ .10	102	33.76 Marchmont
+6.14	259	.83	20	28	8.65	14.37	+5.72	166	49.77 Girvan
+1.13	142	.66	16	25	6.23	7.78	+1.55	125	35.97 Glasgow
+3.25	157	.93	20	26	13.05	18.72	+5.67	144	68.67 Inveraray
+2.55	158	.65	18	24	10.00	12.54	+2.54	125	56.57 Quinish
+ .02	101	.30	16	21	3.92	3.66	— .26	93	28.64 Dundee
+2.05	180	...	...	...	5.47	8.63	+3.16	158	34.93 Braemar
+ .47	120	.38	22	20	4.72	4.60	— .12	97	32.73 Aberdeen
— .95	54	.22	16	8	4.34	4.37	+ .03	101	29.33 Cawdor
+ .17	104	.54	19	24	9.78	11.60	+1.82	119	44.53 Fort Augustus
+2.21	129	.84	11	24	16.79	22.19	+5.40	132	83.61 Bendamph
—1.22	53	.25	17	13	5.33	4.69	— .64	88	31.90 Dunrobin Castle
— .50	78	.30	9	20	4.71	3.87	— .84	82	29.88 Wick
+3.78	176	.73	21	28	10.93	15.12	+4.19	138	54.81 Killarney
+ .96	130	.47	19	22	6.96	6.36	— .60	91	39.57 Waterford
+3.46	220	.76	20	28	6.77	11.66	+4.89	172	39.43 Castle Lough
+2.07	164	.52	27	28	7.22	9.78	+2.56	135	45.11 Miltown Malbay
+ .41	115	.58	24	23	5.94	5.23	— .71	88	34.99 Courtown Ho.
+2.23	187	.55	18	26	5.70	8.55	+2.85	150	35.92 Abbey Leix
+1.83	195	.81	18	24	4.07	6.75	+2.68	166	27.68 Dublin
+2.19	182	.45	20, 27	22	5.77	9.27	+3.50	161	36.14 Mullingar.
+2.36	194	.36	22	26	5.85	8.62	+2.77	148	36.64 Ballinasloe
+3.99	195	.83	16	27	9.55	15.83	+6.28	166	52.87 Enniscoe
+4.04	226	.95	26	28	7.07	12.42	+5.35	176	42.71 Markree
+2.41	186	.81	20	25	6.22	7.34	+1.12	118	38.91 Seaforde
+1.96	177	.39	20	27	5.75	9.17	+3.42	160	37.56 Dundarave
+3.12	216	.63	18	26	6.14	10.44	+4.30	170	39.38 Omagh

## SUPPLEMENTARY RAINFALL, FEBRUARY, 1910.

Div.	STATION.	Rain inches	Div.	STATION.	Rain. inches
II.	Warlingham, Redvers Road	4.85	XI.	Llangyhanfal, Plâs Draw....	2.74
„	Ramsgate .....	2.57	„	Dolgelly Bryntirion .....	6.89
„	Hailsham .....	4.38	„	Bettws-y-Coed, Tyn-y-bryn	6.46
„	Totland Bay, Aston House.	3.23	„	Lligwy .....	3.13
„	Stockbridge, Ashley .....	4.52	„	Douglas, Woodville .....	4.23
„	Grayshott.....	4.72	XII.	Stoneykirk, Ardwell House	4.32
„	Reading, Calcot Place.....	2.98	„	Dalry, The Old Garroch ...	11.38
III.	Harrow Weald, Hill House.	3.00	„	Langholm, Drove Road.....	7.13
„	Pitsford, Sedgebrook.....	2.41	„	Moniaive, Maxwellton House	7.71
„	Huntingdon, Brampton .....	2.15	XIII.	St Mary's Loch, Cramilt Ldge	6.50
„	Woburn, Milton Bryant.....	2.93	„	Edinburgh, Royal Observty.	2.84
„	Wisbech, Monica Road.....	2.35	XIV.	Maybole, Knockdon Farm..	4.94
IV.	Southend Water Works.....	2.50	XV.	Campbeltown, Witchburn...	8.51
„	Colchester, Lexden.....	2.20	„	Glenreadell Mains.....	7.23
„	Newport .....	2.91	„	Ballachulish House.....	12.95
„	Rendlesham .....	2.14	„	Islay, Fallabus .....	8.85
„	Swaffham .....	2.63	XVI.	Dollar Academy .....	2.18
„	Blakeney .....	2.72	„	Balquhider, Stronvar .....	9.32
V.	Bishops Cannings .....	3.73	„	Coupar Angus .....	2.79
„	Winterbourne Steepleton ..	5.20	„	Blair Atholl.....	3.97
„	Ashburton, Druid House ..	8.25	„	Montrose, Sunnyside Asylum	2.62
„	Honiton, Combe Raleigh ..	5.09	XVII.	Alford, Lynturk Manse ...	2.49
„	Okehampton, Oaklands.....	8.73	„	Keith Station .....	2.01
„	Hartland Abbey .....	4.07	XVIII.	Glenquoich, Laon .....	16.80
„	Lynmouth, Rock House ...	6.61	„	Skye, Dunvegan.....	9.13
„	Probus, Lamellyn .....	5.75	„	N. Uist, Lochmaddy .....	6.26
„	North Cadbury Rectory ..	3.84	„	Alvey Manse .....	2.32
VI.	Clifton, Pembroke Road ...	5.06	„	Loch Ness, Drumnadrochit.	1.91
„	Ross, The Graig .....	3.56	„	Glencarron Lodge .....	6.67
„	Shifnal, Hatton Grange.....	2.42	„	Fearn, Lower Pitkerrie.....	.62
„	Blockley, Upton Wold .....	4.23	XIX.	Invershin .....	1.91
„	Worcester, Boughton Park.	3.08	„	Altnaharra .....	3.65
VII.	Market Rasen .....	2.52	„	Bettyhill .....	2.30
„	Bawtry, Hesley Hall.....	2.36	XX.	Dunmanway, The Rectory..	8.98
„	Derby, Midland Railway ..	2.36	„	Cork .....	5.42
„	Buxton.....	4.61	„	Mitchelstown Castle .....	7.23
VIII.	Nantwich, Dorfold Hall.....	2.36	„	Darrynane Abbey .....	9.62
„	Liscard .....	2.82	„	Glenam [Clonmel] .....	5.78
„	Chatburn, Middlewood .....	4.92	„	Nenagh, Traverston .....	7.46
„	Cartmel, Flookburgh .....	5.60	„	Newmarket-on-Fergus, Fenloe	5.11
IX.	Langsett Moor, Up. Midhope	5.41	XXI.	Laragh, Glendalough .....	8.94
„	Scarborough, Scalby .....	3.24	„	Moynalty, Westland .....	4.31
„	Ingleby Greenhow .....	3.42	„	Athlone, Twyford .....	4.34
„	Mickleton .....	2.44	XXII.	Woodlawn .....	5.58
X.	Bardon Mill, Beltingham ...	4.40	„	Westport, St. Helens .....	6.82
„	Ilderton, Lilburn Cottage...	2.57	„	Achill Island, Dugort .....	10.56
„	Keswick, The Bank .....	10.03	„	Mohill .....	5.65
XI.	Llanfrehfa Grange.....	6.19	XXIII.	Enniskillen, Portora .....	5.85
„	Treherbert, Tyn-y-waun ...	12.57	„	Dartrey [Cootehill].....	5.05
„	Carmarthen, The Friary....	5.32	„	Warrenpoint, Manor House	5.97
„	Castle Malgwyn [Llechryd].	6.74	„	Banbridge, Milltown .....	3.69
„	Plylimon.....	13.00	„	Belfast, Springfield .....	5.21
„	Crickhowell, Fordlas.....	6.60	„	Glenarm Castle.....	6.89
„	New Radnor, Ednol .....	4.98	„	Londonderry, Creggan. Res.	5.32
„	Rhayader, Tyrmynydd .....	7.50	„	Killybegs .....	9.58
„	Lake Vyrnwy .....	6.57	„	Horn Head .....	6.14

## METEOROLOGICAL NOTES ON FEBRUARY, 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.—Changeable conditions prevailed throughout, R and sunshine alternating with great frequency. A squally period occurred from 17th to 20th culminating in a strong S gale on the latter day. Duration of sunshine 59·2\* hours, and of R 58·6 hours. Mean temp. 42°·2 or 2°·5 above the average of 50 years. Shade max. 56°·0 on 17th; min. 27°·5 on 5th. F 7, f 21.

TENTERDEN.—The wettest February since 1900. Duration of sunshine, 73·7† hours. Shade max. 52°·5 on 17th; min. 28°·0 on 5th. F 7, f 15.

TOTLAND BAY.—Duration of sunshine, 92·1\* hours. Shade max. 52°·1 on 17th; min. 31°·3 on 12th. F 1, f 11.

PITSFORD.—R 42 in. above the average. Mean temp. 40°·1. Shade max. 53°·5 on 17th; min. 27°·6 on 10th. F 11.

NORTH CADBURY.—The windiest February in the record and with the greatest number of rain days. Shade max. 56°·5 on 17th; min. 31°·0 on 12th. F 5, f 18.

ROSS.—Remarkable for frequency and amount of showers. A violent gale on 20th brought down trees and slates off the houses. Shade max. 52°·1 on 17th; min. 29°·6 on 4th. F 2, f 12.

HODSOCK PRIORY.—Shade max. 55°·1 on 7th and 17th; min. 26°·4 on 28th. F 10, f 17.

SOUTHPORT.—The number of rain days was 4 more than in any February in the previous 39 years. Duration of sunshine 98·3\* hours, or 27·9 hours above the average. Duration of R 76·1 hours. Mean temp. 41°·4. Shade max. 53°·0 on 19th; min. 30°·0 on 9th. F 2, f 13.

ILDERTON.—Unsettled throughout with much R and strong winds. Severe gale on 17th with R; many trees uprooted and broken.

HAVERFORDWEST.—Duration of sunshine 96·8\* hours. Shade max. 52°·0 on 17th; min. 33°·2 on 3rd. F 0, f 5.

LLANDUDNO.—Wet, wild and stormy month. Sheep farmers suffered great loss owing to the continuous wind and R. Shade max. 52°·8 on 5th; min. 33°·2 on 23rd and 26th. F 0.

DOUGLAS.—Wet and stormy with W. gales almost without intermission. An unusual amount of bright sunshine with temp. above the normal.

CARGEN.—Shade max. 52°·0 on 19th; min. 25°·0 on 9th. F 10.

EDINBURGH.—Shade max. 49°·9 on 19th; min. 25°·8 on 9th. F 5, f 15.

ISLAY, EALLABUS.—R fell on every day and the fall was the greatest for February since observations began in 1866.

FORT AUGUSTUS.—Shade max. 49°·8 on 13th; min. 23°·3 on 9th. F 12.

WATERFORD.—Shade max. 56°·0 on 6th; min. 27°·0 on 1st. F 8.

DUBLIN.—Very unsettled, stormy and wet. R occurred daily from 10th and was especially heavy from 18th to 21st. Mean temp. 42°·5. Shade max. 55°·4 on 5th; min. 32°·7 on 1st. F 0, f 12.

MARKREE.—R fell on every day and was the heaviest fall yet recorded here. Shade max. 53°·5 on 5th; min. 24°·8 on 25th. F 11, f 14.

WARRENPOINT.—Shade max. 53°·0 on 6th; min. 35°·0 on 15th, 22nd and 24th. F 0, f 11.

\* Campbell-Stokes.

† Jordan.



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

STATIONS.  (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
								0-100			inches		
London, Camden Square	70.2	6	39.7	2	63.6	48.6	51.2	88	118.0	36.2	2.56	21	7.0
Malta ... ..	93.0	12	61.2	7	80.3	69.7	64.8	76	154.2	...	.08	2	4.0
Lagos ... ..	87.0	2	70.0	12†	84.5	73.1	73.6	79	159.0	68.0	5.31	14	8.6
Cape Town ... ..	89.2	21	39.4	25	69.5	51.0	51.9	74	...	...	.78	6	4.0
Durban, Natal	97.9	11	50.6	3	72.7	59.6	...	...	141.4	...	6.21	16	6.1
Johannesburg ... ..	77.8	18	32.6	26	69.2	47.8	43.6	65	135.4	...	.35	5	1.8
Mauritius ... ..	79.0	21*	56.5	17	77.5	63.1	60.8	74	151.9	50.4	2.24	17	6.9
Calcutta... ..	93.5	10	75.5	20	88.8	78.1	77.6	85	159.0	73.7	9.29	12	7.0
Bombay... ..	87.2	3	74.2	26	83.7	76.0	75.0	86	132.0	70.8	15.35	25	7.4
Madras ... ..	96.0	20	72.1	12	90.4	76.9	75.9	84	141.9	...	8.36	14	6.0
Kodaikanal ... ..	67.2	24	48.7	20	62.7	51.7	51.2	83	136.6	41.1	2.23	14	6.8
Colombo, Ceylon	87.2	27*	74.2	5	85.5	77.2	73.1	76	154.8	72.2	1.07	11	6.7
Hongkong ... ..	90.7	8	76.2	29	87.0	78.5	75.4	80	142.8	...	8.51	17	6.3
Melbourne ... ..	74.5	28	38.0	14	60.9	46.1	44.3	71	128.1	35.2	1.85	14	6.0
Adelaide ... ..	78.9	28	39.3	25	64.4	45.9	45.4	71	142.2	30.2	2.19	10	4.1
Coolgardie ... ..	88.0	17	39.6	29	70.9	46.3	40.8	52	149.0	35.0	.45	7	2.5
Perth ... ..	79.7	21	46.4	23	67.9	51.2	49.9	71	132.0	42.0	4.88	15	4.9
Sydney ... ..	76.0	24	43.5	2	64.0	50.1	48.0	73	115.1	31.4	5.11	25	5.3
Wellington ... ..	65.0	29	37.0	3	56.5	46.3	42.4	72	117.0	30.0	2.61	14	7.4
Auckland ... ..	65.5	28	39.0	3	60.7	50.2	49.4	81	146.0	36.0	3.53	20	6.5
Jamaica, Kingston	92.3	12	71.4	22	88.3	73.0	72.6	80	...	...	10.27	19	7.2
Trinidad ... ..	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada ... ..	90.8	20	71.4	16	85.7	75.7	73.3	78	142.2	...	6.86	22	4.9
Toronto ... ..	89.0	14	41.0	2	70.0	50.0	...	...	103.0	35.0	1.91	11	...
Fredericton ... ..	76.0	4	33.0	10	66.0	47.0	...	83	...	...	10.95	10	6.4
St. John's, N.B.	67.0	11	43.0	19	62.0	52.0	...	...	...	...	7.43	14	6.3
Victoria, B.C. ...	81.0	1	38.0	26	66.0	48.0	...	79	...	...	.79	7	4.0
Dawson ... ..	69.0	2	12.0	26	47.0	32.0	...	...	...	...	2.40	18	7.7

\* and 29. † 17 and 30.

MALTA.—Mean temp. of air 74°·5. Average bright sunshine 8·2 hours.

Johannesburg.—Bright sunshine 272·3 hours.

Mauritius.—Mean temp. of air 0°·2 below, of dew point 0°·6 and R ·81 in. below averages. Mean hourly velocity of wind 10·6 miles or 1·4 below average.

KODAIKANAL.—Bright sunshine 146 hours.

COLOMBO.—Mean temp. of air 78°·8 or 2°·0 below, of dew point 0°·2 below, and R 3·68 in. below, averages. Mean hourly velocity of wind 8·1 miles.

HONGKONG.—Mean temp. of air 82°·2, or 1°·8 above average. Bright sunshine 202·6 hours. Mean hourly velocity of wind 9·0 miles. R 1·14 in. below average.

Melbourne.—Mean temp. of air 0°·4 below, and R ·46 in. below, averages.

Adelaide.—Bright sunshine 33·6 hours above, and R ·46 in. above, averages.

Coolgardie.—Temperature slightly above and R ·24 in. above average.

Perth.—Rainfall 1·60 in. above 33 years' average.

Sydney.—Mean temp. of air 1°·7 below, and R 2·19 in. above, averages.

Wellington.—Bright sunshine 142·4 hours..

# Symons's Meteorological Magazine.

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No. 531.

APRIL, 1910.

VOL. XLV.

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## THE OCEANOGRAPHICAL MUSEUM AT MONACO.

THE Prince of Monaco has for many years taken a deep interest in the study of oceanic phenomena, and first in the sailing yacht *Hirondelle*, and later in the steam yachts *Princesse Alice I.* and *Princesse Alice II.*, he has carried out extensive observations in the North Atlantic and neighbouring seas. His work at first was mainly concerned with establishing the direction and velocity of the Gulf Stream Drift, but it was soon supplemented so as to take account of the temperature of the water at various depths, the sediments which cover the bottom, and the life both animal and vegetable which abounds in the water at all depths. In the course of these researches, the Prince, aided by a highly competent scientific staff, has elaborated a number of new methods, invented and improved apparatus, and has made enormous collections in various departments of natural history. It is impossible to study oceanography without taking account also of meteorological conditions, and during frequent cruises in polar waters the Prince has studied the phenomena of sea ice, and, assisted by Professor Hergesell, he has carried on at sea an important series of researches into the conditions of the upper air. Far as the upper limit of the atmosphere is removed from the bed of the sea, there is nothing wonderful in the union of the two studies, for the problems of upper air research are curiously similar to those of research in the deep sea.

More than ten years ago the Prince resolved to establish a laboratory for the study and a museum for the exhibition of the specimens he collected and of the apparatus he employed; and he has now completed and equipped the most beautiful Palace of Science ever built, on the southern face of the rocky peninsula of Monaco. The museum has just been inaugurated in the presence of a gathering of oceanographers and representatives of scientific societies and institutions, together with delegates of most of the great maritime Powers of Europe, the festivities extending over the four days from March 28th to April 2nd, during which time the visitors were the guests of the Prince.

Space would not permit of it, nor are these pages the proper place

for an adequate account of the splendid fêtes with which the inauguration was accompanied. The close bearing of oceanography on meteorology, however, is a sufficient justification for offering our readers some description of the gifts to science made, not only at the personal cost but by the personal labours of the Prince of Monaco. Apart from the brilliant group of representatives of the Navies and Governments of France, Germany, Italy, Spain and Portugal, there were gathered together several hundred representatives of scientific societies, and individual men of science from all the countries of Europe. The British representatives included Mr. J. Y. Buchanan for the Royal Society, Dr. H. R. Mill for the Royal Society of Edinburgh, Dr. J. Scott Keltie for the Royal Geographical Society, Dr. G. H. Fowler for the Challenger Society, Mr. W. E. Archer, Assistant Secretary to the Board of Agriculture and Fisheries and President of the International Council for the Study of the Sea, and Professor W. A. Herdman, of Liverpool.

The inauguration of the Museum took place on the 28th of March, in one of the four great halls which constitute the main portion of the building, and the Prince delivered an address, in which he stated that he was now opening on Monegasque territory a proud temple dedicated to the new Divinity who reigns over the intellect. He had lent all the powers of his mind, his conscience and his sovereignty to the extension of scientific truth, the only ground on which it was possible to found the elements of a stable civilization guaranteed against the inconstancy of human laws. Oceanography was rapidly developing because it was associated with all the sciences, and standing before the immensity of the work which extends from one pole to another, through all longitudes, in all depths, throughout all time, he had desired to bring together all the intellectual forces of all civilized countries to consolidate a basis and guide the growth of the advancing science. For this purpose he had collected the specimens, which the Museum, the first part of the Oceanographical Institute, was that day thrown open to receive, and to them he hoped would be added similar riches to be accumulated in the future. The other part of the Institute, which would soon be opened at Paris, was to be a centre of instruction in Oceanography in the heart of the University, but completely independent under the control of a French Council, supported by an International Committee, including the most distinguished Oceanographers of all countries. He thanked the delegates and scientific men present for proving by their approval that he had not induced the workers who were following him to enter upon an uncertain road, and that he had, with their assistance, been able to increase a little the light which drew us onwards in the progress of human dignity. He expressed his pleasure also at seeing present a group of workmen representing those who had laboured at the construction of the building, whom he thanked warmly for the admirable manner in which they had carried out the work.

Speeches of acknowledgment were made by M. Pichon, the French

Minister for Foreign Affairs, by Admiral of the Fleet von Koester, who represented the German Emperor, by Vice-Admiral Grenete representing the King of Italy, by the Portuguese Minister in Paris, who referred feelingly to the deep and practical interest which the late King Carlos of Portugal took in Oceanography, and by others. A cantata composed for the occasion, and entitled "*Le nef Triomphale*," was then rendered, in which the music expressed the voyage of a ship in fair weather and storm, passing through a terrific tempest but bringing its cargo safe to port triumphant over the elements. Short addresses were given by the three Professors already appointed to the Oceanographical Institute in Paris, MM. Berget, Portier and Joubin.

On the following day a banquet was given by the Prince in the Museum to about 300 guests and the toasts expressed in eloquent language the feelings of the official and scientific world in recognition of the magnificent gifts to science and the noble hospitality of the Prince. Particular interest attaches to the speech of Professor Hergesell of which the following is a translation from the report in the official journal of the Principality "*Le Petit Monegasque*":—

"*Ex abyssis ad alta*," he commenced, is the proud device engraved upon the plaques which were presented to the friends and collaborators of the Prince on the occasion of the solemn inauguration of this beautiful building. It is to him in particular that this device applies. To him who joins the study of the abysses of the ocean, to those of the heights of the atmosphere, making the two one in maritime Meteorology. The Prince has been the initiator of these conjoined researches by the expeditions of the Princesse Alice. The science of Oceanography thus becomes a science of the world. The speaker referred in high terms to the Pleiad of brilliant investigators with whom the Prince had surrounded himself in the Oceanographical Institute. The aim and the highest object of the Council for perfecting this Institute would always be to preserve to it the noble character of Internationality which the Prince had impressed upon it. No science is more appropriate than Oceanography for furnishing a common field of work for all noble minds, and he was sure that the members of the International Committee would do all in their power to follow in the Prince's footsteps and would make the motto of the Institute their rule of conduct.

On two of the following days meetings were held of four International Committees respectively for Oceanographical research in the Mediterranean Sea and the Atlantic Ocean, for perfecting the Oceanographical Institute and for the preparation of a new edition of the Prince's great bathymetrical chart of the world. Over all these, although their deliberations sometimes extended for more than three hours at a stretch, the Prince presided personally and showed qualities of patience and resourcefulness as a Chairman which are not always displayed on similar occasions. On one of the evenings, Lieut. Bourrée exhibited in the Theatre of the Beaux Arts at Monte

Carlo, an interesting collection of coloured photographs by the lantern, and a unique and extraordinary set of cinematograph films illustrating the use of the various oceanographical instruments on board the *Princesse Alice*, which enabled those present to see the difficulties of the work, and to appreciate the handiness of the sailors in manipulating the enormously bulky and weighty pieces of apparatus in a heavy sea.

The museum is not only a splendid architectural monument externally, no less striking though more reserved and dignified in style than the gorgeous buildings which crown the neighbouring height of Monte Carlo, but internally every detail of the fitting up and decoration of the rooms shows an intelligent and sympathetic application of scientific methods to the arrangement of a museum and of scientific subjects to the art of decoration. The floors are laid in mosaics representing faithfully some of the eccentric forms of deep-sea fishes and invertebrates, while the lights are enclosed in lanterns reproducing in large the forms of microscopic shells familiar to the oceanographer as radiolarians. The larger clusters of electric lights in the centre of the Hall are modelled after various species of medusa, or represent groups of seaweed and shells, amongst which the electric lights gleam like pearls. The entrance hall contains a marble statue, presented by some of the European monarchs, representing the Prince in yachting costume leaning on the bridge of his yacht, a remarkably life-like and unconventional portrait.

Never before have we seen so perfect an exposition of the ideals and attainments of a life of strenuous devotion to scientific work materialized in so splendid a form as this Oceanographical Institute, and its existence must make Monaco in the future a goal of scientific pilgrimage. The laboratories and aquarium on the lower floors of the Museum are sure to produce a continual output of scientific work. The roof of the building also is fitted up as a Meteorological Observatory.

A special performance of the Monte Carlo Opera occupied one evening, during which an Ode to Thought, specially composed for the occasion, was recited by Madame Bartet, one of the most accomplished French elocutionists, and on another evening the harbour of Monaco was illuminated and a marine pageant displayed the arrival of the mythical Hercules, who gave his name to the port, amid a display of fireworks which was pronounced unrivalled by all the visitors. On the last evening the Prince received all who took part in the inauguration in his ancient palace at a grand reception. The pleasant memories of a delightful fête of Science were marred on one or two occasions by wet and cold weather with leaden skies and snow wreathed hills, below which the palm trees shivered uneasily, and to us also by the fact that there were no British official representatives to offer on the part of the Government the national congratulations on the accomplishment of so great a piece of scientific work, especially as the Prince truly observed in his inaugural address the foundation

of Oceanography as a science had been laid by British men of science ; and among the exploring ships whose names decorate the façade of the new building, that of the Challenger deservedly holds the highest place. The French and Italian Navies were both represented by the newest type of torpedo boat destroyers, but the British flag only appeared in the harbour on a group of pleasure yachts.

## CORRELATION OF CLIMATIC CHANGES.

By R. C. MOSSMAN.

(Of the Argentine Meteorological Office.)

THE important contribution to world-wide meteorology contained in M. Arctowski's memoir, "L'Enchaînement des Variations Climatiques," a review of which appears in the January number, suggests some further comments, more especially with reference to the promised extension of the investigation so as to embrace monthly in addition to the annual means. The value of monthly maps is rendered obvious in order to explain the simultaneous occurrence of widely different phenomena in antipodean regions. Abnormal conditions are of frequent occurrence, indeed in the January number there are two notices of this nature which call for remark. Mr. MacDowall, in his note on "Compensation in Weather," points out that for nearly thirty years there has been a progressive rise of temperature in the month of November at Greenwich. This rise, as will appear from the following table, was more marked over western than in eastern Europe and would appear to be due to a deepening of the low pressure minimum at Iceland, associated with an increase of pressure at the Azores, the result being an unusual prevalence of mild, wet, south-west winds over north-western Europe, as shown by the records at Edinburgh and Copenhagen.

### *November Temperature Departures from normal (1856-1905).*

5-Year Period.	Edinburgh.	Greenwich.	Copen- hagen.	Stockholm.	Vienna.	Buenos Ayres.
1856-1860 .....	-0°8	-1°1	-1°3	-4°0	-2°3	+0°9
1861-1865 ...	-1°5	-0°6	+0°6	+0°9	+1°1	+1°9
1866-1870 ...	-0°7	-0°8	-0°8	+0°9	-1°4	-0°3
1871-1875 .....	-1°1	-0°5	-0°3	+0°2	-0°5	+0°5
1876-1880 .....	-1°5	-1°2	-0°2	-0°7	-0°4	-1°1
1881-1885 .....	+0°3	+1°0	-0°3	+0°2	-0°5	+0°5
1886-1890 .....	+0°9	+0°6	+0°8	+0°4	+1°4	-1°0
1891-1895 .....	+1°1	+1°4	+0°6	-0°4	+1°1	-0°8
1896-1900 .....	+2°3	+2°0	+1°4	+2°5	+2°5	0°0
1901-1905 .....	+1°1	-0°5	-0°2	0°0	-0°4	-0°5

It will be seen that Buenos Ayres, on the other hand, has been favoured with cool Novembers at the same time that western

Europe has had abnormally mild Novembers, and this condition would appear to have extended at least as far south as latitude  $52^{\circ}$  S, as shown by the short record at Punta Arenas which began in 1888, and to have embraced the north of South America as far as Rio de Janeiro. To take more recent occurrences, it may be noted that during December while Switzerland was suffering from unusual warmth, Punta Arenas was experiencing the coldest December in the 22 years covered by the record. Since this year began we have had great floods in France, gales in Britain, unusual snowstorms and heat waves in the United States, and in nearly every instance the Argentine weather maps have shown most pronounced abnormalities. It is in throwing light on points like these, and many others, that M. Arctowski's promised monthly maps will be of the greatest utility. Daily weather maps for the globe would be even more interesting in helping to throw light on abnormal weather in far distant regions. For example, on 13th February all previous records of summer heat in that part of the Argentine Republic known as the Pampa Central were broken with shade temperatures of more than  $104^{\circ}$ , this being associated with the advance of a low pressure area. On the 17th an anticyclone of unusual intensity appeared off Cape Horn, the barometer standing at 30.34 inches, a phenomenal summer reading for this region; on the 20th of the month, as this high pressure area moved north, low minimum temperatures were recorded, the thermometer in Buenos Ayres falling to  $39^{\circ}.2$ , or  $6^{\circ}.3$  lower than the previous lowest February reading during the last 50 years. Further south, in the Province of Buenos Ayres, the thermometer at places near sea level fell to freezing point. During the days covered by these specified phenomena a four days' gale of great severity raged in Britain, and that these widely separated phenomena stood in intimate relation to each other is to me quite evident, but daily weather maps of the globe are required to demonstrate the inter-connection.

To render such maps thoroughly effective, more stations would have to be established in arctic and particularly antarctic regions, as it is obviously impossible to give world-wide maps without adequate representation in Polar regions, where, as Hildebrandsson has shown, the principal "centres of action" are located. The establishment of such stations and the immediate application of the data for practical purposes will probably not be realised for some time. While the present situation leaves much to be desired, it is a matter of satisfaction and for congratulation that workers such as M. Arctowski from time to time furnish memoirs which would do credit to the combined strength of a government department, and which show the desirability of the prompt utilisation of world-wide data from a strictly utilitarian standpoint.









## THE WEATHER OF MARCH.

By FRED. J. BRODIE.

THE changeable weather which had prevailed throughout the greater part of last winter continued in a modified degree until about the middle of March. At the beginning of the month the conditions over England were, it is true, mostly fine ; and between the 5th and 7th, when a mild breeze from the southward prevailed over the country generally, the thermometer rose slightly above  $55^{\circ}$  in several parts of England and Ireland. The United Kingdom then lay about midway between an anticyclone, which covered the northern and central parts of the continent, and a large Atlantic depression, the influence of the latter system being sufficient to cause rather frequent falls of rain in all our more western districts. Towards the end of the first week the continental high pressure system passed away to the eastward, and for some few days the weather over the entire kingdom was influenced by the oceanic disturbance which advanced slowly eastward, its centre passing across Scotland between the 9th and 10th when rain occurred very generally. In the rear of the depression a cold wind sprang up from the northward, and on the nights of the 10th and 11th a sharp ground frost occurred in all but the south-eastern district, the exposed thermometer falling to  $25^{\circ}$  or less in several places, to  $20^{\circ}$  at Hereford, and to  $16^{\circ}$  at Llangammarch Wells. A small cyclonic system which advanced northwards from the Bay of Biscay between the 10th and 12th, occasioned a considerable fall of rain along the south coast of England, and a still heavier fall on the other side of the Channel ; the disturbance ultimately passing away towards the western Mediterranean, where it appears to have gradually dispersed. Between the 14th and 16th a continuation of changeable weather was produced by a large depression which moved from Iceland to the north of Scandinavia, the thermometer being fairly high in the daytime, but low at night, with sharp frosts in most inland districts. Over England and the east of Scotland the maximum readings were in some places a trifle above  $55^{\circ}$ , but at night the thermometer, even in the shelter of the screen, fell several degrees below freezing, the minima at some time between the 15th and 18th being as low as  $20^{\circ}$  at Sumburgh Head,  $22^{\circ}$  at Llangammarch Wells, and  $24^{\circ}$  at Balmoral and Cirencester. On the grass the thermometer fell below  $20^{\circ}$  in several places, a reading as low as  $17^{\circ}$  being recorded at Hereford, and a reading of  $15^{\circ}$  at Cambridge and Llangammarch Wells. On the 17th and 18th, as the large depression in the far north continued to move eastward, a strong current of wind from the northward again extended over the whole kingdom, and sharp squalls of snow were experienced in nearly all parts of Great Britain.

During the remainder of the month the distribution of pressure was almost continuously anticyclonic, and over nearly the whole of central and southern England an entire absence of rain was ex-

perienced after the 18th. In most of the western and northern districts, however, a temporary break in the weather occurred at Easter (on the 26th and 27th), the interval between the passage of two distinct anticyclones across the country being marked by the extension of a low pressure system from the Atlantic. Excepting on our east and south-east coasts, where a good deal of fog prevailed, the weather was, with the exception just noted, exceedingly fine, but temperature seldom rose to any very high level even in the daytime, and at night frosts were experienced rather commonly, especially over England. The warmest weather of the month occurred between the 28th and 30th, when the thermometer nearly succeeded in touching  $60^{\circ}$  in many districts, and passed that level at a few central stations in England and Scotland, and also at Killarney. In many places almost equally high readings were recorded at some time between the 20th and 23rd, when  $60^{\circ}$  was touched at Aberdeen, at several places in the north of England, and at Killarney. The sharpest frosts occurred between the 27th and 31st, when the sheltered thermometer fell below  $25^{\circ}$  in many parts of the kingdom, and reached  $20^{\circ}$  at Llangammarch Wells. On the grass the minima were in several instances below  $20^{\circ}$ , the exposed thermometer falling to  $11^{\circ}$  at Llangammarch Wells, and to  $16^{\circ}$  at Southport, Burnley, Cambridge and West Linton.

The mean temperature of the month was above the average in all parts of the United Kingdom, but in the southern districts the excess was small. In the north of Scotland the month was the warmest March since that of 1893. Ireland and the west of Scotland received less than the average amount of bright sunshine, but in all other parts of the country there was an excess. At Westminster the total of 110 hours was 41 hours more than the average and was, with three exceptions, the largest recorded in March since the observations commenced in 1883. In 1893 the total amounted to 113 hours, in 1894 to 140 hours, and in 1907 to as many as 152 hours.



## ROYAL METEOROLOGICAL SOCIETY.

For many years past it has been the custom to arrange for the March Meeting of this Society to be of a more popular character than the other meetings of the session. At the meeting on the 16th ult., Capt. H. G. Lyons, F.R.S., who was until last year Director of the Egyptian Survey Department, delivered an instructive and interesting Lecture on "Climatic Influences in Egypt and the Sudan," which he illustrated by a large number of lantern slides. Mr. H. Mellish, President, occupied the chair.

Captain Lyons began by pointing out that from early times the ancient Greeks recognised the marked difference between the climate of the Mediterranean and that of Africa, and that Aristotle indicated correctly the rain of Ethiopia as the cause of the annual flood of the

Nile. Travellers have supplemented our knowledge from time to time, but only within the last ten years has a network of meteorological stations given precision to our views and furnished a basis for further investigation. The comparatively low relief of the country, which lies as a vast land area in low latitudes, combined with the effect of the North-easterly trade winds which sweep over it produce the hot and dry conditions which are so characteristic of north-eastern Africa. Modified somewhat in the north by the warm waters of the Mediterranean, and in the south by the rains of the monsoon in summer, the highest temperatures and most arid conditions are reached between Wadi Halfa and Dongola, where Northerly winds, clear skies, and a great range of temperature prevail throughout the year.

The lecturer showed that the important rains are those falling in Uganda, the southern plains of the Sudan, and on the table-land of Abyssinia, since they not only provide the whole supply of the Nile and its tributaries, but largely control their regimen. Fed by the South-easterly air currents blowing in from the Indian Ocean, these monsoon rains supply the equatorial lakes and the tributaries of the Nile, though these lose much of their water in the lakes and marshy valleys through which they flow. The dense tropical forests of Uganda are due to the same rainfall, which, however, falls off rapidly to the northwards, and park land, thorn forest, and savannah successively herald the approach of the true desert which extends from near Khartum to the shores of the Mediterranean. But it is the Abyssinian table-land, with its heavy summer rainfall which is most effective, since it furnishes the whole of the Nile flood and enables the Nile to maintain itself through 1,500 miles of desert.

As the sole source of the flood, the variation of these rains directly determines the abundance or deficiency of Egypt's supply, so that this climatic problem is of immense practical importance. Hardly less important in these days of intensive cultivation of cotton, is the study of the winter storms which occasionally break in the Sudan and Abyssinia, raising the level of the rivers and increasing the supply of the Nile appreciably at a time when the normal supply is inadequate. The climate of the region not only influences the water supply, but the great range of temperature rapidly disintegrates the rocks and the wind removes the finer portion of the material. In this way the deserts are being constantly modified and vast ranges of sand dunes are piled up. The distribution of vegetation is very markedly influenced both by the moisture and by the physical character of the country; and in them the explanation of the tropical forest of Uganda, the rank growth of the marshes of the Upper Nile, which forms the "sadd" of that region, the thorn forest, and the savannah of Kordofan and the Gezira whence large supplies of gum are obtained, is to be found.

Captain Lyons stated that man has been affected also to a great extent, and in the ancient civilization of the Egyptians we see clear



evidence of the influence on him of the climatic conditions of his own country and the lands to the south. His calendar, his agricultural operations, his architecture, his general character, and even his adoption of the process of mummification for the artificial preservation of the bodies of the dead, are all the direct consequences of the climatic conditions among which he lived.

On the motion of Dr. Theodore Williams, seconded by Colonel H. E. Rawson, a very cordial vote of thanks was passed to Captain Lyons for his Lecture.

Mr. Roberto Irizar was elected a Fellow of the Society.

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## INSPECTION OF THE NATIONAL PHYSICAL LABORATORY.

ON the occasion of the inspection of the National Physical Laboratory, on March 18th, when a large number of men of science assembled at the Laboratory wild gusts of bitter wind, accompanied by frequent showers of snow, detracted somewhat from the enjoyment of the visitors. The whole of the Laboratory, situated in the grounds of Bushey House, was thrown open, and despite the weather many persons interested in the scientific and engineering work of the Institution took advantage of the opportunity afforded of being personally conducted through the various departments.

The work of the Laboratory, apart from the Kew Observatory branch, touches only at a few points on meteorology, being chiefly concerned with the testing of instruments and apparatus for electrical and general engineering purposes, but promising results from a meteorological point of view may be expected on the completion of the two newly erected towers for testing wind-force with a special view to the application of the information thus obtained to aeronautical science. Unfortunately the comparatively low altitude of the platforms on which the resistance plates are situated, being only sixty feet above ground, fails to secure them completely from obstruction by the surrounding trees and buildings, and the indications can only be looked upon as satisfactory when the experiments are made with the wind in a particular quarter. Experiments are also being made to ascertain the action of steady winds and gusts upon model aeroplanes. Laboratory work on this subject is made possible by the use of a large whirling table.

The testing of thermometers is carried on in a special department, but in practically all cases the instruments designed for use in meteorological work are tested at the long established Observatory at Kew which is in its present organization a special branch of the National Physical Laboratory.

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## Correspondence.

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

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### ATMOSPHERIC TIDES.

It is certainly strange that the lunar atmospheric tide is so small that it is hardly, if at all, apparent in our barometric records. If we lived at the bottom of one of the deep oceans we should hardly be conscious of the tides, for the rise and fall in deep water is very small, and at a depth of 30,000 feet the change of pressure would be less than one ten-thousandth part of the whole, and would be inappreciable, just as a barometric change of .002 or .003 inches is inappreciable. Still the analogy is not a good one, for the free play of the water is restricted by land masses, notably by North and South America, whereas there is very little hindrance in comparison to the free play of the air.

But is it so certain that the double daily oscillation of the barometer is not due to a solar tide? This oscillation remains unexplained, excepting that it is fairly certain that the atmosphere as a whole has a natural period of oscillation of about twelve hours. A series of very small impulses, provided they are exactly timed, and long continued, will set a person swinging in an ordinary swing, just as one clock will set going another clock placed near it if the two pendulums oscillate exactly together. Similarly if the natural period of the atmosphere should chance to be very close to twelve hours, the tide producing power of the sun, with a period which is always within a minute of twelve hours, must inevitably produce some such tide as we see in the double daily barometric oscillation. That there is no lunar effect corresponding to the spring and neap tides of the sea may be because the time during which the sun and moon act together (the spring tides of the sea) is too short to produce an appreciable effect on the magnitude of the oscillation.

W. H. DINES.

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IN your March issue Mr. Philpotts asks why the effects of atmospheric tides are not perceptible in the variations of the barometer.

In reality these effects are so small that they must be masked by changes due to other causes. It can readily be seen that they must be very small by considering the analogous case of the variations of pressure at the bottom of a hypothetical ocean whose depth is comparable with the height of the atmosphere, *e.g.*, the pressure due to a tide of 20 ft. would only increase the pressure at a depth of 40 miles by one ten-thousandth part, and it is barometric variations of this order that we should expect to find. The effect of the compressibility of the air would be to decrease these effects.

The idea that the lesser density of the air as compared with water

would increase the height of the atmospheric tides is erroneous, as is M. Arago's explanation that the increase of height is compensated by a decrease of weight due to the attraction of the tide-producing body.

May not the small diurnal variation of the barometer be at least partly due to the effects of the solar tide?

M. LANGDON.

*2, Matford Avenue, Exeter, April 6th, 1910.*

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## RECORDS OF METEORS.

MAY I suggest that meteorological observers should always register the dates, times, and apparent positions and directions of such conspicuous meteors as casually come under their notice? Meteors, though undoubtedly of cosmic or astronomical origin, belong to the phenomena of our atmosphere, since they are rendered luminous only when traversing it, and owe their visible existence and dispersion entirely to its action.

Luke Howard included a few interesting accounts of meteors in his "Climate of London," and present-day observers will do well to emulate his example. This is the more necessary from the circumstance that brilliant meteoric fireballs often make their apparition at times when regular astronomical students are not watching for them. They may appear in a partially clouded sky, in moonlight or twilight—in fact, a particularly favourable hour for viewing these attractive objects is in the strong twilight of early evening.

Meteorologists while watching cloud scenery, looking for changes of wind or noting the variable aspects of the sky, often have their attention momentarily diverted by the passage of bright meteors. If suitable allusion to these were preserved in meteorological registers and published the material would be of value to those investigating the subject. The most important features in such records are the position and direction of the luminous flights. These should be described according to the stars near them, or the cardinal points given together with estimated altitude of the beginning and end of the observed trajectory. Better still, perhaps, is the plan of marking the meteor's course upon a star chart or celestial globe, and reading off the right ascension and declination of the extremities of the flight; but a little astronomical knowledge is required in this process.

For data regarding splendid fireballs we have often to rely upon mere newspaper descriptions by unskilled spectators who know nothing of the features which it is essential to record. Hence, meteorological observers, who frequently possess some knowledge of the constellations and are practised in suitably recording atmospheric occurrences, might materially aid our knowledge by taking notes of such bright meteors as may chance to present themselves during their observations.

W. F. DENNING.

*Bristol.*

## THE "GREEN FLASH" AT SUNSET.

LAST evening, midway between Marseilles and the Strait of Bonifacio, the sky was perfectly clear, after a cloudless day, with little wind, about S.S.E. As the sun approached the horizon, the line 'twixt sea and sky for about  $45^{\circ}$  each side of the sun became suffused with a rich dull rose pink, and the waves reflected a marvellous ruby shade on their surfaces facing the sunset, whilst the other faces were an opalescent blue or green from the upper sky. The two colours flashed and changed in a marvellous way, such intensity of colouring had never been seen by those on board.

I saw in the Salon at Düsseldorf last year an impressionist oil painting which showed the same effect, and I remember remarking it was surely an exaggeration; but here was Nature giving it far more beautifully in her power of chromo-illustration.

The sun set clean into the sea, and about ten (or less) seconds after it had disappeared a bright green single flash, just like a railway signal lamp, but brighter far, met our view and rewarded our watching for it.

GEORGE H. BAINES.

*R.M.S. Dunottar Castle, at sea, 5th March, 1910.*

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## AN UNUSUAL LUNAR RAINBOW.

I VENTURE to send you news of an uncommon phenomenon which appeared in the sky here the other evening, believing it to be worthy of record in your Magazine.

At half-past eight, on the 25th instant, when the moon was a few degrees above the horizon, in an almost cloudless sky, rain began to fall from overhead. As a result, a perfect rainbow was thrown on to the western sky, appearing as a faintly luminous arc of light, without, of course, the ordinary rainbow colours. This is the first time I have observed such a formation, as, I believe, the circumstances must be very rarely favourable for producing it.

A. B. WEEKES,

*Met. Observer.*

*Kroonstad, Orange River Colony, February 28th, 1910.*

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## HEAVY RAINFALLS IN THE SOUTH-EAST OF ENGLAND, AND ANTICYCLONIC PERIODS.

MAY I venture to draw your attention to a somewhat remarkable phenomenon which has just recently been repeated, and incidentally ask a question of your readers more learned in the subject than I?

Last month at Tunbridge Wells we experienced two isolated but very heavy rainfalls, viz., 9th, 1.16 in., and 11th, 1.00 in., the rest of the precipitation of the month amounting to only .27 in., and thereafter we only had four slight falls to the end of the month.



Now these rainfalls at my Clapham Park station are only represented by .35 in. and .32 in. respectively, and at Stow-on-the-Wold by .28 in. and .10 in.

The idea I wish to put forward is this, that if my memory serves me well, heavy *isolated* falls of rain in the south-east of England are nearly always, and especially in the spring months, followed by a lengthy period of anticyclonic weather; and it occurred to me that those having access to the Camden Square or Greenwich records might like to follow the matter up further. The assumption is, that granting this to be as I have suggested, that we should be about to enjoy a very fine spring and early summer.

D. W. HORNER, F.R.Met.Soc.

*Tunbridge Wells, 5th April, 1910.*

[Heavy isolated falls of rain are usually associated with thunderstorms, line squalls, or small secondary cyclones, the first-named being more frequent in summer than in spring. All cases in which the rainfall appreciably exceeds one inch are investigated at Camden Square, and discussed in the section on Heavy Rains on Rainfall Days in "British Rainfall," usually with the aid of a map. We cannot, however, say that we have observed any relation between isolated heavy rains and the subsequent weather.—Ed., *S.M.M.*]

## REVIEWS.

*Weather Forecasting by Simple Methods.* By FRANCIS S. GRANGER. Nottingham: Henry B. Saxton, 1909. Size  $8\frac{1}{2} \times 5\frac{1}{2}$ . Pp. xii + 122. Price 2s. 6d. net.

MR. GRANGER has devoted much attention to the signs of the sky, and we have no doubt that he is able to predict local changes of weather with a fair degree of success. We are sorry, however, that we cannot recommend his book as likely to assist other observers. The descriptions are not always very clear; essential and accidental appearances are rarely distinguished, and the author has but an imperfect appreciation of the fundamental facts of meteorology. It is painful to be obliged to refer to an absolutely honest and sincere effort in this way; but it is a duty we owe to our readers all the same. As an observer, Mr. Granger has, we are sure, derived much pleasure from his observations of clouds and the colour of the sky, but it is a difficult art to communicate one's impressions in such a way as to assist others to follow in one's steps.

*Zur Meteorologie von Peru* (On the Meteorology of Peru) von J. HANN. [Sitzungsber. k. Akad. Wiss. Math.-Naturw. Klasse. Bd. 118, Abt. IIa. November, 1909]. Wien, 1909, Size  $10 \times 6\frac{1}{2}$ , Pp. 90.

IN this impressive memoir Prof. Hann discusses the meteorological data accumulated at the Arequipa Observatory and auxiliary stations,

which were published without discussion in the Annals of the Astronomical Observatory at Harvard College, between 1899 and 1908. Prof. Hann had already dealt in the *Meteorologische Zeitschrift* with the purely climatological results of some of these volumes; he now attacks the meteorological considerations especially with regard to the annual and diurnal periodicity of the various elements.

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*Nouvelle Méthode de Prévission du Temps* (New Method of Weather Prediction), par GABRIEL GUILBERT. Avec une Préface, par BERNARD BRUNHES, Directeur de l'Observatoire du Puy de Dôme. Paris, Gauthier-Villars, 1909. Size  $10 \times 6\frac{1}{2}$ , pp. xxxviii + 344. Plates.

A BOOK of such originality and importance as this is a rare planet in the meteorological sky, and the matter with which it deals ought to be the subject of a long article rather than a short notice. The name of M. Guilbert as a student of weather forecasts has been known in France for eighteen years; but official forecasters not unnaturally fight shy of amateurs with original methods. A competition in weather forecasting, arranged at Liège in 1905, gave M. Guilbert an opportunity of demonstrating the practicability of his system; and he has now set it forth in detail with numerous examples in the volume before us. The preface by M. Brunhes, who was one of the judges who awarded M. Guilbert the prize for the contest at Liège, gives a resumé of the method with critical remarks which are the more convincing because they do not accept all the author's explanations, nor approve all his modes of expression.

Put briefly the "new method" is to view the depression or cyclone as the essential factor in weather-making, and to regard the drawing of the isobaric chart of to-morrow as the immediate object of the forecaster. In order to ascertain which way, and how far, the depression will move, and whether it will deepen or fill up on the way, M. Guilbert makes use of the principle of the normal wind to be expected in a given arrangement of isobars. If the wind actually blowing is in excess or defect of the normal force, or different to the normal direction, he takes it as a sign of external influences affecting the movement of the depression as a whole, and he expects the system to move in the direction of least resistance as indicated by the deviation of the actual winds from the normal. Only experience and a fair trial can show whether the new method is to prove successful in official forecasts; but there can be no doubt that local forecasts can be greatly improved by attention to the rules as regards actual winds. The criticisms of various distinguished meteorologists are recorded and considered; and the author discusses the question with great moderation and a thoroughly scientific openness of mind.

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## RAINFALL TABLE FOR MARCH, 1910.

| STATION.                      | COUNTY.            | Lat.<br>N. | Long.<br>W.<br>[°E.] | Height<br>above<br>Sea.<br>ft. | RAINFALL<br>OF MONTH.          |              |
|-------------------------------|--------------------|------------|----------------------|--------------------------------|--------------------------------|--------------|
|                               |                    |            |                      |                                | Aver.<br>1875—<br>1909.<br>in. | 1910.<br>in. |
| Camden Square.....            | London.....        | 51 32      | 0 8                  | 111                            | 1'70                           | '97          |
| Tenterden.....                | Kent.....          | 51 4       | *0 41                | 190                            | 1'95                           | 1'51         |
| Steyning.....                 | Sussex.....        | 50 53      | 0 20                 | 80                             | 2'25                           | 1'63         |
| Southampton (Cadland) ..      | Hampshire.....     | 50 50      | 1 22                 | 52                             | 2'17                           | '97          |
| Hitchin.....                  | Hertfordshire..... | 51 57      | 0 17                 | 238                            | 1'69                           | '95          |
| Oxford (Magdalen College)..   | Oxfordshire.....   | 51 45      | 1 15                 | 186                            | 1'45                           | '54          |
| Bury St. Edmunds (Westley)    | Suffolk.....       | 52 15      | *0 40                | 226                            | 1'71                           | 1'07         |
| Geldeston [Beccles].....      | Norfolk.....       | 52 27      | *1 31                | 38                             | 1'57                           | '95          |
| Polapit Tamar [Launceston]    | Devon.....         | 50 40      | 4 22                 | 315                            | 2'74                           | 1'03         |
| Rousdon [Lyme Regis].....     | „.....             | 50 41      | 3 0                  | 510                            | 2'30                           | '77          |
| Stroud (Upfield).....         | Gloucestershire..  | 51 44      | 2 13                 | 226                            | 2'01                           | '69          |
| Church Stretton (Wolaston)..  | Shropshire.....    | 52 35      | 2 48                 | 800                            | 2'19                           | '81          |
| Coventry (Kingswood).....     | Warwickshire.....  | 52 24      | 1 30                 | 340                            | 1'89                           | '84          |
| Market Overton.....           | Rutland.....       | 52 44      | 0 41                 | 475                            | 1'69                           | 1'04         |
| Boston.....                   | Lincolnshire.....  | 52 58      | 0 1                  | 25                             | 1'47                           | '65          |
| Workshop (Hodsock Priory).    | Nottinghamshire    | 53 22      | 1 5                  | 56                             | 1'70                           | '54          |
| Macclesfield.....             | Cheshire.....      | 53 15      | 2 7                  | 501                            | 2'50                           | '80          |
| Southport (Hesketh Park)..    | Lancashire.....    | 53 38      | 2 59                 | 38                             | 2'11                           | 1'03         |
| Wetherby (Ribston Hall)...    | Yorkshire, W.R.    | 53 59      | 1 24                 | 130                            | 1'92                           | '84          |
| Arncliffe Vicarage.....       | „.....             | 54 8       | 2 6                  | 732                            | 5'17                           | 2'29         |
| Hull (Pearson Park).....      | „..... E.R.        | 53 45      | 0 20                 | 6                              | 1'84                           | '76          |
| Newcastle (Town Moor)...      | Northumberland     | 54 59      | 1 38                 | 201                            | 2'10                           | '43          |
| Borrowdale (Seathwaite)...    | Cumberland.....    | 54 30      | 3 10                 | 423                            | 10'63                          | 9'76         |
| Cardiff (Ely).....            | Glamorgan.....     | 51 29      | 3 13                 | 53                             | 2'89                           | 1'24         |
| Haverfordwest (High Street)   | Pembroke.....      | 51 48      | 4 58                 | 95                             | 3'16                           | 1'71         |
| Aberystwyth (Gogerddan)..     | Cardigan.....      | 52 26      | 4 1                  | 83                             | 3'04                           | 1'66         |
| Llandudno.....                | Carnarvon.....     | 53 20      | 3 50                 | 72                             | 2'13                           | '92          |
| Cargen [Dumfries].....        | Kirkcudbright...   | 55 2       | 3 37                 | 80                             | 3'33                           | 4'58         |
| Marchmont House.....          | Berwick.....       | 55 44      | 2 24                 | 498                            | 2'64                           | 1'09         |
| Girvan (Pinmore).....         | Ayr.....           | 55 10      | 4 49                 | 207                            | 3'62                           | 2'98         |
| Glasgow (Queen's Park)...     | Renfrew.....       | 55 53      | 4 18                 | 144                            | 2'61                           | 2'02         |
| Inveraray (Newtown).....      | Argyll.....        | 56 14      | 5 4                  | 17                             | 5'41                           | 3'48         |
| Mull (Quinish).....           | „.....             | 56 36      | 6 13                 | 35                             | 4'28                           | 3'64         |
| Dundee (Eastern Necropolis)   | Forfar.....        | 56 28      | 2 57                 | 199                            | 2'06                           | 1'09         |
| Braemar.....                  | Aberdeen.....      | 57 0       | 3 24                 | 1114                           | 2'87                           | 2'73         |
| Aberdeen (Cranford).....      | „.....             | 57 8       | 2 7                  | 120                            | 2'65                           | 1'55         |
| Cawdor.....                   | Nairn.....         | 57 31      | 3 57                 | 250                            | 2'35                           | 1'44         |
| Fort Augustus (S. Benedict's) | E. Inverness.....  | 57 9       | 4 41                 | 68                             | 3'79                           | 2'72         |
| Loch Torridon (Bendamph)      | W. Ross.....       | 57 32      | 5 32                 | 20                             | 7'29                           | 8'60         |
| Dunrobin Castle.....          | Sutherland.....    | 57 59      | 3 56                 | 14                             | 2'64                           | 1'01         |
| Wick.....                     | Caithness.....     | 58 26      | 3 6                  | 77                             | 2'24                           | 1'43         |
| Killarney (District Asylum)   | Kerry.....         | 52 4       | 9 31                 | 178                            | 4'51                           | 6'76         |
| Waterford (Brook Lodge)...    | Waterford.....     | 52 15      | 7 7                  | 104                            | 2'64                           | 2'05         |
| Nenagh (Castle Lough).....    | Tipperary.....     | 52 54      | 8 24                 | 120                            | 2'99                           | 2'86         |
| Miltown Malbay.....           | Clare.....         | 52 52      | 9 26                 | 400                            | 3'11                           | 3'02         |
| Gorey (Courtown House)...     | Wexford.....       | 52 40      | 6 13                 | 80                             | 2'28                           | 2'12         |
| Abbey Leix (Blandsfort)...    | Queen's County..   | 52 56      | 7 17                 | 532                            | 2'59                           | 2'16         |
| Dublin (Fitz William Square)  | Dublin.....        | 53 21      | 6 14                 | 54                             | 1'98                           | '92          |
| Mullingar (Belvedere).....    | Westmeath.....     | 53 29      | 7 22                 | 367                            | 2'64                           | 1'67         |
| Ballinasloe.....              | Galway.....        | 53 20      | 8 15                 | 160                            | 2'66                           | 2'36         |
| Crossmolina (Enniscroe).....  | Mayo.....          | 54 4       | 9 18                 | 74                             | 4'36                           | 3'69         |
| Collooney (Markree Obsy.)..   | Sligo.....         | 54 11      | 8 27                 | 127                            | 3'33                           | 3'75         |
| Seaforde.....                 | Down.....          | 54 19      | 5 50                 | 180                            | 2'84                           | 1'98         |
| Bushmills (Dundarave).....    | Antrim.....        | 55 12      | 6 30                 | 162                            | 2'73                           | 2'48         |
| Omagh (Edenfel).....          | Tyrone.....        | 54 36      | 7 18                 | 280                            | 2'98                           | 2'20         |

Erratum in February Table:—

Coventry (Kingswood) should read .....|| 2'52

## RAINFALL TABLE FOR MARCH, 1910—continued.

| RAINFALL OF MONTH (con.) |          |                   |             |      | 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.                      | Av.      | in.               | Date.       | Days | in.                   | in.   | in.                  | Av.      | in.                    |                 |
| — .73                    | 57       | .40               | 9           | 9    | 5.19                  | 5.50  | + .31                | 106      | 25.11                  | Camden Square   |
| — .44                    | 77       | .87               | 9           | 12   | 5.99                  | 8.19  | +2.20                | 137      | 27.64                  | Tenterden       |
| — .62                    | 72       | .91               | 9           | 7    | 7.75                  | 11.42 | +3.67                | 147      | 33.58                  | Steyning        |
| — 1.20                   | 45       | .52               | 9           | 8    | 7.20                  | 7.87  | + .67                | 109      | 31.86                  | Cadland         |
| — .74                    | 56       | .42               | 9           | 7    | 5.01                  | 5.38  | + .37                | 107      | 25.16                  | Hitchin         |
| — .91                    | 37       | .22               | 9           | 8    | 4.85                  | 4.47  | — .38                | 92       | 24.58                  | Oxford          |
| — .64                    | 63       | .37               | 9           | 10   | 5.00                  | 4.83  | — .17                | 97       | 25.40                  | Westley         |
| — .62                    | 60       | .35               | 9           | 11   | 4.51                  | 4.79  | + .28                | 106      | 23.73                  | Geldeston       |
| — 1.71                   | 38       | .28               | 6           | 11   | 9.28                  | 14.30 | +5.02                | 154      | 38.27                  | Polapit Tamar   |
| — 1.53                   | 34       | .25               | 9           | 8    | 7.74                  | 7.71  | — .03                | 100      | 33.54                  | Roundon         |
| — 1.32                   | 34       | .27               | 9           | 11   | 6.46                  | 6.75  | + .29                | 104      | 29.81                  | Stroud          |
| — 1.38                   | 37       | .36               | 8           | 10   | 6.87                  | 6.20  | — .67                | 90       | 32.41                  | Wolstaston      |
| — 1.05                   | 44       | .22               | 8           | 9    | 6.12                  | 5.73  | — .39                | 94       | 28.98                  | Coventry        |
| — .65                    | 62       | .22               | 9           | 17   | 5.42                  | 5.70  | + .28                | 105      | 27.10                  | Market Overton  |
| — .82                    | 44       | .15               | 9           | 10   | 4.54                  | 4.39  | — .15                | 97       | 23.35                  | Boston          |
| — 1.16                   | 32       | .17               | 7           | 7    | 5.04                  | 4.25  | — .79                | 84       | 24.46                  | Hodsock Priory  |
| — 1.70                   | 32       | .28               | 8           | 10   | 7.46                  | 6.65  | — .81                | 89       | 34.73                  | Macclesfield    |
| — 1.08                   | 49       | .16               | 8, 9        | 9    | 6.73                  | 7.73  | +1.00                | 115      | 32.70                  | Southport       |
| — 1.08                   | 44       | .30               | 8           | 12   | 5.52                  | 7.66  | +2.14                | 139      | 26.87                  | Ribston Hall    |
| — 2.88                   | 44       | .60               | 8           | 11   | 10.31                 | 24.17 | +7.86                | 148      | 61.49                  | Arncliffe       |
| — 1.08                   | 41       | .30               | 8           | 14   | 5.32                  | 4.26  | — 1.06               | 80       | 26.42                  | Hull            |
| — 1.67                   | 20       | .18               | 8           | 8    | 5.63                  | 6.37  | + .74                | 113      | 27.94                  | Newcastle       |
| — .87                    | 92       | 3.74              | 1           | 13   | 35.03                 | 47.25 | +12.22               | 135      | 129.48                 | Seathwaite      |
| — 1.65                   | 43       | .40               | 7           | 8    | 9.61                  | 12.39 | +2.78                | 129      | 42.28                  | Cardiff         |
| — 1.45                   | 54       | .38               | 8           | 12   | 11.27                 | 10.88 | — .39                | 97       | 46.82                  | Haverfordwest   |
| — 1.38                   | 55       | .50               | 9           | 14   | 10.04                 | 11.31 | +1.27                | 113      | 45.46                  | Gogerddan       |
| — 1.21                   | 43       | .32               | 9           | 15   | 6.75                  | 8.22  | +1.47                | 122      | 30.36                  | Llandudno       |
| + 1.25                   | 138      | 1.80              | 1           | 10   | 10.85                 | 15.46 | +4.61                | 142      | 43.47                  | Cargen          |
| — 1.55                   | 41       | .23               | 9           | 10   | 7.19                  | 5.74  | — 1.45               | 80       | 33.76                  | Marchmont       |
| — .64                    | 82       | .85               | 2           | 16   | 12.27                 | 17.35 | +5.08                | 141      | 49.77                  | Girvan          |
| — .59                    | 77       | .62               | 1           | 12   | 8.84                  | 9.80  | + .96                | 111      | 35.97                  | Glasgow         |
| — 1.93                   | 64       | .61               | 9           | 18   | 18.46                 | 22.20 | +3.74                | 120      | 68.67                  | Inveraray       |
| — .64                    | 85       | .66               | 3           | 19   | 14.28                 | 16.18 | +1.90                | 113      | 56.57                  | Quinish         |
| — .97                    | 53       | .39               | 9           | 11   | 5.98                  | 4.75  | — 1.23               | 79       | 28.64                  | Dundee          |
| — .14                    | 95       | ...               | ...         | ...  | 8.34                  | 11.36 | +3.02                | 136      | 34.93                  | Braemar         |
| — 1.10                   | 58       | .27               | 9           | 14   | 7.37                  | 6.15  | — 1.22               | 83       | 32.73                  | Aberdeen        |
| — .91                    | 61       | .38               | 16          | 7    | 6.69                  | 5.81  | — .88                | 87       | 29.33                  | Cawdor          |
| — 1.07                   | 72       | .56               | 9           | 15   | 13.57                 | 14.32 | + .75                | 106      | 44.53                  | Fort Augustus   |
| + 1.31                   | 118      | 1.37              | 11          | 21   | 24.08                 | 30.79 | +6.71                | 128      | 83.61                  | Bendamp         |
| — 1.63                   | 38       | .36               | 9           | 10   | 7.97                  | 5.70  | — 2.27               | 71       | 31.90                  | Dunrobin Castle |
| — .81                    | 64       | .27               | 18          | 17   | 6.95                  | 5.30  | — 1.65               | 76       | 29.88                  | Wick            |
| + 2.25                   | 150      | 2.50              | 1           | 19   | 15.44                 | 21.88 | +6.44                | 142      | 54.81                  | Killarney       |
| — .59                    | 78       | .58               | 1           | 10   | 9.60                  | 8.41  | — 1.19               | 88       | 39.57                  | Waterford       |
| — .13                    | 96       | .98               | 1           | 12   | 9.76                  | 14.52 | +4.76                | 149      | 39.43                  | Castle Lough    |
| — .09                    | 97       | .81               | 9           | 18   | 10.33                 | 12.80 | +2.47                | 124      | 45.11                  | Miltown Malbay  |
| — .16                    | 93       | .71               | 1           | 10   | 8.22                  | 7.35  | — .87                | 89       | 34.99                  | Courtown Ho.    |
| — .43                    | 83       | .60               | 1           | 13   | 8.29                  | 10.71 | +2.42                | 129      | 35.92                  | Abbey Leix      |
| — 1.06                   | 46       | .40               | 1           | 11   | 6.05                  | 7.67  | +1.62                | 127      | 27.68                  | Dublin          |
| — .97                    | 63       | .40               | 9           | 7    | 8.41                  | 10.94 | +2.53                | 130      | 36.14                  | Mullingar.      |
| — .30                    | 89       | .74               | 1           | 16   | 8.51                  | 10.98 | +2.47                | 129      | 36.64                  | Ballinasloe     |
| — .67                    | 85       | 1.08              | 2           | 17   | 13.91                 | 19.52 | +5.61                | 140      | 52.87                  | Enniscoe        |
| + .42                    | 113      | 1.31              | 9           | 18   | 10.40                 | 16.17 | +5.77                | 155      | 42.71                  | Markree         |
| — .86                    | 70       | .68               | 8           | 9    | 9.06                  | 9.32  | + .26                | 103      | 38.91                  | Seaforde        |
| — .25                    | 91       | .92               | 9           | 16   | 8.48                  | 11.65 | +3.17                | 137      | 37.56                  | Dundarave       |
| — .78                    | 74       | .67               | 9           | 15   | 9.12                  | 12.64 | +3.52                | 139      | 39.38                  | Omagh           |

+ .51 | 125 | .35 | 20 | 24 || 4.23 | 4.89 | + .66 | 116 || 28.98 ||

**Symons's Meteorological Magazine.**

**SUPPLEMENTARY RAINFALL, MARCH, 1910.**

| Div.  | STATION.                    | Rain<br>inches | Div.   | STATION.                     | Rain.<br>inches |
|-------|-----------------------------|----------------|--------|------------------------------|-----------------|
| II.   | Warlingham, Redvers Road    | 1·54           | XI.    | Llangyhanfal, Plâs Draw....  | 1·04            |
| „     | Ramsgate .....              | 1·37           | „      | Dolgelly Bryntirion .....    | 2·61            |
| „     | Hailsham .....              | 1·78           | „      | Bettws-y-Coed, Tyn-y-bryn    | 2·78            |
| „     | Totland Bay, Aston House.   | 1·18           | „      | Lligwy .....                 | 1·50            |
| „     | Stockbridge, Ashley .....   | ·89            | „      | Douglas, Woodville .....     | 1·94            |
| „     | Grayshott .....             | 1·57           | XII.   | Stoneykirk, Ardwell House    | 1·77            |
| „     | Reading, Calcot Place.....  | ·99            | „      | Dalry, The Old Garroch ...   | 5·35            |
| III.  | Harrow Weald, Hill House.   | 1·03           | „      | Langholm, Drove Road.....    | 3·86            |
| „     | Pitsford, Sedgebrook.....   | ·54            | „      | Moniaive, Maxwellton House   | 4·19            |
| „     | Huntingdon, Brampton.....   | ·86            | XIII.  | St Mary's Loch, Cramilt Ldge | 4·37            |
| „     | Woburn, Milton Bryant.....  | ·86            | „      | Edinburgh, Royal Observty.   | ·85             |
| „     | Wisbech, Monica Road.....   | ·59            | XIV.   | Maybole, Knockdon Farm..     | 1·71            |
| IV.   | Southend Water Works.....   | 1·17           | XV.    | Campbeltown, Witchburn...    | 2·33            |
| „     | Colchester, Lexden.....     | ·88            | „      | Glenreassdell Mains.....     | 2·23            |
| „     | Newport .....               | ·79            | „      | Ballachulish House.....      | 5·89            |
| „     | Rendlesham .....            | 1·19           | „      | Islay, Eallabus .....        | 2·40            |
| „     | Swaffham .....              | ·81            | XVI.   | Dollar Academy .....         | 1·19            |
| „     | Blakeney .....              | ·57            | „      | Balquhiddy, Stronvar .....   | 5·42            |
| V.    | Bishops Cannings .....      | ·85            | „      | Coupar Angus .....           | 1·63            |
| „     | Winterbourne Steepleton ..  | 1·00           | „      | Blair Atholl.....            | 2·00            |
| „     | Ashburton, Druid House ..   | 1·39           | „      | Montrose, Sunnyside Asylum   | 1·35            |
| „     | Honiton, Combe Raleigh ...  | ·85            | XVII.  | Alford, Lynturk Manse ...    | 1·90            |
| „     | Okehampton, Oaklands.....   | 1·09           | „      | Keith Station .....          | 1·44            |
| „     | Hartland Abbey .....        | ·62            | XVIII. | Glenquoich, Laon .....       | 14·50           |
| „     | Lynmouth, Rock House ...    | ·91            | „      | Skye, Dunvegan.....          | 5·24            |
| „     | Probus, Lamellyn .....      | ·88            | „      | N. Uist, Lochmaddy .....     | ...             |
| „     | North Cadbury Rectory ..    | ·74            | „      | Alvey Manse .....            | 1·80            |
| VI.   | Clifton, Pembroke Road ...  | ·67            | „      | Loch Ness, Drumnadrochit.    | 1·80            |
| „     | Ross, The Graig .....       | ·91            | „      | Glencarron Lodge .....       | 6·17            |
| „     | Shifnal, Hatton Grange..... | ·42            | „      | Fearn, Lower Pitkerrie.....  | ·71             |
| „     | Blockley, Upton Wold .....  | ·73            | XIX.   | Invershin .....              | 1·49            |
| „     | Worcester, Boughton Park.   | ·79            | „      | Altnaharra .....             | 1·89            |
| VII.  | Market Rasen .....          | ·66            | „      | Bettyhill .....              | 1·90            |
| „     | Bawtry, Hesley Hall.....    | ·58            | XX.    | Dunmanway, The Rectory..     | 3·76            |
| „     | Derby, Midland Railway ...  | ·52            | „      | Cork .....                   | 2·49            |
| „     | Buxton.....                 | 1·36           | „      | Mitchelstown Castle .....    | 2·83            |
| VIII. | Nantwich, Dorfold Hall..... | ·73            | „      | Darrynane Abbey .....        | 4·20            |
| „     | Liscard .....               | ·75            | „      | Glenam [Clonmel] .....       | 2·99            |
| „     | Chatburn, Middlewood .....  | ·69            | „      | Nenagh, Traverston .....     | 3·24            |
| „     | Cartmel, Flookburgh .....   | 1·77           | „      | Newmarket-on-Fergus, Fenloe  | 2·12            |
| IX.   | Langsett Moor, Up. Midhope  | 1·02           | XXI.   | Laragh, Glendalough .....    | 4·59            |
| „     | Scarborough, Scalby .....   | ·84            | „      | Moynalty, Westland .....     | 2·13            |
| „     | Ingleby Greenhow .....      | ·96            | „      | Athlone, Twyford .....       | 2·29            |
| „     | Mickleton.....              | ·88            | XXII.  | Woodlawn .....               | 2·15            |
| X.    | Bardon Mill, Beltingham ... | ·87            | „      | Westport, St. Helens .....   | 3·92            |
| „     | Ilderton, Lilburn Cottage.. | ·73            | „      | Achill Island, Dugort .....  | 6·20            |
| „     | Keswick, The Bank .....     | 4·90           | „      | Mohill .....                 | 2·55            |
| XI.   | Llanfrehfa Grange.....      | 2·10           | XXIII. | Enniskillen, Portora .....   | ...             |
| „     | Treherbert, Tyn-y-waun ...  | 3·30           | „      | Dartrey [Cootehill].....     | 2·70            |
| „     | Carmarthen, The Friary..... | 2·29           | „      | Warrenpoint, Manor House     | 2·13            |
| „     | Castle Malgwyn [Lechryd].   | 2·96           | „      | Banbridge, Milltown .....    | 1·38            |
| „     | Plynlimon.....              | 3·00           | „      | Belfast, Springfield .....   | 1·67            |
| „     | Crickhowell, Ffordlas.....  | 1·50           | „      | Glenarm Castle.....          | 2·69            |
| „     | New Radnor, Ednol .....     | 1·43           | „      | Londonderry, Creggan. Res.   | 2·54            |
| „     | Rhayader, Tyrmynydd .....   | 2·61           | „      | Killybegs .....              | 3·25            |
| „     | Lake Vyrnwy .....           | 1·87           | „      | Horn Head .....              | 2·43            |

## METEOROLOGICAL NOTES ON MARCH, 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.—Dry, sunny and springlike with moderate temp. A little S fell on 18th accompanied by N.W. squalls, but from that date to the close there was no precipitation. Duration of sunshine, 120·4\* hours, and of R 23·3 hours. Mean temp. 43°·2 or 0°·9 above the average of 50 years. Shade max. 58°·2 on 30th; min. 27°·3 on 20th. F 9, f 23.

TENTERDEN.—A complete contrast to February, the first 5 days being fine and warm with S.E. winds and the latter part fine and dry, but with N.W. and N.E. winds. Duration of sunshine, 187·0† hours. Shade max. 58°·5 on 27th; min. 29°·0 on 19th and 21st. F 9, f 17.

TOTLAND BAY.—Duration of sunshine, 188·1\* hours, or 57·8 hours above the average. Shade max. 56°·2 on 30th; min. 30°·6 on 15th and 20th. F 5, f 17.

PITSFORD.—R 1·16 in. below the average. Mean temp. 42°·1. Shade max. 58°·6 on 27th; min. 26°·4 on 29th. F 13.

NORTH CADBURY.—Dry, sunny and seasonable and very welcome after the R of the winter. The ground dried well, much to the benefit of farms and gardens. Shade max. 64°·2 on 28th; min. 27°·0 on 16th. F 9, f 20.

ROSS.—Shade max. 60°·8 on 30th; min. 27°·0 on 16th. F 14, f 21.

HODSOCK PRIORY.—The smallest R since 1894. Shade max. 60°·7 on 30th; min. 25°·2 on 29th. F 14, f 23.

SOUTHPORT.—Duration of sunshine 144·6\* hours, or 17·0 hours above the average. Duration of R 25·1 hours. Mean temp. 43°·9 or 2°·4 above the average. The mean amount of cloud at 9 a.m. was the smallest for March in 39 years. Shade max. 57°·0 on 29th; min. 32°·2 on 29th. F 0, f 16.

HULL.—Fine and mild at the beginning and end, but cold in the middle with light falls of S and sleet. Shade max. 57°·0 on 21st and 27th; min. 30°·0 on 29th. F 2, f 17.

HAVERFORDWEST.—Duration of sunshine 145·1\* hours. Shade max. 56°·1 on 30th; min. 27°·1 on 16th. F 6, f 13.

LLANDUDNO.—Shade max. 56°·5 on 26th; min. 32°·5 on 18th. F 0.

DOUGLAS.—The cold, stormy weather of the previous months continued to 18th when a great change occurred and the rest of the month was very fine. Some days of brilliant sunshine increased vegetation, and fruit blossom was not backward.

CARGEN.—Of the total R, 2·98 in. fell on 2 days, the 1st and 9th. A splendid seed time occurred in the latter half, and vegetation of all kinds was in a forward condition. Shade max. 60°·0 on 30th; min. 29°·0 on 18th and 29th. F 9.

EDINBURGH.—Shade max. 56°·6 on 29th; min. 29°·0 on 18th. F 3, f 11.

ABERDEEN.—Shade max. 60°·0 on 20th; min. 28°·0 on 17th. F 9, f 12.

FORT AUGUSTUS.—Shade max. 60°·1 on 30th; min. 28°·0 on 18th. F 7.

WATERFORD.—Shade max. 57°·0 on 30th; min. 27°·5 on 29th. F 3.

DUBLIN.—A quiet, fine and dry month with only ·01 in. of R after 17th. Mean temp. 44°·8. Shade max. 55°·2 on 20th; min. 33°·9 on 13th and 29th. F 0, f 11.

MARKREE.—Shade max. 58°·8 on 29th; min. 26°·3 on 13th. F 9, f 14.

WARRENPOINT.—Fairly dry and mild, with high winds at the commencement, but light airs and calms in the latter part. Shade max. 58°·0 on 28th; min. 36°·0 on 11th, F 0, f 10.

\* Campbell-Stokes.

† Jordan.

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

| STATIONS.<br><br>(Those in italics are<br>South of the Equator.) | Absolute. |       |          |       | Average. |      |               |           | Absolute.       |                   | Total Rain |       | Aver.<br>Cloud. |
|------------------------------------------------------------------|-----------|-------|----------|-------|----------|------|---------------|-----------|-----------------|-------------------|------------|-------|-----------------|
|                                                                  | Maximum.  |       | Minimum. |       | Max.     | Min. | Dew<br>Point. | Humidity. | Max. in<br>Sun. | Min. on<br>Grass. | Depth.     | Days. |                 |
|                                                                  | Temp.     | Date. | Temp.    | Date. |          |      |               |           |                 |                   |            |       |                 |
| London, Camden Square                                            | 67.1      | 5     | 29.1     | 30    | 59.1     | 47.8 | 49.4          | 88        | 105.9           | 21.1              | 4.16       | 23    | 7.1             |
| Malta ... ..                                                     | 81.3      | 7     | 59.5     | 24    | 73.9     | 65.2 | 60.4          | 76        | 140.2           | ...               | 9.32       | 8     | 4.0             |
| Lagos ... ..                                                     | 89.0      | 29*   | 71.0     | 1, 2  | 86.3     | 74.1 | 75.0          | 78        | 159.0           | 69.0              | 5.80       | 15    | 8.3             |
| Cape Town ... ..                                                 | 82.7      | 21    | 41.2     | 1     | 67.0     | 52.2 | 51.2          | 73        | ...             | ...               | 2.30       | 9     | 5.4             |
| Durban, Natal ... ..                                             | 88.0      | 12    | 52.9     | 14    | 76.2     | 61.1 | ...           | ...       | 142.3           | ...               | 2.11       | 14    | 5.9             |
| Johannesburg ... ..                                              | 82.8      | 27    | 39.2     | 15    | 72.2     | 49.4 | 45.5          | 62        | 140.1           | 37.4              | 1.37       | 7     | 2.6             |
| Mauritius ... ..                                                 | 81.3      | 16†   | 59.5     | 28    | 79.0     | 63.3 | 59.7          | 70        | 155.0           | 50.5              | 1.39       | 17    | 6.5             |
| Calcutta... ..                                                   | 91.7      | 6, 7  | 65.8     | 24    | 88.4     | 74.1 | 73.3          | 79        | 156.5           | 62.5              | 3.77       | 4     | 3.9             |
| Bombay... ..                                                     | 91.7      | 15    | 72.0     | 26    | 88.1     | 75.7 | 73.9          | 80        | 137.2           | 65.9              | .00        | 0     | 2.1             |
| Madras ... ..                                                    | 98.1      | 6     | 68.7     | 27    | 93.3     | 75.2 | 74.3          | 78        | 149.6           | 65.2              | .61        | 4     | 3.2             |
| Kodaikanal ... ..                                                | 66.7      | 2     | 45.9     | 28    | 61.9     | 51.3 | 51.8          | 88        | 132.5           | 34.8              | 11.23      | 21    | 7.0             |
| Colombo, Ceylon ... ..                                           | 88.7      | 8     | 70.8     | 28    | 85.9     | 75.3 | 74.1          | 81        | 158.0           | 67.1              | 16.27      | 21    | 7.7             |
| Hongkong ... ..                                                  | 90.5      | 18    | 65.3     | 30    | 81.5     | 74.0 | 70.2          | 77        | 139.2           | ...               | 23.99      | 17    | 8.0             |
| Melbourne ... ..                                                 | 81.3      | 23    | 39.5     | 8     | 67.8     | 48.2 | 46.0          | 65        | 142.4           | 35.4              | 1.61       | 11    | 5.2             |
| Adelaide ... ..                                                  | 91.1      | 23    | 42.8     | 4     | 71.3     | 50.9 | 48.6          | 62        | 151.9           | 34.1              | 2.17       | 10    | 3.7             |
| Coolgardie ... ..                                                | 96.0      | 14    | 37.0     | 1     | 75.9     | 50.3 | 45.0          | 51        | 160.0           | 35.0              | 2.89       | 9     | 3.1             |
| Perth ... ..                                                     | 73.0      | 17‡   | 43.0     | 1     | 67.0     | 51.6 | 52.3          | 77        | 136.4           | 39.4              | 2.30       | 15    | 4.8             |
| Sydney ... ..                                                    | 94.0      | 10    | 46.9     | 5     | 72.0     | 56.8 | 50.7          | 62        | 128.0           | 37.0              | 1.68       | 20    | 5.2             |
| Wellington ... ..                                                | 66.0      | 11    | 40.0     | 18    | 55.8     | 49.5 | 46.7          | 75        | 116.0           | 31.0              | 2.75       | 15    | 7.3             |
| Auckland ... ..                                                  | 68.5      | 12    | 44.5     | 17    | 63.4     | 50.5 | 49.8          | 77        | 143.0           | 42.0              | 3.68       | 16    | 6.0             |
| Jamaica, Kingston ... ..                                         | 91.7      | 5     | 70.7     | 31    | 87.5     | 72.8 | 72.1          | 80        | ...             | ...               | 11.74      | 14    | ...             |
| Grenada ... ..                                                   | 87.0      | 1     | 73.0     | 15    | 84.0     | 75.1 | 72.6          | 79        | 154.2           | ...               | 11.84      | 23    | 5.5             |
| Toronto ... ..                                                   | 77.0      | 10    | 21.0     | 30    | 56.0     | 37.0 | ...           | ...       | 97.0            | 15.0              | 1.18       | 11    | ...             |
| Fredericton ... ..                                               | 78.0      | 9     | 25.0     | 31    | 55.0     | 40.0 | ...           | 80        | ...             | ...               | 5.58       | 10    | 5.6             |
| St. John's, N.B. ... ..                                          | 73.0      | 9     | 29.0     | 31    | 55.0     | 43.0 | ...           | ...       | ...             | ...               | 4.37       | 14    | 5.4             |
| Victoria, B.C. ... ..                                            | 69.0      | 11    | 37.0     | 30    | 57.0     | 44.0 | ...           | 85        | ...             | ...               | 2.31       | 15    | 8.0             |
| Dawson ... ..                                                    | 54.0      | 11    | -1.0     | 22    | 30.0     | 18.0 | ...           | ...       | ...             | ...               | .96        | 14    | 7.5             |

\* 30 and 31. † and 31. ‡ and 18. || and 19.

MALTA.—Mean temp. of air 68°·9. Average bright sunshine 6·7 hours.

Johannesburg.—Bright sunshine 299·7 hours.

Mauritius.—Mean temp. of air 1°·6 below, of dew point 1°·9 and R 24 in. below averages. Mean hourly velocity of wind 10·7 miles or 0·3 below average.

KODAIKANAL.—Bright sunshine 130 hours.

COLOMBO.—Mean temp. of air 78°·1 or 1°·9 below, of dew point 1°·0 above, and R 1·75 in. above, averages. Mean hourly velocity of wind 5·8 miles. TS on 4 days.

HONGKONG.—Mean temp. of air 77°·8, or 1°·5 above, bright sunshine 137·5 hours, or 74·8 below, mean hourly velocity of wind 16·8 miles, or 2·2 above, R 19·42 in. above, averages. Typhoons nearly all the month.

Melbourne.—Mean temp. of air 0°·5 above, and R 1·07 in. below, averages.

Adelaide.—Bright sunshine 49·5 hours above, and R 3·38 in. above, averages.

Sydney.—Mean temp. of air 0°·9 above, and R 1·16 in. below, averages.

Wellington.—Bright sunshine 211·4 hours.

Auckland.—Rainfall slightly above average of previous 44 years. Mean temp. of air slightly below average.

# Symons's Meteorological Magazine.

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No. 532.

MAY, 1910.

VOL. XLV.

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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.

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## 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-maneuvered 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 Felddes Weir.

Symons's Meteorological Magazine.

ALTITUDE  
SCALE

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

SCALE OF MILES

0 5 10 15 20

## 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.<br>N. | Long.<br>W.<br>[*E.] | Height<br>above<br>Sea.<br>ft. | RAINFALL<br>OF MONTH.          |              |
|----------------------------------|--------------------|------------|----------------------|--------------------------------|--------------------------------|--------------|
|                                  |                    |            |                      |                                | Aver.<br>1875—<br>1909.<br>in. | 1910.<br>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 [Dumfries].....           | 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         |
| Collooney (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                  | Wolverston      |
| — '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                  | Arncliffe       |
| + '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<br>inches | Div.   | STATION.                     | Rain.<br>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           | „      | Dalry, 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 Observy.    | 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.<br><br>(Those in italics are<br>South of the Equator.) | Absolute. |       |          |       | Average. |       |               |           | Absolute.       |                   | Total Rain    |       | Aver.<br>Cloud. |
|------------------------------------------------------------------|-----------|-------|----------|-------|----------|-------|---------------|-----------|-----------------|-------------------|---------------|-------|-----------------|
|                                                                  | Maximum.  |       | Minimum. |       | Max.     | Min.  | Dew<br>Point. | Humidity. | Max. in<br>Sun. | Min. on<br>Grass. | Depth.        | Days. |                 |
|                                                                  | Temp.     | Date. | Temp.    | Date. |          |       |               |           |                 |                   |               |       |                 |
| London, Camden Square                                            | 54.9      | 3     | 29.1     | 21    | 47.1     | 36.3  | 38.6          | 0.100     | 79.6            | 22.9              | inches<br>.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.

# Symons's Meteorological Magazine.

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No. 533.

JUNE, 1910.

VOL. XLV.

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## THE BRITISH RAINFALL ORGANIZATION.

### A NEW DEVELOPMENT.

WHEN George James Symons was twenty years of age he was struck by the fact that if the distribution of rainfall over the country were ever to be ascertained far more numerous observations would be necessary than for the determination of temperature or pressure. He also saw that the average person was more interested in rainfall than in any of the other elements of climate, because it touches the comfort of all who have to be out of doors, and the interests of those who have to do directly or indirectly with agriculture, water-supply, canal navigation, and public health. As the Meteorological Department of the Board of Trade, in which Symons was an assistant fifty years ago, did not see that it was necessary to deal in greater detail with rainfall than with the other meteorological data, he commenced himself to collect observations and in February, 1861, he published a four-page pamphlet "English Rainfall, 1860," giving the total rainfall at 168 stations. In the following year he published a pamphlet of 18 pages "British Rainfall, 1860—61," and gave the rainfall recorded in all parts of the British Isles by 507 observers. From that time forward each year showed a substantial increase in the number of records dealt with, this exceeded 1,000 in 1865, 2,000 in 1877, and 3,000 in 1894. Mr. Symons not only collected records, he investigated the best forms of apparatus, the best methods of recording, and worked strenuously to increase the accuracy and the uniformity of the work all over the country. As the number of records increased and the quality improved, he introduced various discussions of the data into the annual volumes of British Rainfall, and pointed out the great practical importance which might accrue from the united work of the multitude of scattered observers. In 1858 he initiated the Camden Square meteorological station, which has had a longer life than any other existing private meteorological observatory, and he established this magazine in 1866 as the development of an earlier "Monthly Rain Circular."

As the years went on the issue of "British Rainfall" gradually receded farther from the end of the year with which it dealt, the month of publication, originally February, was by degrees displaced to August, and was only stopped there by the employment of addi-

tional assistants. Mr. Symons and the rainfall observers interested in the scientific and public aspects of the work, found the money for carrying it on. For a time help was received from the British Association, but that ceased in 1876, and as Mr. Symons's accumulated experience began to assume a considerable professional value in advising water-works engineers, and in other practical matters, he was able, when occasion required, to make up any deficit which might arise.

On his death, in 1900, Mr. Symons bequeathed all the rainfall records he had accumulated during more than 40 years, the instruments and an option to purchase the leasehold of 62, Camden Square, to his colleague, Mr. H. Sowerby Wallis, who had worked with him from 1872, and had been associated in the editorship of *British Rainfall* since 1890. In 1901 Dr. H. R. Mill joined Mr. Wallis in carrying on the Organization, and when the latter was obliged to retire on account of ill-health, in 1903, Dr. Mill purchased the leasehold of the historic rainfall house, 62, Camden Square; the instruments in use there and the whole collection of records accumulated up to that date. By 1905 the number of observers had reached 4,000 and now they have almost reached 5,000. The volume of work has been greatly increased by the introduction of detailed cartographic treatment of the returns and by the increase in the number of records received monthly from about 200 to about 1,000. In place of the single assistant, who, with Mr. Symons, was once able to overtake the whole work, and to publish the volume of *British Rainfall* in June, five assistants are now required to complete the volume in time for publication in September. The British Rainfall Organization has, in fact, attained a magnitude which makes its direction a heavy burden for any individual, and it has long been recognized that the risk of so large and complex a system depending on a single life is too great to be prudently run.

Whereas, when the Organization was younger, the whole expenses were met, and rather more than met, by the subscriptions of observers, these subscriptions have increased very slowly while the expenses have increased very rapidly and there is now a substantial deficit to be met annually by the Director. It is impossible to have any sort of endowment, or to receive legacies towards the improvement of the financial position while the Organization remains a personal enterprise, and in the fiftieth year of its existence the time seems to have come for making a change which has long been contemplated and anxiously considered. Dr. Mill always intended to leave the records and the house as a bequest to the nation, for it seemed right that the freely rendered services of the great army of observers in these islands should be recognized by placing the result at the disposal of the community; but he felt that the transition from private to public ownership could be made with less risk of altering the character of the Organization if it were carried out under his own supervision so that the continuity of the work would be fully

preserved. He accordingly requested nine representative rainfall observers to join him as Trustees, and, on June 8th, formally transferred the whole of the property he had acquired in connection with the Rainfall Organization, as a gift to the new body of which he became the Chairman, while continuing to act as Director as before. The nucleus of an Endowment Fund has been formed by a few friends, and with the sums promised, it amounts at present to £800. It is vested in the Trustees, with Mr. F. Druce as Treasurer, and is kept distinct from the General Fund, which is, as before, under the sole charge of the Director. During Dr. Mill's tenure of the office of Director the responsibility of the Trustees is confined to the care of the Endowment Fund; but the duty of appointing a new Director will devolve on them, and by the Trust Deed they are empowered to exercise the fullest discretion as to the future management of the Organization, the one purpose for which they have come into existence being to maintain it in perpetuity in a state of efficiency. Should the Endowment Fund eventually attain such proportions as to secure the free development of the Organization as an unofficial body of an entirely voluntary nature, the wishes of the founder will be most fully met; but should the Trustees at any time see it to be advantageous to unite with any other body of kindred aims, or to adopt any other means of securing continuity and efficiency, they are free to do so.

The Trustees who have agreed to act are :—

Dr. H. R. Mill.

Mr. Francis Druce, London.

Sir John Murray, Edinburgh.

Sir Alexander Binnie, Past President of the Institution of Civil Engineers, London.

Mr. Henry Mellish, President of the Royal Meteorological Society, Hodsock Priory, Worksop.

Mr. Douglas W. Freshfield, Wych Cross Place, Surrey.

Mr. J. G. Wood, Barrister-at-Law, London.

Mr. Charles L. Brook, Meltham, Yorks.

Mr. Charles J. P. Cave, Ditcham Park, Sussex.

Mr. R. M. Barrington, Fasseroe, Bray, Co. Wicklow.

All of these are old friends of the Organization, and the names of most of them are familiar to our readers as frequent contributors to these pages. Mr. J. G. Wood is one of the very small band of surviving observers whose records appeared in the first volume of *British Rainfall*, for 1860–61, and as a life-long friend of Mr. Symons, he serves in a special way as a link between the past and the future of the Organization.

There will be no change in the work of the Organization, or in its staff or publications; but the existence of the Trustees removes any anxiety as to the future of the Organization which may have been felt hitherto.



## INTERNATIONAL BALLOON ASCENTS, JANUARY 2nd, 3rd & 4th, 1908.

By W. H. DINES, F.R.S.

IN accordance with the article published last month, we now commence the series of records of international meteorological balloon meteorological ascents beginning with January, 1908.

This was one of the small series of ascents on three consecutive days that are arranged three times in each year. The figures are of a somewhat unusual character, inasmuch as the beginning of the isothermal column was very badly defined over the whole area, and the temperature in many cases was lowest at the point where the balloons burst. This partly accounts for the differences in the height of the commencement of the isothermal between neighbouring stations—Brussels and Paris, for example, and Pyrton Hill and Petersfield, on January 3rd—since the gradual change in the temperature gradient makes it hard to define the precise point. Also the currents of air, shown by the directions the balloons took, are very various and discordant; however, it must be borne in mind that the ascents were not strictly simultaneous.

A strong N.E. wind prevailed in England at the time, with cold weather.

*Barometric conditions.*—On the 1st an extensive anticyclone lay over Scandinavia, and a depression over the Mediterranean. On the next day a depression approached from the Arctic Ocean, so that on the 4th a deep cyclone lay over west Russia and the north of Scandinavia, while a band of high pressure stretched from the British Isles to the Black Sea, and a shallow depression prevailed on the Mediterranean coasts.

### *January 2nd, 1908.*

| Starting Point. | Lat.     | Long.    | A     | B      | C    | D      | E    | F      | G        |
|-----------------|----------|----------|-------|--------|------|--------|------|--------|----------|
|                 | ° /      | ° /      | in.   | miles. | ° F. | miles. | ° F. | miles. |          |
| Manchester .... | 53 30 N. | 2 14 W.  | ..    | 5·8    | —51  | 9·0    | —61  | 47     | S.W.     |
| Trappes .....   | 48 50 N. | 2 20 E.  | 30·12 | 6·3    | —71  | 9·2    | —74  | 40     | S.E.     |
| Strassburg .... | 48 36 N. | 7 42 E.  | 30·20 | 6·0    | —71  | 9·0    | —76  | 14     | S.S.E.   |
| Munich .....    | 48 9 N.  | 11 37 E. | 30·16 | 6·7    | —83  | 8·9    | —74  | 26     | N. by E. |
| Pavia .....     | 45 11 N. | 9 9 E.   | 30·08 | 5·4    | —78  | 5·9    | —78  | 26     | E. by S. |

### *January 3rd, 1908.*

|                 |          |          |       |     |     |      |     |    |            |
|-----------------|----------|----------|-------|-----|-----|------|-----|----|------------|
| Pyrton Hill.... | 51 48 N. | 1 0 W.   | 30·20 | 8·1 | —76 | 11·9 | —81 | 45 | W. by S    |
| Ditcham Park..  | 51 0 N.  | 1 0 W.   | 30·12 | 6·9 | —69 | 7·5  | —69 | 20 | S.         |
| Uccle.....      | 50 51 N. | 4 22 E.  | 30·28 | 7·5 | —72 | 9·1  | —78 | 24 | W.S.W.     |
| Lindenberg .... | 52 12    | ..       | 30·52 | 6·4 | —81 | 7·5  | —76 | 22 | S.W.byW.   |
| Trappes .....   | 48 50 N. | 2 20 E.  | 30·08 | 6·2 | —72 | 7·4  | —72 | 58 | S.S.E.     |
| Strassburg .... | 48 36 N. | 7 42 E.  | 30·20 | 6·2 | —74 | 6·9  | —74 | 15 | N. by E.   |
| Munich .....    | 48 9 N.  | 11 37 E. | 30·16 | 5·7 | —71 | 8·3  | —73 | 15 | S.S.E.     |
| Vienna .....    | 48 12 N. | 16 23 E. | 30·36 | 6·1 | —82 | 6·8  | —81 | 4  | S.S.E.     |
| Pavia.....      | 44 11 N. | 9 9 E.   | 30·20 | 6·9 | —90 | 10·6 | —80 | 51 | S.E. by E. |

# RAINFALL OF THAMES VALLEY — MAY, 1910.



Symons's Meteorological Magazine. Watershed of River Thames above Taddington, and River Lee above Felides Weir. Isohyetals Rainfall stations reporting.



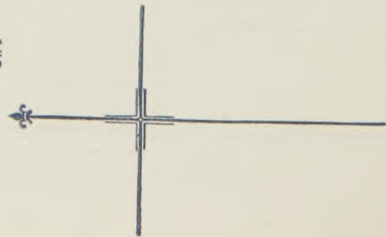
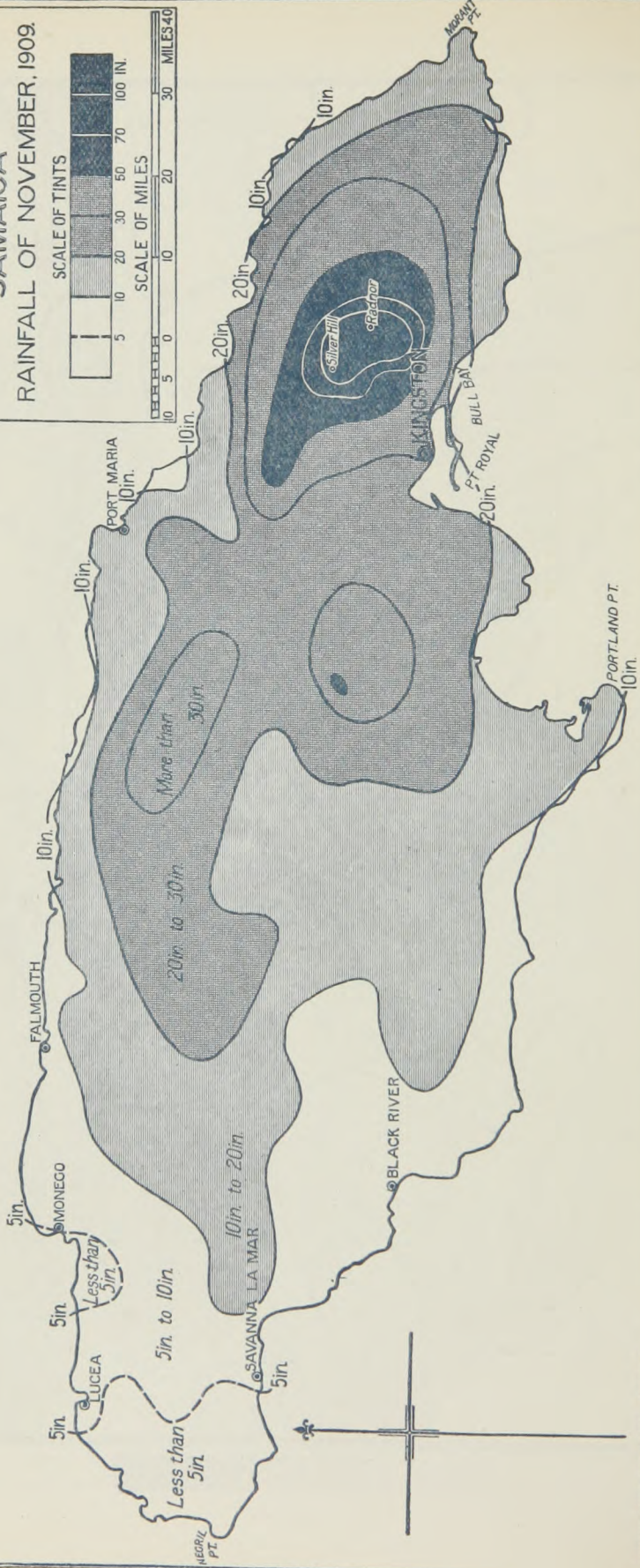
# JAMAICA

RAINFALL OF NOVEMBER, 1909.

SCALE OF TINTS



SCALE OF MILES



*January 4th, 1908.*

| Starting Point. | Lat.     | Long.    | A     | B      | C    | D      | E    | F      | G          |
|-----------------|----------|----------|-------|--------|------|--------|------|--------|------------|
|                 | ° /      | ° /      | in.   | miles. | ° F. | miles. | ° F. | miles. |            |
| Manchester....  | 53 30 N. | 2 14 W.  | ?     | ..     | ..   | 6·9    | —67  | 67     | N.W.byN.   |
| Pyrton Hill.... | 51 48 N. | 1 0 W.   | 30·24 | 8·1    | —69  | 11·0   | —72  | 62     | N.W.       |
| Ditcham Park..  | 51 0 N.  | 1 0 W.   | 30·24 | 7·5    | —56  | 8·1    | —56  | 55     | N.W.byW.   |
| Trappes .....   | 48 50 N. | 2 20 E.  | 30·08 | 6·9    | —78  | 8·5    | —82  | 11     | N.         |
| Munich .....    | 48 9 N.  | 11 37 E. | 30·16 | 7·1    | —78  | 9·2    | —78  | 32     | S. by W.   |
| Pavia.....      | 44 11 N. | 9 9 E.   | 30·16 | 6·1    | —80  | 6·3    | —80  | 9      | S.E. by E. |

A=Approximate barometric pressure reduced to sea-level.

B=Height in miles of commencement of isothermal column.

C=Temperature, F., at bottom of column.

D=Greatest height of reliable record in miles.

E=Temperature, F., at greatest height.

F=Distance in miles of point where balloon fell.

G=Bearing of falling from starting point.

## THE RAINFALL OF JAMAICA IN NOVEMBER, 1909.

By CARLE SALTER.

IN the February issue of this Magazine we published a note referring to the extraordinary rainfall which occurred in Jamaica during the month of November, 1909, but in the absence of fuller information we were not at that time able to give any details. We have now received a copy of the official report dealing with the meteorology of the month in question, and containing the total rainfall as measured at nearly two hundred stations. These figures we have plotted on a map of the island, with the exception of a few which we have not been able to locate; lines have been drawn in the usual way to indicate the distribution of rainfall for the month, and the map is reproduced here. We have no information respecting the exposure of the instruments, but judging from the smooth way in which the lines run, and the remarkably rare instances in which any figure appeared out of harmony with its neighbours, there can be little doubt that the data may be accepted with confidence as fully comparable one with another. The normal rainfall of Jamaica in November is not a small one, amounting on the average to seven inches, but at many mountain stations much larger falls take place, and at one place, Fellowship, in the east of the island, the average is mentioned as 26·76 in. The rainfall in November, 1909, was, generally speaking, below the average only in the extreme west. It increased steadily towards the east, and more than twenty inches fell over practically the whole of the eastern half of the island. A marked falling off took place towards the coast on all sides and the bulk of the heavy rainfall was concentrated in three large patches in the interior, in each of which more than 30 inches fell. It was in the eastern of these three patches that the most remarkable and destructive downpours took place.

The following is an excerpt from the official report issued by Mr. Maxwell Hall, Government Meteorologist.

The excessive rains were due to a remarkable disturbance between November 4th and 11th. The rains were chiefly confined to the eastern end of the island and to the highest mountains. At Silver Hill, near Hardware Gap, 135 in. were recorded from 4th to 11th, and at Farm Hill, near Radnor, in the same neighbourhood, rather more to the south, 120·87 in. from 1st to 16th, as follows:—

| SILVER HILL.    |       |        | FARM HILL.       |       |        |
|-----------------|-------|--------|------------------|-------|--------|
|                 |       | in.    |                  |       | in.    |
| November 4      | ..... | 6·50   | November 1       | ..... | 3·00   |
| „ 5             | ..... | 21·00  | „ 2              | ..... | ·55    |
| „ 6             | ..... | 30·50  | „ 3              | ..... | ...    |
| „ 7             | ..... | 27·00  | „ 4              | ..... | 4·20   |
| „ 8             | ..... | 18·00  | „ 5              | ..... | 7·70   |
| „ 9             | ..... | 18·00  | „ 6              | ..... | 23·80  |
| „ 10            | ..... | 8·00   | „ 7              | ..... | 28·50  |
| „ 11            | ..... | 6·00   | „ 8              | ..... | 21·00  |
|                 |       |        | „ 9              | ..... | 22·58  |
|                 |       |        | „ 10             | ..... | ...    |
|                 |       |        | „ 11             | ..... | 6·62   |
|                 |       |        | „ 12             | ..... | ..     |
|                 |       |        | „ 13             | ..... | ...    |
|                 |       |        | „ 14             | ..... | 1·45   |
|                 |       |        | „ 15             | ..... | ...    |
|                 |       |        | „ 16             | ..... | 1·47   |
| For 8 days..... |       | 135·00 | For 16 days..... |       | 120·87 |

Referring chiefly to the east end of the island, rain set in from the north during the night of the 4th, and continued till 7th, with a slowly rising barometer. The wind was very strong on 7th and following days, and S.S. *Bradford*, at Port Antonio, and some sloops elsewhere were driven ashore. The rains continued till 12th, with a falling barometer, and the weather then became suddenly fine, not only in Jamaica but throughout this part of the Caribbean Sea.

These excessive rains had disastrous results in the eastern parishes, and there was loss of life and property; the damage to the latter including the destruction of roads, bridges, railways, intakes for water and electric supplies, houses, coffee works, coffee plantations, telegraphs, and even submarine cables. The cable belonging to the Direct West Indian Cable Company, laid about three miles off Bull Bay in about 600 fathoms of water, was broken, probably by landslides, and twisted into knots as it was after the great earthquake of 1907. The West Indian and Panama Telegraph Company's cable was also broken in the same way, and the wires connecting Kingston with Holland Bay being down, Jamaica was for several days isolated. Much of the damage done was by landslides, which blocked the gullies and forced the enormous floods to find a vent by unusual channels. The suggestion is made that these landslides were the result of the earthquake of 1907, since during the hurricanes of October 17th to 19th, 1815, the rainfall among the mountains was probably equally heavy, and there are no notes of landslides occurring on that occasion.

## ROYAL METEOROLOGICAL SOCIETY.

THE first of the afternoon meetings for the present session, which had been postponed on account of the death of His Majesty King Edward VII., was held on Wednesday, May 25th, at 70, Victoria Street, Westminster, Mr. H. Mellish, President, in the chair.

The President moved that a loyal and dutiful address of condolence and homage be presented to King George V., and on the motion being carried the Address was read, the audience standing.

A paper by Mr. W. C. Nash on the "Daily Rainfall at the Royal Observatory, Greenwich, 1841-1903," was read by the Secretary. From his analysis of the 63 years' observations the author found that the day with the maximum number of rain days is December 5th; while the days with the least number of rain days are April 18th, 19th, June 27th and September 13th. There were 94 occasions on which the rainfall exceeded one inch in the day, and 7 of these exceeded two inches in amount, the heaviest fall being 3·666 in. on July 26th, 1867. The recurrence of heavy falls on or about certain days is remarkable; excessive falls having occurred four times on August 23rd, and three times on June 10th, July 11th, August 17th and October 30th.

The following are some of the more important average monthly results :—

| Month.          | Rainfall. | No. of rain days. | Percentage. |                | Mean Fall. |               |
|-----------------|-----------|-------------------|-------------|----------------|------------|---------------|
|                 |           |                   | Rain days.  | Rainless days. | Per day.   | Per rain day. |
|                 | in.       |                   | %           | %              | in.        | in.           |
| January .....   | 1·88      | 14·8              | 47·6        | 52·4           | ·061       | ·128          |
| February .....  | 1·48      | 12·4              | 44·0        | 56·0           | ·052       | ·119          |
| March .....     | 1·49      | 13·2              | 42·4        | 57·6           | ·048       | ·113          |
| April .....     | 1·57      | 12·0              | 40·0        | 60·0           | ·052       | ·131          |
| May .....       | 1·92      | 12·4              | 39·8        | 60·2           | ·062       | ·156          |
| June .....      | 2·02      | 11·6              | 38·7        | 61·3           | ·067       | ·174          |
| July .....      | 2·43      | 12·6              | 40·5        | 59·5           | ·078       | ·193          |
| August .....    | 2·36      | 12·9              | 41·7        | 58·3           | ·076       | ·182          |
| September ..... | 2·16      | 12·3              | 41·1        | 58·9           | ·072       | ·175          |
| October .....   | 2·83      | 15·1              | 48·8        | 51·2           | ·091       | ·187          |
| November .....  | 2·21      | 14·0              | 46·8        | 53·2           | ·074       | ·158          |
| December .....  | 1·84      | 14·2              | 45·8        | 54·2           | ·059       | ·130          |
| Year .....      | 24·19     | 157·5             | 43·1        | 56·9           | ·066       | ·154          |

Mr. Nash said that the fallacy of the popular belief in the "St. Swithin's" legend has been repeatedly pointed out, and has received ample confirmation by the result of this investigation.

An interesting discussion followed, in which Mr. W. W. Bryant, Mr. F. J. Brodie, Mr. C. Salter, Col. H. E. Rawson, Mr. E. Gold. Mr. R. H. Hooker, Mr. J. Hopkinson and the President, took part.

Mr. L. C. W. Bonacina read a paper on "Low Temperature Periods during the Winters of 1908-9 and 1909-10," in which he referred to the remarkable frosts of (1) December, 1908, in the south of England ; (2) March, 1909, in the south of England ; (3) November, 1909, in Scotland and Ireland ; and (4) January, 1910, in Scotland and the north of England. The author's generalisations touching the subject of hard frost are : (a) The lowest temperatures in the United Kingdom occur in the north-east of Scotland in the neighbourhood of Aberdeenshire ; (b) There is no portion of the British Isles, except the Scilly Isles, where the temperature of the air does not occasionally fall below 20° F. ; (c) The severest frosts occur, as a rule, not in anti-cyclonic conditions as commonly supposed, but when the distribution of pressure is irregular and complex and favourable to heavy falls of snow ; and (d) Although the hardest frosts certainly tend to occur in the most inland districts of England, Scotland and Ireland, the relation is frequently to a greater or less extent masked by other factors.

Mr. R. Corless read a paper on "The Rate of Rainfall at Kew in 1908," in which he described a method of obtaining information about the rate of fall of rain from the records obtained from a self-recording rain-gauge of the Beckley, Halliwell, or similar type, which yields a continuous trace showing, by the position of the pen, the amount of rain fallen.

The following new Fellows were elected :—Mr. A. D. Linklater, Capt. A. C. Scott, R.N., Mr. T. V. Staton, Mr. C. Stoeckel, M.A., Mr. T. Taylor, and Mr. C. Wilkinson.

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## Correspondence.

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

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### HALLEY'S COMET AND THE ATMOSPHERE.

AT the suggestion of Mr. Cave, a series of balloon ascents was arranged by the President of the International Commission in connection with the passage of the earth through the tail of Halley's comet.

Owing to the fortunate prevalence of a S.E. current of air, most of the balloons sent up from Ditcham Park and Pyrton Hill have been found, and I have examined cursorily ten records obtained between May 17th and 21st. As Mr. Cave, and, I think, most of us expected, the result is a negative one. The records show the average conditions of temperature up to 10 miles height, the approximate values above six miles ranging from —60° F. to —80° F., but very rapid fluctuations of temperature within these limits were occurring. These fluctuations, though unusual, have been noted on several previous

occasions ; and are, perhaps, to be ascribed to the thunderstorms and generally disturbed condition of the weather that prevailed during the week.

It appears that owing to our ignorance as to the amount of curvature in the comet's tail, we do not know the precise time of the earth passage through it ; the balloons were sent up at 7 a.m. and 9 p.m. on Wednesday ; at 2 a.m., 7 a.m. and 7 p.m. on Thursday ; and at 7 a.m. on Friday.

W. H. DINES.

*Pyrton Hill, Watlington, Oxon.*

### FIREBALL IN SUNSHINE ON MAY 10th.

THE brilliant fireball which appeared on October 6th, 1909, at 9.40 a.m., and formed quite a conspicuous feature even in the presence of the sun, was referred to in *Symons's Magazine* for October and November last. An object of similar character has now to be chronicled, for on May 10th, at 7.52 a.m., many observers were surprised by the appearance of an almost dazzlingly luminous meteor sailing across the sunlit sky with a somewhat slow motion. Its head formed an elongated mass of flame—several of the spectators describe it as kite-shaped—of a bluish colour, and a stream of red sparks followed it.

Descriptions of the fireball have been received from 16 places, chiefly in the Midlands, and among these may be mentioned Leeds, Lichfield, Birmingham, Walsall, Hereford, Fordham in Cambridgeshire, Alderley Edge, Cheshire, Tunstall, Staffordshire, Ferry Bridge, Yorks, &c.

But the accounts are for the most part vague and incomplete, so that it is difficult to derive the real height and direction of the phenomenon. The meteor could not have been a fragment of Halley's comet, though the earth was comparatively near the comet's orbit at the time, for the radiant point of the latter was in due south altitude about 38 degrees and the luminous flight, as approximately recorded, is not in conformity with this position.

Even at night, with a myriad stars affording useful reference points, it is often impossible to accurately record the apparent paths of meteors, but in the daytime with only the sun and blue expanse visible it is incomparably more difficult.

It is certain, however, that the meteor of May 10th passed over the counties of York or Lincoln to Lancashire.

Readers of your Magazine who witnessed its descent may be able to describe its position and enable the details of its course in the air to be correctly deduced.

W. F. DENNING.

*Bristol, May, 18th, 1910.*

P.S., June 10th.—The probable height of the fireball was 83 to 32 miles, descending along a path of 100 miles, at a velocity of 17 miles per second. The radiant point was near the bright star Capella in Auriga.



## THE LATEST WINTER SNOW SPOT IN ENGLAND AND WALES.

I WONDER where the above spot exists. I have investigated the Snowdonian Range for several years, and find it, not at Snowdon, the highest mountain on the range, but at a place near Carned Llewelyn, 500 ft. lower than Snowdon, in a gully locally known as "Y ffaes ddyfn" (The deep cut). The conditions for the accumulation of snow at Carned Llewelyn, like that for rain at Snowdon, are unique, viz. :— High elevation of 3,000 ft., a large gathering ground, the fact that the drift is blown during every snowstorm towards the gully from all points except S.E., and that the gully or cut is situated on the



THE SNOW-SPOT ON CARNED LLEWELYN.

edge of the sloping ground, with the result that the accumulation of the winter drifts lasts generally into July, being, as a rule, a month later than those at Snowdon. The only unfavourable factor, and that a very powerful one, is that the snow faces the sun most of the day in spring and summer. Except for this, I believe it would last until August, and some years all the year round.

As a great height is not the only feature for a late snow, perhaps there are spots existing in Cumberland or other places in England where similar favourable conditions prevail as at Carned Llewelyn, with the extra advantage of being in the sun-shade ; and as summer

is now well advanced, would it not be possible to ascertain through your Magazine the date of the disappearance of the last winter accumulation in the English heights?

I was on the summit of Carned Llewelyn on Whit Monday last, 16th May, and found the gully nearly full, the quantity remaining being larger than usual in the middle of May, and from its present appearance from a distance on this date (June 1st), will last with average weather another four or six weeks. Most likely there are some drifts still on the English heights, and before the summer is over, I am sure the readers of this Magazine will be greatly interested to know the dates for comparison of the last disappearances at various places in the country. For this purpose, I will keep my eye on the Welsh spot: will English friends do the same in England? I hope that this question will be solved even in the July number.

J. R. GETHIN JONES.

*Bodgethin, Dolgarog, Taly Cafn, June 1st, 1910.*

## DEW PONDS.

IN his interesting contribution to your Magazine of last month on the subject of Dew-ponds, Mr. Herbert Gibson says: "The term dew-pond is a misnomer. It is a rain-pond. It might with propriety be called a down pond."

Those who in recent years have interested themselves in the subject, will doubtless agree with Mr. Gibson that the term down-pond is appropriate, while that of dew-pond is not; but is the supply of water to these ponds attributable solely to rain?

I suggest that the humid equatorial winds which blow in front of advancing depressions add largely to the supply. Upon a ship at sea the equatorial wind deposits a considerable amount of moisture, so much at times that from the cool surfaces of iron, polished wood, &c., exposed on deck the water drips quite freely. This may occur in daytime as well as at night. The same obtains on land, although in a less degree perhaps. Even if the water in a dew-pond were much warmer in the night than the surrounding air—a premise which Mr. Gibson thinks may be accepted without proof—the deposit of moisture from vapour-laden air upon the water surely is not impossible. But is the water always warmer than the air? I think not, because the wind circulating in front of a depression is a warm wind, and the temperature of the water at the surface of a comparatively shallow pond is readily cooled.

CAMPBELL HEPWORTH.

*2, Amherst Road, Castle Bar, Ealing, W., May 16th, 1910.*



## METEOROLOGICAL NEWS.

THE ROYAL METEOROLOGICAL SOCIETY is arranging a Meteorological Section in the Agricultural Education Exhibition at the Royal Agricultural Society's Show, which is to be held at Liverpool, from Tuesday to Saturday, June 21st to 25th. At the Climatological station in connection with this section, an address on a meteorological subject will be given each day, at 3 p.m., by Mr. W. Marriott, which will be followed by the ascent of a registering-balloon. It is probable that similar balloons will be sent up at the same time at Pyrton Hill, Oxfordshire, and the University, Manchester. We hope that rainfall observers visiting the Show will not fail to inspect the Meteorological Section; and if they make themselves known to Mr. Marriott or his assistants, we are sure that any matters of special interest to them will be fully and courteously explained.

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### THE THUNDERSTORMS OF JUNE 5th—9th, 1910.

WHILE going to press we are receiving a mass of correspondence dealing with the disturbed weather conditions of this June, much of which we should have printed in full, but which we are obliged at the last moment to touch on very briefly.

At almost any time from June 5th to 9th thunderstorms seem to have been in progress in some part of the south of England. So far as we can gather, the main characteristic of the storms lay in the violence of the thunder and lightning; the rainfall appears to have been very heavy only at isolated spots. The storms of the night of the 5th to 6th affected chiefly the south-east of the country, and a great many instances of damage by lightning were reported from Sussex, where the storm lasted from eight to ten hours, and was accompanied by a severe north-east gale. More than an inch of rain fell at Horsham (1·78 in.), Brighton, Hoddington, Bath, North Cadbury, Clifton and Wraxall. On the 7th the chief disturbances took place in the neighbourhood of the Thames Valley, where, at many places, three distinct thunderstorms occurred. Extremely heavy rain also fell at Whatlington, near Battle, where Miss Gripper writes that 2·84 in. fell in about three hours. At Wantage the lightning struck a field tearing up the ground for some yards. The most remarkable rainfalls were:—Battle, 2·84 in.; Hoddington, 2·02 in.; Wantage, 1·77 in.; Swerford, 1·26 in.; Fairford, 2·07 in.; Stow-on-the-Wold, 3·55 in.; Hidecote, 1·39 in., and Mickleton, 1·05 in. On 9th 2·50 in. of rain, accompanied by hail stones as large as walnuts, fell in an hour and 10 minutes at Caversham, causing much flooding. At Pyrton Hill 1·93 in. fell, and 1·48 in. at Forest Row, and there was much damage by lightning and hail. A newspaper reports 4·55 in. of rain in 4½ hours at Wheatley, in Oxfordshire.

## WIND WAVES IN WATER, SAND AND SNOW.

(Continued.)

Dr. Cornish explained and defended the statement of navigators that waves from 80 to 100 feet high had been encountered in the North Atlantic. He said the observations were usually made quite conscientiously by the officers on the great liners and the distorted height was due to several causes. The ship might be ploughing through a very heavy sea and be in the trough of a huge wave when it strikes the vessel. The added upward tendency thus given to the mass of rising water has sometimes caused it to damage the look-out tower, which under normal conditions would perhaps be 80 feet above sea level, and so the navigator is led to believe the wave far steeper than it really is.

In his second lecture on Waves in Sand, Dr. Cornish said they were always of a forced nature and could only move so long as the wind or water producing them continues its action. In showing some pictures of sand waves along the Lancashire coast, the lecturer said that he had found that the ratio of length to height was 18 to 1 and it was interesting to note that this ratio was the same with the great sand waves caused by the strong desert winds. These great sand waves, or *dunes*, are composed of the heavier sand of the desert, for neither the dust nor the small stones are easily piled into great dunes. They sometimes attain a height of several hundred feet with a steep slope on the lee side and a gentle slope on the weather side. A tremendous vertical wind circulation about a horizontal axis takes place on the lee side and this is entirely responsible for the steeper gradient on that side. The veering of the wind sometimes causes the dunes to alter their formation until they appear of confused shape but Dr. Cornish when measuring over a large and apparently confused area, found that the average ratio of length to height of 18 to 1 was maintained, the deficiency in some cases being exactly balanced by the excess in others. Some remarkable pictures showed sand waves in a brook moving up-stream when both the sand particles and the water were running down stream. In this case sand is ever being added on the weather side and depleted on the leeward side of the wave.

In his lecture on Waves in Snow, Dr. Cornish stated that snow might be classed under two heads:—(1). That which falls at a temperature of 32° F or thereabouts, which is the variety generally experienced in great Britain, and (2) that which falls at or below zero F. The first variety—owing to its adhesive nature—is not easily rippled, but the striking feature about the waves when formed is that the steep side invariably faces the wind. This peculiarity is often observed in the snow drifts of the Scottish Highlands. Dr. Cornish traversed Canada in winter, in order to study the dry sand waves, for on the Canadian prairie the snow is usually of the second variety. His most noteworthy observations were made in the Selkirk

Mountains of British Columbia. Snow waves were observed travelling at such a rate as to make their movement quite perceptible to the eye. The ratio of length to height of these snow waves is about 40 to 1, thus they are about half the steepness of the sand waves. A striking fact is that when the wind drops the snow sets hard and the wave formation is simultaneously stopped. This, in a great measure, accounts for the fact that snow does not pile intself into great dunes like the sand of the African desert, although a good deal of slipping goes on which also materially prevents the growth of the waves. Dr. Cornish said that snow never falls for more than a few minutes in any particular way. There is usually a lull probably followed by an accelerated fall. During the lull a wind springs up which marks or ripples the snow, and when the wind ceases this marking sets. Thus the second fall of snow does not fall on a level, but on a hard and rippled surface. This latter fall is in turn rippled and sets, and thus goes on a process of stratification which often continues for a considerable time with most interesting and striking results. While in Winnipeg, the lecturer had observed snow falling heavily on the prairie to the north of the town, accompanied by a stiff N. breeze which in the usual way would have caused extensive drifting outside the town. In the town no snow had fallen and business proceeded without hindrance, but on the southern side snow fell gently. The atmosphere had a strange appearance, and it was obvious that ice particles were passing over the town. Careful observation showed that the snow on the northern side was gently wafted upward by the breeze—probably aided by a warm upper current of air—and passed right over the town, falling again when reaching the colder air on the southern side. Dr. Cornish observed that snow drifts in the neighbourhood of obstacles assumed various shapes while the eddy-space was being filled, but when sufficient snow had fallen to fill the space, the vertical section of the drift was always fish-shaped with a blunt head and tapering tail, this being the form of least eddy-making resistance. In the Selkirk mountains the annual snow fall amounts to about 50 feet, and not infrequently as much as one foot falls in an hour.

Dr. Cornish concluded his lecture with some remarks on cloud ripples, and in showing the negative of one picture pointed out the striking similarity with the sand ripples discussed in his second lecture. The blue sky between the clouds—not the clouds themselves—is the true aërial ripplemark.

The lectures were largely attended, and at the close Sir George Darwin warmly thanked Dr. Cornish for his very interesting and instructive discourses.

H.E.C.



## THE WEATHER OF MAY.

By FRED. J. BRODIE.

EXCEPTING in the fourth week the weather was influenced almost entirely by cyclonic systems, which appeared, in the first instance, off our northern coasts, and, subsequently over the more southern parts. One of the most striking features was the frequency of thunderstorms, which occurred in one place or another almost every day. At the commencement, when a mild south-westerly breeze extended over the north, the thermometer rose to  $65^{\circ}$  in the north-east of England and the north and east of Scotland; the readings in the south being at the same time mostly below  $60^{\circ}$ . Later on, in the rear of depressions which moved from Iceland to Scandinavia, cool winds from between west and north-west prevailed, with showers of hail or sleet and frequent thunderstorms, especially in England. A sharp ground frost occurred rather extensively between the nights of the 2nd and 4th, the exposed thermometer falling to a minimum of  $21^{\circ}$  at Crathes,  $22^{\circ}$  at Llangammarch Wells, and  $23^{\circ}$  at Sheffield, Hereford and Cambridge. On the 8th and 9th, when the wind veered temporarily to the northward, a keener frost was experienced, shade temperatures of  $5^{\circ}$  to  $7^{\circ}$  below freezing being recorded in many places, and a reading as low as  $22^{\circ}$  at West Linton. On the grass the minima were as low as  $18^{\circ}$  at Cambridge,  $19^{\circ}$  at Hereford, and  $20^{\circ}$  at Birmingham, Rauceby, and Llangammarch Wells.

Between the 12th and 19th the weather was mainly easterly, the British Islands lying about midway between an anticyclone, which hovered between northern Russia and the oceanic region lying between Iceland and Scandinavia, and a large area of low pressure which spread up from southern Europe. The thermometer was at first low, but afterwards rose gradually in all but our north-eastern districts, where the east wind, blowing in from the sea, produced much fog and mist and a continued low temperature, the daily maxima being in many cases very little above  $50^{\circ}$ . In the west the weather on the 16th and 17th was much warmer than in the east, or even in the south, the thermometer exceeding  $70^{\circ}$  in several places, and reaching  $75^{\circ}$  at Bettws-y-Coed and  $78^{\circ}$  at Killarney. A day or two later a shift of wind from east to south-east resulted in the extension of warm air from the Continent, the thermometer on the 20th rising to between  $75^{\circ}$  and  $80^{\circ}$  in many parts of England. On our north-east coasts the maximum temperatures on the same day were about  $30^{\circ}$  lower than in the inland districts. In the fourth week the conditions were mainly anticyclonic, the days fairly warm, but the nights cold, with a ground frost in many districts on the 25th and 26th. On the 23rd and 24th shade temperatures of  $75^{\circ}$  were registered in several places. After about the 27th cyclonic systems began to skirt our northern coasts, and cool westerly winds set in, with showery thundery weather. The mean temperature was rather above the average in the south, and rather below the average in the north and east. Bright sunshine was below normal only in the south-west.

## RAINFALL TABLE FOR MAY, 1910.

| STATION.                       | COUNTY.                      | Lat.<br>N.<br>° / | Long.<br>W.<br>[*E.]<br>° / | Height<br>above<br>Sea.<br>ft. | RAINFALL<br>OF MONTH.          |              |
|--------------------------------|------------------------------|-------------------|-----------------------------|--------------------------------|--------------------------------|--------------|
|                                |                              |                   |                             |                                | Aver.<br>1875—<br>1909.<br>in. | 1910.<br>in. |
| Camden Square.....             | <i>London</i> .....          | 51 32             | 0 8                         | 111                            | 1.75                           | 2.22         |
| Tenterden.....                 | <i>Kent</i> .....            | 51 4              | *0 41                       | 190                            | 1.65                           | 2.47         |
| Steyning .....                 | <i>Sussex</i> .....          | 50 53             | 0 20                        | 80                             | 1.93                           | 2.84         |
| Southampton (Cadland) ...      | <i>Hampshire</i> .....       | 50 50             | 1 22                        | 52                             | 1.96                           | 1.48         |
| Hitchin .....                  | <i>Hertfordshire</i> .....   | 51 57             | 0 17                        | 238                            | 1.93                           | 2.49         |
| Oxford (Magdalen College)..    | <i>Oxfordshire</i> .....     | 51 45             | 1 15                        | 186                            | 1.81                           | 1.53         |
| Bury St. Edmunds (Westley)     | <i>Suffolk</i> .....         | 52 15             | *0 40                       | 226                            | 1.93                           | 2.78         |
| Geldeston [Beccles].....       | <i>Norfolk</i> .....         | 52 27             | *1 31                       | 38                             | 1.78                           | 3.91         |
| Polapit Tamar [Launceston]     | <i>Devon</i> .....           | 50 40             | 4 22                        | 315                            | 2.08                           | 2.66         |
| Rousdon [Lyme Regis] .....     | " .....                      | 50 41             | 3 0                         | 516                            | 2.02                           | 3.08         |
| Stroud (Upfield) .....         | <i>Gloucestershire</i> ..... | 51 44             | 2 13                        | 226                            | 2.10                           | 1.35         |
| Church Stretton (Wolstaston).. | <i>Shropshire</i> .....      | 52 35             | 2 48                        | 800                            | 2.64                           | 2.53         |
| Coventry (Kingswood) .....     | <i>Warwickshire</i> .....    | 52 24             | 1 30                        | 340                            | 2.15                           | 2.06         |
| Market Overton .....           | <i>Rutland</i> .....         | 52 44             | 0 41                        | 475                            | 2.13                           | 3.21         |
| Boston .....                   | <i>Lincolnshire</i> .....    | 52 58             | 0 1                         | 25                             | 1.80                           | 2.82         |
| Worksop (Hodsock Priory).      | <i>Nottinghamshire</i> ..... | 53 22             | 1 5                         | 56                             | 2.08                           | 2.19         |
| Macclesfield .....             | <i>Cheshire</i> .....        | 53 15             | 2 7                         | 501                            | 2.43                           | 2.24         |
| Southport (Hesketh Park)..     | <i>Lancashire</i> .....      | 53 38             | 2 59                        | 38                             | 2.13                           | 2.32         |
| Wetherby (Ribston Hall) ...    | <i>Yorkshire, W.R.</i> ..... | 53 59             | 1 24                        | 130                            | 2.09                           | 2.44         |
| Arneliffe Vicarage .....       | " .....                      | 54 8              | 2 6                         | 732                            | 3.55                           | 3.25         |
| Hull (Pearson Park) .....      | " <i>E.R.</i> .....          | 53 45             | 0 20                        | 6                              | 1.98                           | 1.90         |
| Newcastle (Town Moor) ...      | <i>Northumberland</i> .....  | 54 59             | 1 38                        | 201                            | 2.04                           | 2.64         |
| Borrowdale (Seathwaite) ...    | <i>Cumberland</i> .....      | 54 30             | 3 10                        | 423                            | 7.50                           | 7.96         |
| Cardiff (Ely).....             | <i>Glamorgan</i> .....       | 51 29             | 3 13                        | 53                             | 2.56                           | 3.36         |
| Haverfordwest (High Street)    | <i>Pembroke</i> .....        | 51 48             | 4 58                        | 95                             | 2.62                           | 2.40         |
| Aberystwyth (Gogerddan)..      | <i>Cardigan</i> .....        | 52 26             | 4 1                         | 83                             | 2.63                           | 1.90         |
| Llandudno .....                | <i>Carnarvon</i> .....       | 53 20             | 3 50                        | 72                             | 1.86                           | 2.23         |
| Cargen [Dumfries] .....        | <i>Kirkcudbright</i> .....   | 55 2              | 3 37                        | 80                             | 2.87                           | 2.92         |
| Marchmont House .....          | <i>Berwick</i> .....         | 55 44             | 2 24                        | 498                            | 2.53                           | 1.60         |
| Girvan (Pinmore).....          | <i>Ayr</i> .....             | 55 10             | 4 49                        | 207                            | 2.97                           | 2.73         |
| Glasgow (Queen's Park) ...     | <i>Renfrew</i> .....         | 55 53             | 4 18                        | 144                            | 2.40                           | 1.78         |
| Inveraray (Newtown) .....      | <i>Argyll</i> .....          | 56 14             | 5 4                         | 17                             | 3.53                           | 3.58         |
| Mull (Quinish).....            | " .....                      | 56 36             | 6 13                        | 35                             | 2.99                           | 2.90         |
| Dundee (Eastern Necropolis)    | <i>Forfar</i> .....          | 56 28             | 2 57                        | 199                            | 2.05                           | 1.36         |
| Braemar .....                  | <i>Aberdeen</i> .....        | 57 0              | 3 24                        | 1114                           | 2.33                           | 1.25         |
| Aberdeen (Cranford) .....      | " .....                      | 57 8              | 2 7                         | 120                            | 2.40                           | 2.55         |
| Cawdor .....                   | <i>Nairn</i> .....           | 57 31             | 3 57                        | 250                            | 2.07                           | 1.73         |
| Fort Augustus (S. Benedict's)  | <i>E. Inverness</i> .....    | 57 9              | 4 41                        | 68                             | 2.36                           | 3.52         |
| Loch Torridon (Bendamph)       | <i>W. Ross</i> .....         | 57 32             | 5 32                        | 20                             | 4.54                           | 6.62         |
| Dunrobin Castle .....          | <i>Sutherland</i> .....      | 57 59             | 3 56                        | 14                             | 2.19                           | 2.98         |
| Wick .....                     | <i>Caithness</i> .....       | 58 26             | 3 6                         | 77                             | 2.04                           | 2.09         |
| Killarney (District Asylum)    | <i>Kerry</i> .....           | 52 4              | 9 31                        | 178                            | 3.05                           | 3.34         |
| Waterford (Brook Lodge)...     | <i>Waterford</i> .....       | 52 15             | 7 7                         | 104                            | 2.33                           | 1.63         |
| Nenagh (Castle Lough)...       | <i>Tipperary</i> .....       | 52 54             | 8 24                        | 120                            | 2.51                           | 2.23         |
| Miltown Malbay.....            | <i>Clare</i> .....           | 52 52             | 9 26                        | 400                            | 2.57                           | 2.73         |
| Gorey (Courtown House) ..      | <i>Wexford</i> .....         | 52 40             | 6 13                        | 80                             | 2.24                           | 1.27         |
| Abbey Leix (Blandsfort)....    | <i>Queen's County</i> .....  | 52 56             | 7 17                        | 532                            | 2.43                           | 2.35         |
| Dublin (Fitz William Square)   | <i>Dublin</i> .....          | 53 21             | 6 14                        | 54                             | 2.07                           | 2.55         |
| Mullingar (Belvedere) .....    | <i>Westmeath</i> .....       | 53 29             | 7 22                        | 367                            | 2.51                           | 2.26         |
| Ballinasloe .....              | <i>Galway</i> .....          | 53 20             | 8 15                        | 160                            | 2.58                           | 1.72         |
| Crossmolina (Enniscoe).....    | <i>Mayo</i> .....            | 54 4              | 9 18                        | 74                             | 3.17                           | 3.13         |
| Collooney (Markree Obsy.)..    | <i>Sligo</i> .....           | 54 11             | 8 27                        | 127                            | 2.80                           | 3.89         |
| Seaforde .....                 | <i>Down</i> .....            | 54 19             | 5 50                        | 180                            | 2.72                           | 2.15         |
| Bushmills (Dundarave) .....    | <i>Antrim</i> .....          | 55 12             | 6 30                        | 162                            | 2.37                           | 2.43         |
| Omagh (Edenfel).....           | <i>Tyrone</i> .....          | 54 36             | 7 18                        | 280                            | 2.66                           | 2.71         |

## RAINFALL TABLE FOR MAY, 1910—continued.

| RAINFALL OF MONTH (con.) |          |                   |             |                  | 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.    |                        |          |
| + 47                     | 127      | 52 18             | 19          | 8.68             | 9.96                  | +1.28                | 115      | 25.11  | Camden Square          |          |
| + 82                     | 150      | 39 2              | 18          | 9.41             | 12.03                 | +2.62                | 128      | 27.64  | Tenterden              |          |
| + 91                     | 147      | 47 18             | 16          | 11.61            | 16.35                 | +4.74                | 141      | 33.58  | Steyning               |          |
| - 48                     | 75       | 23 12             | 16          | 11.14            | 11.77                 | + .63                | 106      | 31.87  | Cadland                |          |
| + 56                     | 129      | 36 18             | ...         | 8.61             | 10.15                 | +1.54                | 118      | 25.16  | Hitchin                |          |
| - 28                     | 85       | 24 11             | 19          | 8.33             | 8.38                  | + .05                | 101      | 24.58  | Oxford                 |          |
| + 85                     | 144      | 41 14             | 19          | 8.55             | 10.35                 | +1.80                | 121      | 25.40  | Westley                |          |
| +2.13                    | 219      | 93 14             | 18          | 7.84             | 10.36                 | +2.52                | 132      | 23.73  | Geldeston              |          |
| + 58                     | 128      | 47 17             | 17          | 13.70            | 19.63                 | +5.93                | 144      | 38.27  | Polapit Tamar          |          |
| +1.06                    | 152      | 92 17             | 18          | 12.15            | 12.58                 | + .43                | 104      | 33.54  | Rousdon                |          |
| - 75                     | 64       | 30 28             | 17          | 10.65            | 10.54                 | - .11                | 99       | 29.81  | Stroud                 |          |
| - 11                     | 96       | 35 18             | 18          | 11.71            | 10.96                 | - .75                | 94       | 32.41  | Wolstaston             |          |
| - 09                     | 96       | 46 21             | 17          | 10.23            | 9.57                  | - .66                | 94       | 28.98  | Coventry               |          |
| +1.08                    | 151      | 72 18             | 21          | 9.42             | 10.83                 | +1.41                | 115      | 27.10  | Market Overton.        |          |
| +1.02                    | 157      | 68 8              | 17          | 7.91             | 9.12                  | +1.21                | 115      | 23.35  | Boston                 |          |
| + 11                     | 105      | 46 15             | 18          | 8.74             | 7.93                  | - .81                | 91       | 24.46  | Hodsock Priory         |          |
| - 19                     | 92       | 42 6              | 17          | 11.91            | 13.35                 | +1.44                | 112      | 34.73  | Macclesfield           |          |
| + 19                     | 109      | 43 15             | 17          | 10.70            | 12.25                 | +1.55                | 114      | 32.70  | Southport              |          |
| + 35                     | 117      | 43 5              | 19          | 9.46             | 12.89                 | +3.43                | 136      | 26.87  | Ribston Hall           |          |
| - 30                     | 92       | 83 5              | 18          | 23.59            | 31.60                 | +8.01                | 134      | 61.49  | Arncliffe              |          |
| - 08                     | 96       | 27 5†             | 17          | 8.99             | 8.24                  | - .75                | 92       | 26.42  | Hull                   |          |
| + 60                     | 129      | 44 31             | 23          | 9.51             | 11.21                 | +1.70                | 118      | 27.94  | Newcastle              |          |
| + 46                     | 106      | 1.81 30           | 20          | 49.44            | 64.53                 | +15.09               | 130      | 129.48 | Seathwaite             |          |
| + 80                     | 131      | 57 19             | 21          | 14.67            | 19.06                 | +4.39                | 130      | 42.28  | Cardiff                |          |
| - 22                     | 92       | 37 30             | 18          | 16.71            | 15.53                 | -1.18                | 93       | 46.82  | Haverfordwest          |          |
| - 73                     | 72       | 36 3              | 19          | 15.15            | 18.24                 | +3.09                | 120      | 45.46  | Gogerddan              |          |
| + 37                     | 120      | 35 15             | 20          | 10.40            | 13.86                 | +3.46                | 133      | 30.36  | Llandudno              |          |
| + 05                     | 102      | 49 15             | 11          | 16.22            | 22.39                 | +6.17                | 138      | 43.47  | Cargen                 |          |
| - 93                     | 63       | 42 11             | 14          | 12.00            | 9.98                  | -2.02                | 83       | 33.76  | Marchmont              |          |
| - 24                     | 92       | 45 8              | 16          | 18.05            | 23.87                 | +5.82                | 132      | 49.77  | Girvan                 |          |
| - 62                     | 74       | 32 12             | 15          | 13.10            | 16.08                 | +2.98                | 123      | 35.97  | Glasgow                |          |
| + 05                     | 101      | 56 6, 29          | 20          | 25.68            | 32.63                 | +6.95                | 127      | 68.67  | Inveraray              |          |
| - 09                     | 97       | 53 4              | 21          | 20.25            | 24.04                 | +3.79                | 119      | 56.57  | Quinish                |          |
| - 69                     | 66       | 52 8              | 11          | 9.96             | 8.19                  | -1.77                | 82       | 28.64  | Dundee                 |          |
| -1.08                    | 54       | ...               | ...         | 12.97            | 16.31                 | +3.34                | 126      | 34.93  | Braemar                |          |
| + 15                     | 106      | 46 18             | 18          | 12.00            | 11.77                 | - .23                | 98       | 32.73  | Aberdeen               |          |
| - 34                     | 84       | 34 11             | 12          | 10.38            | 12.99                 | +2.61                | 125      | 29.33  | Cawdor                 |          |
| +1.16                    | 149      | 82 30             | 15          | 18.15            | 23.99                 | +5.84                | 132      | 44.53  | Fort Augustus          |          |
| +2.08                    | 146      | 1.35 4            | 17          | 33.32            | 44.63                 | +11.31               | 134      | 83.61  | Bendamp                |          |
| + 79                     | 136      | 46 14             | 20          | 12.18            | 11.91                 | - .27                | 98       | 31.90  | Dunrobin Castle        |          |
| + 05                     | 102      | 25 8, 27          | 19          | 10.88            | 11.81                 | + .93                | 109      | 29.88  | Wick                   |          |
| + 29                     | 110      | 71 18             | 19          | 21.95            | 28.39                 | +6.44                | 129      | 54.81  | Killarney              |          |
| - 70                     | 70       | 41 18             | 15          | 14.61            | 12.61                 | -2.00                | 86       | 39.57  | Waterford              |          |
| - 28                     | 89       | 41 18             | 18          | 14.81            | 19.89                 | +5.08                | 134      | 39.43  | Castle Lough           |          |
| + 16                     | 106      | 35 18             | 21          | 15.59            | 19.14                 | +3.55                | 123      | 45.11  | Miltown Malbay         |          |
| - 97                     | 57       | 20 3, 18          | 15          | 12.83            | 11.36                 | -1.47                | 89       | 34.99  | Courtown Ho.           |          |
| - 08                     | 97       | 62 18             | 18          | 13.26            | 16.67                 | +3.41                | 126      | 35.92  | Abbey Leix             |          |
| + 48                     | 123      | 37 18             | 21          | 10.15            | 12.42                 | +2.27                | 122      | 27.68  | Dublin                 |          |
| - 25                     | 90       | 35 30             | 13          | 13.29            | 15.88                 | +2.59                | 119      | 36.14  | Mullingar.             |          |
| - 86                     | 67       | 29 30             | 19          | 13.46            | 15.64                 | +2.18                | 116      | 36.64  | Ballinasloe            |          |
| + 04                     | 99       | 37 7, 15          | 21          | 20.21            | 25.09                 | +4.96                | 124      | 52.87  | Enniscoe               |          |
| +1.09                    | 139      | 53 15             | 20          | 15.72            | 22.71                 | +6.99                | 144      | 42.71  | Markree                |          |
| - 57                     | 79       | 31 15             | 18          | 14.54            | 13.46                 | -1.08                | 93       | 38.91  | Seaforde               |          |
| + 06                     | 103      | 57 3              | 19          | 12.93            | 16.85                 | +3.92                | 130      | 37.56  | Dundarave              |          |
| + 05                     | 102      | 42 20             | 18          | 14.28            | 17.75                 | +3.47                | 124      | 39.38  | Omagh                  |          |



## SUPPLEMENTARY RAINFALL, MAY, 1910.

| Div.  | STATION.                     | Rain<br>inches | Div.   | STATION.                    | Rain.<br>inches |
|-------|------------------------------|----------------|--------|-----------------------------|-----------------|
| II.   | Warlingham, Redvers Road     | 2.61           | XI.    | Llangyhanfal, Plâs Draw.... | 2.16            |
| "     | Ramsgate .....               | 4.11           | "      | Dolgelly Bryntirion .....   | 3.90            |
| "     | Hailsham .....               | 2.47           | "      | Bettws-y-Coed, Tyn-y-bryn   | 3.00            |
| "     | Totland Bay, Aston House.    | 1.24           | "      | Lligwy .....                | 2.50            |
| "     | Stockbridge, Ashley .....    | 1.81           | "      | Douglas, Woodville .....    | ...             |
| "     | Grayshott.....               | 2.15           | XII.   | Stoneykirk, Ardwell House   | 2.25            |
| "     | Reading, Calcot Place.....   | 1.55           | "      | Dalry, The Old Garroch ...  | 3.13            |
| III.  | Harrow Weald, Hill House.    | 2.44           | "      | Langholm, Drove Road.....   | 2.43            |
| "     | Pitsford, Sedgebrook .....   | 2.32           | "      | Moniaive, Maxwellton House  | 2.26            |
| "     | Huntingdon, Brampton.....    | 2.90           | XIII.  | St.Mary's Loch, CramiltLdge | 2.03            |
| "     | Woburn, Milton Bryant.....   | 2.59           | "      | Edinburgh, Royal Observty.  | 1.46            |
| "     | Wisbech, Monica Road.....    | 2.87           | XIV.   | Maybole, Knockdon Farm..    | 3.26            |
| IV.   | Southend Water Works.....    | 3.34           | XV.    | Campbeltown, Witchburn...   | 3.85            |
| "     | Colchester, Lexden.....      | 2.49           | "      | Glenreasdell Mains.....     | 3.43            |
| "     | Newport .....                | 2.49           | "      | Ballachulish House.....     | 4.81            |
| "     | Rendlesham .....             | 3.03           | "      | Islay, Fallabus .....       | 2.96            |
| "     | Swaffham .....               | 3.12           | XVI.   | Dollar Academy .....        | .87             |
| "     | Blakeney .....               | 2.24           | "      | Balquhidder, Stronvar ..... | 2.83            |
| V.    | Bishops Cannings .....       | 1.86           | "      | Coupar Angus .....          | 1.37            |
| "     | Winterbourne Steepleton ..   | 2.48           | "      | Blair Atholl.....           | .82             |
| "     | Ashburton, Druid House ..    | 3.31           | "      | Montrose, SunnysideAsylum   | 2.37            |
| "     | Honiton, Combe Raleigh ...   | 2.79           | XVII.  | Alford, Lynturk Manse ...   | 2.55            |
| "     | Okehampton, Oaklands.....    | 3.34           | "      | Keith Station .....         | 1.07            |
| "     | Hartland Abbey .....         | 2.47           | XVIII. | Glenquoich, Laon .....      | 13.20           |
| "     | Lynmouth, Rock House ..      | 2.93           | "      | Skye, Dunvegan.....         | 5.29            |
| "     | Probus, Lamellyn .....       | 2.14           | "      | N. Uist, Lochinaddy .....   | 3.19            |
| "     | North Cadbury Rectory ..     | 2.16           | "      | Alvey Manse .....           | .94             |
| VI.   | Clifton, Pembroke Road ...   | 1.98           | "      | Loch Ness, Drumnadrochit.   | 2.86            |
| "     | Ross, The Graig .....        | 1.52           | "      | Glen carron Lodge .....     | 6.60            |
| "     | Shifnal, Hatton Grange.....  | 1.62           | "      | Fearn, Lower Pitkerrie..... | .72             |
| "     | Blockley, Upton Wold .....   | 2.07           | XIX.   | Invershin .....             | 2.66            |
| "     | Worcester, Boughton Park.    | 1.32           | "      | Altnaharra .....            | 2.29            |
| VII.  | Market Rasen .....           | 2.79           | "      | Bettyhill .....             | 1.97            |
| "     | Bawtry, Hesley Hall.....     | 1.94           | XX.    | Dunmanway, The Rectory..    | 2.12            |
| "     | Derby, Midland Railway ...   | 2.43           | "      | Cork .....                  | 1.65            |
| "     | Buxton.....                  | 2.93           | "      | Mitchelstown Castle .....   | 3.56            |
| VIII. | Nantwich, Dorfold Hall.....  | 2.32           | "      | Darrynane Abbey .....       | 3.75            |
| "     | Liscard .....                | 2.37           | "      | Glenam [Clonmel] .....      | 2.93            |
| "     | Chatburn, Middlewood .....   | 2.61           | "      | Nenagh, Traverston .....    | 2.70            |
| "     | Cartmel, Flookburgh .....    | 2.50           | "      | Newmarket-on-Fergus, Fenloe | ...             |
| IX.   | Langsett Moor, Up. Midhope   | 4.23           | XXI.   | Laragh, Glendalough .....   | 3.27            |
| "     | Scarborough, Scalby .....    | 2.43           | "      | Moynalty, Westland .....    | 3.52            |
| "     | Ingleby Greenhow .....       | 2.53           | "      | Athlone, Twyford .....      | 1.86            |
| "     | Mickleton.....               | 2.06           | XXII.  | Woodlawn .....              | 2.12            |
| X.    | Bardon Mill, Beltingham ...  | 2.33           | "      | Westport, St. Helens .....  | 3.07            |
| "     | Ilderton, Lilburn Cottage... | 1.88           | "      | Achill Island, Dugort ..... | 5.19            |
| "     | Keswick, The Bank .....      | 3.08           | "      | Mohill .....                | 2.88            |
| XI.   | Llanfrechfa Grange.....      | 2.48           | XXIII. | Enniskillen, Portora .....  | 3.11            |
| "     | Treherbert, Tyn-y-waun ...   | 4.27           | "      | Dartrey [Cootehill].....    | 3.32            |
| "     | Carmarthen, The Friary.....  | 2.70           | "      | Warrenpoint, Manor House    | 2.40            |
| "     | Castle Malgwyn [Llechryd].   | 2.94           | "      | Banbridge, Milltown .....   | 1.89            |
| "     | Plynlimon.....               | 6.00           | "      | Belfast, Springfield .....  | 3.01            |
| "     | Crickhowell, Ffordlas.....   | 2.80           | "      | Glenarm Castle.....         | 2.85            |
| "     | New Radnor, Ednol .....      | 2.82           | "      | Londonderry, Creggan. Res.  | 3.38            |
| "     | Rhayader, Tyrmynydd .....    | 3.52           | "      | Killybegs .....             | 4.31            |
| "     | Lake Vyrnwy .....            | 2.89           | "      | Horn Head ... ..            | 2.73            |

## METEOROLOGICAL NOTES ON MAY, 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.—Variable conditions prevailed throughout the first half, showers and sunshine alternating with great frequency. Temp. rose rapidly on 14th, and it continued warm and sunny to the close. A heavy TS with .52 in. of R occurred between 3 and 4.30 a.m. on 19th. Duration of sunshine, 196.1\* hours, with only one sunless day. Duration of R 39.5 hours. Mean temp. 54°.9, or 1°.0 above the average. Shade max. 80° 0 on 22nd; min. 29° 8 on 10th. F 1, f 7.

TENTERDEN.—Duration of sunshine, 187.0† hours. Shade max. 73° 0 on 16th; min. 32° 5 on 10th. F 0, f 4.

TOTLAND BAY.—Duration of sunshine, 227.6\* hours. Shade max. 73° 9 on 23rd; min. 34° 2 on 10th. F 0, f 7.

PITSFORD.—R .27 in. above the average. Mean temp. 53° 6. Shade max. 78° 6 on 20th; min. 28° 5 on 10th. F 3.

RENDLESHAM.—A heavy TS with L and E, and a strong, squally N.E. wind occurred on 12th, but the weather was fine and dry from 15th to 27th, with sunshine lasting several hours daily.

NORTH CADBURY.—T was much more frequent than usual, though only one storm came here, during which a tree was struck. It was cold to 13th but warm after. Shade max. 77° 5 on 23rd; min. 30° 5 on 9th. F 1, f 8.

ROSS.—Unsettled until 19th but the last 10 days were fine and warm and vegetation made rapid growth, although flowers generally were rather late. Shade max. 77° 6 on 23rd; min. 27° 0 on 9th. F 3, f 3.

HODSOCK PRIORY.—Shade max. 75° 6 on 20th; min. 28° 4 on 11th. F 2, f 6.

SOUTHPORT.—Duration of sunshine 224.6\* hours, and of R 46.9 hours. Mean temp. 51° 8, or 1° 3 above the average. Shade max. 76° 7 on 20th; min. 33° 8 on 9th. F 0, f 7.

HULL.—Generally dull with winds from between N.E. and N.W. Often squally and stormy with cold showers. Shade max. 73° 0 on 26th; min. 33° 0 on 3rd. F 0, f 6.

HAVERFORDWEST.—Generally cold and dry but with some warm days. Vegetation backward. Shade max. 76° 0 on 24th; min. 40° 8 on 26th.

LLANDUDNO.—The outlook for the hay harvest is very encouraging. Shade max. 65° 8 on 26th; min. 38° 2 on 7th.

CARGEN.—Halley's comet seen on 19th and 20th, resembling a hazy star. Vegetation was forward, and hay and corn crops promised well. Shade max. 77° 5 on 22nd; min. 29° 0 on 9th. F 2.

EDINBURGH.—Shade max. 65° 2 on 26th; min. 30° 3 on 9th. F 1, f 2.

COUPAR ANGUS.—The mean temp., 51° 2, was above the average, but this was due more to bright sunny days than to general warmth. A welcome change for the better occurred on 12th, but did not last, for a return to N. winds, with unpropitious weather, soon set in again and lasted generally to the close. Shade max. 73° 0 on 15th; min. 29° 5 on 9th.

FORT AUGUSTUS.—Shade max. 72° 7 on 25th; min. 31° 6 on 11th. F 2.

WATERFORD.—Several H showers occurred during the month, and T on 14th, 17th and 24th. Halley's comet was seen on 21st, 22nd and 23rd. Shade max. 72° 5 on 3 days; min. 34° 0 on 12th.

DUBLIN.—Except during an anti-cyclonic spell in the fourth week, the weather was unsettled and showery. H fell on 5th and the 3 following days, and there was a brief TS on the afternoon of 6th. Mean temp. 51° 5. Shade max. 69° 2 on 22nd; min. 35° 0 on 9th. F 0, f 1.

MARKREE.—H and E showers occurred in the first part with a TS on 13th, but the remainder was fine and dry generally. Shade max. 69° 0 on 25th; min. 32° 8 on 4th. F 0, f 7.

WARRENPOINT.—Shade max. 66° 0 on 4 days; min. 39° 0 on 8th. F 0, f 5.

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

| STATIONS.<br><br>(Those in italics are<br>South of the Equator.) | Absolute. |       |          |       | Average. |        |               |           | Absolute.       |                   | Total Rain |       | Aver. |
|------------------------------------------------------------------|-----------|-------|----------|-------|----------|--------|---------------|-----------|-----------------|-------------------|------------|-------|-------|
|                                                                  | Maximum.  |       | Minimum. |       | Max.     | Min.   | Dew<br>Point. | Humidity. | Max. in<br>Sun. | Min. on<br>Grass. | Depth.     | Days. |       |
|                                                                  | Temp.     | Date. | Temp.    | Date. |          |        |               |           |                 |                   |            |       |       |
|                                                                  |           |       |          |       |          |        |               | 0-100     |                 |                   | inches     |       |       |
| London, Camden Square                                            | 53°·7     | 22    | 23°·2    | 21    | 45°·5    | 35°·1  | 38°·0         | 90        | 72°·1           | 18°·6             | 2·79       | 23    | 7·1   |
| Malta ... ..                                                     | 68°·9     | 25    | 47°·0    | 11    | 62°·9    | 54°·6  | 50°·3         | 80        | 130°·0          | ...               | 2·89       | 14    | 5·6   |
| Lagos ... ..                                                     | 90°·0     | 5, 7* | 71°·0    | 2     | 87°·7    | 75°·0  | 74°·4         | 75        | 150°·0          | 69°·0             | 1·42       | 6     | 8·5   |
| Cape Town ... ..                                                 | 91°·0     | 18    | 45°·7    | 7     | 71°·3    | 57°·5  | 54°·0         | 72        | ...             | ...               | 2·97       | 13    | 5·4   |
| Durban, Natal                                                    | 90°·2     | 4     | 61°·8    | 7     | 80°·8    | 67°·3  | ...           | ...       | 148°·5          | ...               | 8°·07      | 22    | 7·1   |
| Johannesburg ... ..                                              | 82°·2     | 13    | 50°·5    | 28    | 73°·5    | 55°·7  | 56°·1         | 81        | 145°·9          | 45°·5             | 5°·12      | 17    | 5·9   |
| Mauritius ... ..                                                 | 89°·3     | 27    | 65°·6    | 18    | 86°·0    | 70°·0  | 66°·1         | 69        | 159°·7          | 58°·2             | 1°·97      | 11    | 6°·0  |
| Calcutta... ..                                                   | 83°·0     | 2     | 52°·2    | 10    | 77°·3    | 57°·6  | 57°·2         | 72        | ...             | 46°·7             | °·65       | 2     | 2°·3  |
| Bombay... ..                                                     | 88°·1     | 28    | 65°·8    | 16    | 83°·7    | 70°·3  | 67°·8         | 76        | 133°·6          | 59°·7             | °·00       | 0     | 1°·5  |
| Madras ... ..                                                    | 90°·4     | 4     | 65°·5    | 27    | 85°·6    | 71°·1  | 68°·8         | 77        | 136°·5          | 62°·1             | °·70       | 3     | 3°·5  |
| Kodaikanal ... ..                                                | 66°·0     | 24    | 43°·4    | 28    | 61°·3    | 46°·9  | 45°·8         | 76        | 130°·8          | 29°·0             | 1°·32      | 7     | 5°·2  |
| Colombo, Ceylon                                                  | 88°·9     | 19    | 70°·0    | 29    | 86°·4    | 72°·1  | 72°·9         | 82        | 168°·0          | 66°·1             | 1°·14      | 10    | 5°·4  |
| Hongkong ... ..                                                  | 77°·9     | 9     | 50°·8    | 26    | 68°·9    | 58°·9  | 49°·6         | 59        | 126°·0          | ...               | °·00       | 0     | 3°·0  |
| Melbourne ... ..                                                 | 103°·9    | 26    | 43°·6    | 4     | 75°·1    | 52°·3  | 46°·8         | 54        | 167°·7          | 40°·2             | 2°·77      | 13    | 4°·7  |
| Adelaide ... ..                                                  | 100°·7    | 27    | 44°·5    | 10    | 76°·9    | 54°·7  | 48°·8         | 55        | 156°·7          | 36°·2             | °·33       | 5     | 4°·1  |
| Coolgardie ... ..                                                | 109°·0    | 25    | 51°·0    | 1     | 91°·7    | 60°·7  | 47°·9         | 37        | 171°·0          | 49°·2             | °·00       | 0     | 0°·6  |
| Perth ... ..                                                     | 100°·8    | 23    | 55°·1    | 21    | 96°·7    | 64°·1  | 55°·5         | 50        | 154°·3          | 46°·7             | °·01       | 1     | 1°·8  |
| Sydney ... ..                                                    | 102°·8    | 14    | 50°·9    | 9     | 78°·8    | 61°·4  | 55°·9         | 59        | 145°·5          | 41°·5             | 3°·64      | 11    | 3°·6  |
| Wellington ... ..                                                | 75°·2     | 6     | 43°·0    | 27    | 68°·9    | 56°·6  | 53°·2         | 71        | 136°·0          | 39°·0             | 1°·77      | 8     | 6°·5  |
| Auckland ... ..                                                  | 77°·5     | 22    | 54°·5    | 4†    | 72°·8    | 59°·4  | 58°·7         | 77        | 158°·0          | 51°·0             | °·79       | 10    | 4°·7  |
| Jamaica, Kingston                                                | 87°·8     | 12    | 63°·5    | 2     | 84°·9    | 66°·6  | 65°·2         | 74        | ...             | ...               | °·00       | 0     | ...   |
| Grenada ... ..                                                   | 87°·6     | 5     | 71°·0    | 1     | 83°·0    | 73°·4  | 69°·0         | 74        | 141°·0          | ...               | 4°·10      | 23    | 3°·5  |
| Toronto ... ..                                                   | 44°·9     | 5     | —5°·0    | 29    | 31°·7    | 20°·2  | ...           | 86        | 71°·2           | —8°·7             | 2°·65      | 12    | 7°·5  |
| Fredericton ... ..                                               | 43°·3     | 5     | —15°·0   | 29    | 27°·7    | 14°·4  | ...           | 89        | ...             | ...               | 2°·53      | 8     | 7°·1  |
| St. John's, N.B.                                                 | 41°·3     | 6     | 3°·5     | 29    | 30°·1    | 20°·8  | ...           | 82        | ...             | ...               | 2°·65      | 12    | 7°·0  |
| Victoria, B.C. ...                                               | 49°·0     | 12    | 23°·6    | 3     | 40°·0    | 33°·3  | ...           | 89        | ...             | ...               | 3°·76      | 10    | 7°·0  |
| Dawson ... ..                                                    | 18°·0     | 28†   | 45°·5    | 7     | —8°·0    | —19°·1 | ...           | ...       | ...             | ...               | 1°·17      | 8     | 6°·0  |

\* and 9. † and 29. ‡ 15 and 26. || and 30.

MALTA.—Mean temp. of air 57°·8. Average bright sunshine 5·6 hours.

Natal.—Rainfall 3·28 in. above the average.

Johannesburg.—Bright sunshine 221 hours.

Mauritius.—Mean temp. of air 0°·7, of dew point 1°·5, and R 2·97 in., below averages. Mean hourly velocity of wind 9·6 miles, or 1·2 below average.

KODAIKANAL.—Bright sunshine 184 hours.

COLOMBO.—Mean temp. of air 77°·6, or 1°·5 below, of dew point 2°·0 above, and R 4·13 in. below, averages. Mean hourly velocity of wind 5·7 miles. TSS on 2 days.

HONGKONG.—Mean temp. of air 63°·6, bright sunshine 249·7 hours, or 70 hours above average. Mean hourly velocity of wind 11·4 miles. R 1·18 in. below average.

Melbourne.—Mean temp. of air 0°·8 below, and R ·53 in. above, averages.

Adelaide.—Mean temp. of air 5°·5 below, and R ·54 in. below, averages. The coolest December on record.

Sydney.—Mean temp. of air 0°·1 above, and R 1·16 in. above, averages.

Wellington.—Mean temp. of air 2°·7 above, and R 1·63 in. below, averages. Bright sunshine 280·5 hours.

Auckland.—Rainfall only a quarter of the average. Mean temp. slightly above average.

# Symons's Meteorological Magazine.

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No. 534.

JULY, 1910.

VOL. XLV.

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## KEW AND ESKDALE MUIR OBSERVATORIES AND THE METEOROLOGICAL OFFICE.

By arrangements recently concluded between the Lords Commissioners of H.M. Treasury, the Royal Society, the National Physical Laboratory, and the Meteorological Office, the administration of the work of the Kew Observatory, in so far as it is concerned with observational and experimental work in meteorology and geophysics, will be transferred to the Meteorological Office as from 1st July, 1910. The Kew Observatory will be the Central Observatory for the Office. All communications respecting that side of the work of the Observatory should thenceforth be addressed to the Director of the Meteorological Office, Kew Observatory, Richmond, Surrey.

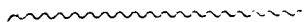
By another provision of the arrangement the administration of the Observatory at Eskdale Muir will be associated by the Royal Society with the Meteorological Office instead of as heretofore with the National Physical Laboratory.

In the conduct of the administration of the Observatories the Director of the Meteorological Office will have the assistance of an advisory Committee—the Gassiot Committee, appointed by the Royal Society to administer the funds of the Gassiot Trust, representing an endowment of £10,000, vested in the Royal Society in 1871 by Mr. J. P. Gassiot.

One of the provisions of the new scheme is that the Superintendents of the three Observatories—Kew, Eskdale Muir and Valencia—under the direction of the Meteorological Office shall be appointed by the Meteorological Committee upon the nomination of the Gassiot Committee. On this nomination the appointments of Dr. C. Chree, F.R.S., as Superintendent of the Central Observatory, and of Mr. G. W. Walker, M.A., of Eskdale Muir Observatory, have been continued by the Meteorological Committee. Dr. Chree has further been appointed Assistant-Director of Observatories for the Meteorological Office. Mr. J. E. Cullum remains Superintendent of Valencia Observatory.

The work of testing instruments now carried on at Kew Observatory by the National Physical Laboratory will be removed to Teddington as soon as the necessary provision for its transference can be made. The Laboratory will retain the well-known K.O. mark for

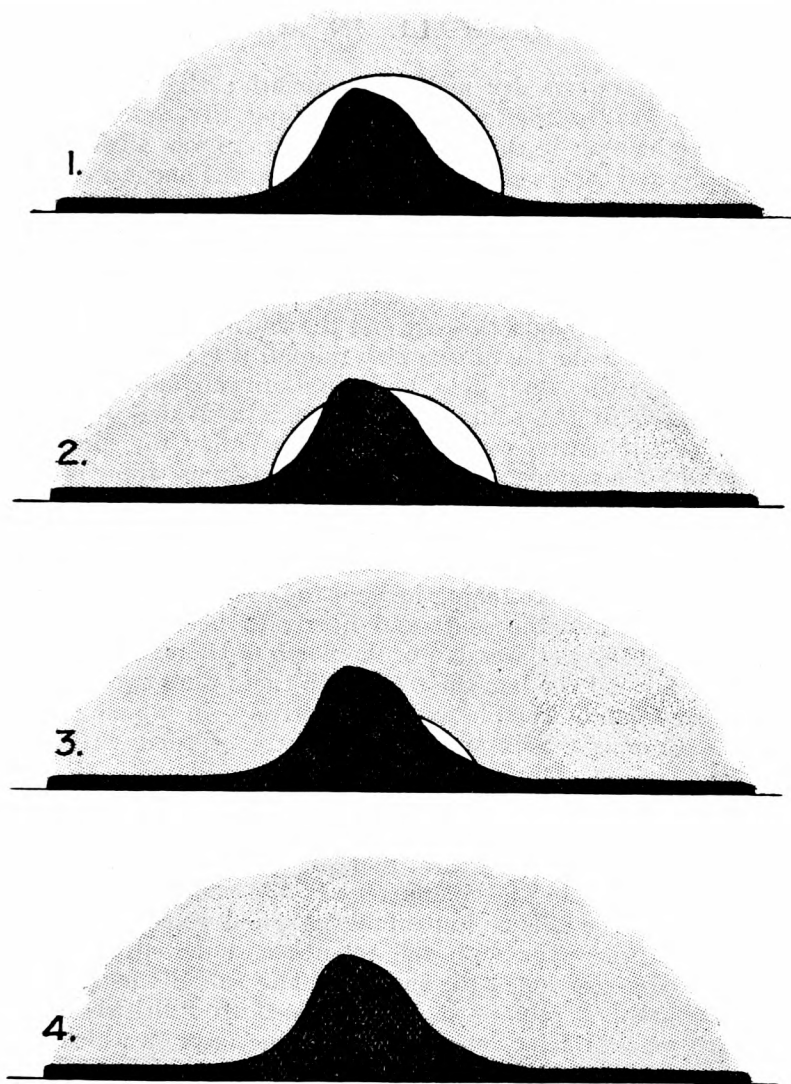
use with those classes of instruments which have hitherto been tested at the Kew Observatory. For the time being the work will be carried on at the Observatory as a department separate from the observational work, but under the superintendence of Dr. Chree. Communications respecting this side of the work should be addressed to the Director of the National Physical Laboratory, Observatory Department, Richmond, Surrey.



### THREE GREEN RAYS IN ONE SUNSET.

By HUGH ROBERT MILL, D.Sc.

THE fascination of the rarely-seen phenomenon of the bluish-green colour of the last ray of light from the setting sun survives the full and satisfactory scientific explanation of the phenomenon given by Dr. Rambaut in these pages four years ago. (Vol. 41, pp. 21, 41.) It is so seldom that a clear horizon, free from cloud or haze, occurs in this country, so much more seldom that anyone is watching the sun when setting on such a horizon, that the observation is never likely to be a common one. The object of the present note is to emphasize the fact that a water-horizon is not essential to the production of the effect, but that any sharp bounding line is sufficient to cause it to appear, and that the appearance may be observed at one point while the sun's disc is still visible elsewhere. On the evening of June 22nd, 1910, I was in a rowing boat off Bunessan in Mull, and about 9.15 p.m. saw that the sun was to set not in the sea as I had hoped but behind the rocky islet known as the Dutchman's Cap. This islet was distant about  $12\frac{1}{4}$  miles, bearing nearly north-west, and the central part of it behind which the sun disappeared is a pyramidal rock rising 284 feet above sea level, and subtending an angle, estimated from the disc of the sun behind it (Fig. 1), of something like  $20'$ . The effect was, that when the upper limb of the sun sank below the summit of the islet, a segment of the disc appeared on each side of the rock (Fig. 2), gradually diminishing in extent until the shoulders of the rock hid each in turn (Figs 3 and 4); there being thus three separate points of the sun's limb which successively passed behind the rock. When the summit of the rock nearly reached the upper portion of the sun's disc (a few seconds after the period of Fig. 1) the sun's limb near the rock assumed a yellowish-green colour changing as the last line of light vanished to the familiar clear blue-green, while the two segments visible over the shoulders of the rock (Fig. 2) retained their dull orange colour, the light of which was so reduced that there was no dazzling in looking at the sun through a Zeiss glass magnifying eight diameters. The segment on the left diminished rapidly and the vanishing thread of light turned yellowish-green and expired (Fig. 3) in greenish-blue. Then the segment on the right underwent the same changes, and in its green



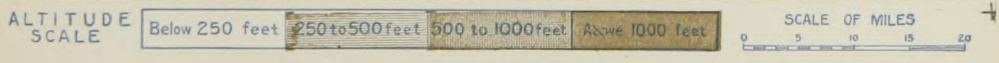
ray the sun disappeared (Fig. 4) leaving the bright twilight which lingered in the sky all night. The triple effect recalls that described by Mr. Whitmill through the slits in the belfry of a Wesleyan Chapel (see Vol. 41 (1906), p. 44). The sea horizon has been shown to be unnecessary for the production of the effect on many previous occasions, and it would hardly be worth while to call attention to the fact again were it not that residents in inland places should be reminded that if they command a sharp horizon they may, on exceptionally clear evenings, enjoy watching a phenomenon, the reputed rareness of which is a striking proof of the unobservant habits of most people.

## HEAVY RAINFALL IN JUNE 1910.

IN Scotland, June was a dry and sunny month; the rainfall along the east coast was less than an inch, that along the west coast was less than two inches; in the Inner Hebrides there was anxiety as to water supply, and the grass along the roadsides was burnt and brown. Only a few stations in central Scotland reported a rainfall of as much as 3 inches. The north of England also was remarkably dry, falls of 3 inches or over for the month being confined to the centre of the Lake District, southern Lancashire and the west of the West Riding of Yorkshire. The Midlands, the east and the south-east of England had on the whole a dry month, or one with rainfall not greatly exceeding the average, and the same held good in Cornwall and Devon and along the coast of the south of England. In Wales, Gloucester, Somerset and the central part of the Thames Valley the month was very wet, and in some places recalled the disastrous June of 1903. Almost the whole of Wales, except the coast, had more than five inches of rain, and a considerable area in the centre more than eight inches, while our map of the Thames Valley shows a rainfall exceeding four inches, stretching in from the south-west and reaching as far as Aldershot in the south and nearly to Berkhamsted in the north. A detached wet area lay in the north of Gloucestershire. In Wessex just beyond the border of the map there were two areas west of Wells and north of Templecombe respectively, in which the rain for the month exceeded six and in the centre of them even seven inches. In Ireland a large district round Dublin, normally the driest part of the country, had more than six inches of rain; but the rainfall diminished rapidly on all sides and in the extreme south-west and north-east was less than three inches.

The monthly totals, although remarkable enough, are far less interesting than the falls on individual days, and we could have filled this magazine twice over with the reports and newspaper extracts which have been sent us on the subject. The full discussion of the daily distribution of rain must be postponed to "British Rainfall, 1910," but we may refer here to two of the days on which severe thunderstorms affected parts of the country. On June 7th more than an inch fell along a narrow track from Odiham to Windsor, the heaviest fall in which was 2.52 in. at Old Windsor; more than an inch fell also over nearly the whole of the Thames Valley west of Abingdon, and at Stow-on-the-Wold the exceptionally heavy fall of 3.55 in. was recorded; but we must pass these by to give the little space at our disposal to the more remarkable occurrences of June 9th. This was a day of terrific thunderstorms and deluges of rain and hail in the Thames Valley. The rainfalls were by the nature of the weather very erratic, some places having less than an inch while others a few miles away had four or five inches. There were two points of maximum intensity, both in Oxfordshire from which we have received details of so remarkable a kind that we must subject









them to further examination before we consider it safe to place them at the head of all records for intensity of thunderstorm rain in the Thames Valley. Mr. Higgins, Schoolmaster at Kidmore End, about four miles north-west of Reading, recorded 3·23 in. between 12·30 and 1·30 p.m., and the reading for the 24 hours amounted to 5·51 in. The rain gauge was, unfortunately, not of standard pattern, and we are not sure whether it was impossible for rain to find its way into the receiver by running down the outside of the funnel; but Mr. C. M. Powell, F.R. Met. Soc., sent us some important notes derived from an inspection of the gauge and he is of opinion that the figure will stand.

At Wheatley, about six miles east of Oxford, the Schoolmaster, Mr. Leyshon, records that the storm broke at 12·42, and at 1·20 p.m. he emptied the gauge and found that 2·68 in. had fallen in 48 minutes; at 1·40 p.m., 1·66 in. more was measured as the result of 20 minutes, making 4·34 in. in 68 minutes. At 6 p.m., ·86 in. more was measured, and at 9 a.m. on the 10th, ·29 in., making the total for the rainfall day of June 9th, 5·49 in. Terrific hail as well as rain made up the deluge and the village street became a rushing torrent. It so happens that we have received no records of the day's rainfall in the straight line between Wheatley and Kidmore End; but if we can judge from stations a little to the east and west the rainfall on the 9th did not exceed 2 inches at some points between the two places.

Were it not for the enlightened action of the Oxfordshire Education Committee in encouraging rainfall observations at the village schools these most important records might never have been made.

## THE POST OFFICE AND MONTHLY MAGAZINES.

THE Editor of the *Agricultural Economist* has raised the vexed question of the unfair discrimination on the part of the Post Office in favour of weekly as against monthly journals. A weekly journal may travel by post for one halfpenny irrespective of weight, but a monthly journal requires to pay at the rate of a halfpenny for every two ounces of its weight. Thus we cannot add six pages to our little Magazine without raising its weight a fraction over 2 oz. and doubling its postage, whereas a weekly paper can, and often does, circulate a pound weight of advertisements and some ounces of literary matter for half the price. A paper like ours, on which there is no profit, is seriously crippled by the financial necessity of keeping the weight below 2 oz., and we cordially agree with our contemporary, whose case is harder than our own, in wishing that common sense might be allowed to whisper reasonableness to the Post Office. Nearly a thousand monthly journals are in the same position, and each has probably before now brought its own ineffectual protest before the unresponsive rulers of the Post Office; but we will gladly join in any new appeal, for by continual coming perchance we may weary them.

## THE WEATHER OF JUNE.

By FRED. J. BRODIE.

THE weather of June varied considerably from time to time, and in different parts of the country.

At the commencement of the month nearly all districts were affected by small shallow depressions appearing as secondaries to larger disturbances which passed from Iceland to Scandinavia. With these conditions the winds were light and variable, and more or less rain fell in all places (while thunderstorms occurred in the North of England), the thermometer being fairly high in the daytime, but low at night. On the 2nd and 3rd the daily maxima were slightly above  $70^{\circ}$  in many parts of England, and on the latter date Greenwich touched  $75^{\circ}$ . Several places, however, recorded night maxima below  $40^{\circ}$ , and in a few isolated spots the thermometer on the grass fell slightly below the freezing point.

After the 4th, an anticyclone was formed to the northward of these islands, and for some few days Scotland experienced a spell of exceedingly fine weather, the total duration of sunshine for the week ending the 11th amounting to over 70 hours in many places, to over 80 hours at Aberdeen, and to as many as 87 hours at Stornoway. Notwithstanding the prevalence of so clear an atmosphere the day temperatures were at first of moderate height, and, with much terrestrial radiation, the nights remained cold, the thermometer even in the screen falling to  $33^{\circ}$  at Balmoral early on the 5th, and to  $34^{\circ}$  at Wick on the morning of the 7th. Over England and Ireland the weather at this time was of a very different character, the extension of a large and complex area of low barometrical pressure from France and Southern Europe being accompanied by frequent thunderstorms, and in many places by torrential falls of rain and hail. Little bright sunshine was experienced (in London the total for the week ending the 11th was less than one fourth of that recorded at Stornoway), but the air was warm and close, and in the South and South-East of England the night temperatures were unusually high. Between the 7th and 9th the thermometer rose generally, maximum readings of  $75^{\circ}$  and upwards being recorded over a large portion of Great Britain, and a reading of  $80^{\circ}$  at Greenwich.

After the 11th the low pressure system passed away to the eastward, while an anticyclone extended north-eastwards from the southern portion of the North Atlantic, the area of highest pressure being situated on the 15th and 16th directly over the United Kingdom. Fine, dry weather now set in generally, and continued for rather more than a week. A good deal of fog prevailed round the English and Irish coasts and kept the thermometer low in places, but over the country as a whole the temperature rose to a seasonable level, the shade maxima of the 19th–21st being slightly above  $80^{\circ}$  in several English districts—the highest level yet reached during the present year. At Hillington and Raunds the thermometer, on the 19th,

touched 83°. A large area of low pressure was at this time beginning to spread in from the Atlantic, and between the 21st and 24th unsettled thundery weather became general. Temperature remained at first a little above the average, but on the 25th, when the low pressure system passed eastwards to the continent, a cool wind swept down from the northward, and for the remainder of the month the thermometer was decidedly low for the time of the year. In the closing week the weather was influenced by a new low pressure area which hung off our northern coasts between the Faëroes and the west of Norway, the wind in these islands being brisk from the westward, with frequent showers and thunderstorms in many English districts.

The mean temperature of June was above the average over nearly the whole of England, and also in the west of Scotland, but the excess was nowhere large. Over Scotland as a whole, and in the west and north of Ireland and some portions of the south-west of England, the mean values were slightly below the average. Bright sunshine was nearly everywhere deficient, a large excess being, however, reported in the Hebrides where the early part of the month was so extremely fine. At Westminster the total duration, 156 hours, was 11 hours below the average of the 25 years, 1881-1905.

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### Correspondence.

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

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#### HISTORICAL CLIMATOLOGICAL RECORDS—A FROST IN 1607.

The following account of a frost in the English Lake District shows that there are old entries relating to weather to be found for searching. The Rumney's and Castelhowe's are still landowners in the parish, and the use of the word "carried" as meaning conducted still survives in Cumberland.

It is difficult to see how the information in registers relating to meteorology could be collected as the registers are all over the country, and often in most inaccessible places. There exists a Society, I believe, for printing Parish Registers, but whether they would copy and make public entries relating to weather I do not know. It would be most interesting if it could be done.

RICHARD COOKE.

*The Croft, Detling, Maidstone, May 2nd, 1910.*

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THE *Journal* of the British Archæological Association recently quoted the following quaint extract from the Watermillock Register, published by Titus Wilson, Kendal in 1908:—

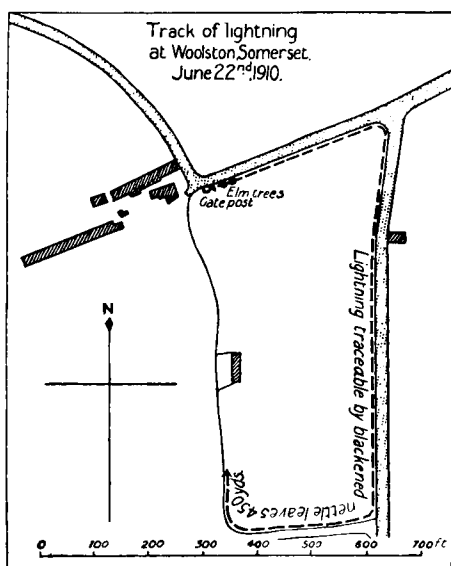
"In this yeare of our Lord God, 1607, was a marveillous great frost wch continued from the first day of December until the xv<sup>th</sup> day of February

after. Viles water was frozen ower and so contynued from the vj<sup>th</sup> day of December untill the xxij<sup>nd</sup> day of February followinge. So stronge that men in great companies made a common way vp the same from John Bartons dore to Fewsdaille Wyke. And men of Martindail carried shepe vp the same on at Barton's and of at Sharrowsande. Men went vp the same water and over yt wth horses loaden with corne. Vpon the vj<sup>th</sup> day of January the younge folkes of Sowlby went unto the mydst of the same water and had a Minstrell with them and there daanced all the after Noone. On Shrovetuesday, being the ix<sup>th</sup> day of February, at Weathermeallock was a Boone fire builded on the Ise and matches of Shotinges Shott, and a pott wth aill drunke thereupon by Edward Willson of Benethead, Anthony Rumpney, Francis Rumney, John Castelhowe and others, ect."

Fewsdail Wyke is now generally known as Howtown Bay, and Sharrow is about midway between it and the foot of the lake.

## REMARKABLE LIGHTNING FLASH.

DURING the thunderstorm of June 22<sup>nd</sup>, 1910, at Woolston, one mile east of North Cadbury, two elm trees standing close together were struck by lightning. From these trees the lightning ran along a



wire fence both ways, as shown on the accompanying tracing, reduced from an Ordnance Survey 25 inch map. In one direction (westward) the lightning only went a few yards to a gate-post, which was split to bits, throwing the iron hooks to some distance and cutting one of them in two. In the other direction it ran 450 yards, at first splitting the small posts which held the wire, and blackening the nettle leaves which it left stingless all the 450 yards, along more than three sides of the orchard. A cloud of smoke passed over the field after the flash. There were eight people in and about

the farmhouse close by. One of them described to me the appearance of a ball of fire "as big as a loaf," moving slowly horizontally. Another corroborated this in very vague language. The shock to all those in the farm-house was terrible.

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

## WAVE OF HEAT.

THE temperature here on the morning of Tuesday, the 7th inst., at 9.30 was  $85^{\circ}$ ; at 12 o'clock noon,  $94^{\circ}$ ; and at 5 p.m.,  $80^{\circ}$ . On reference, I find these are the highest records for over 50 years at Braystones. The early temperature ( $85^{\circ}$  at 9.30 a.m.) is, as far as I know, unprecedented in the North of England, if not elsewhere in this country.

W. H. WATSON, F.G.S., F.C.S.

*Braystones, Cumberland, June 9th, 1910.*

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## INTERNATIONAL BALLOON ASCENTS, FEBRUARY 6th, 1908.

WITH the exception of Pyrton Hill, where, however, the ascent was made the previous evening, the height of the upper inversion was very uniform, and rather above the average. The temperatures also were very uniform, but distinctly below the average. In the southern part of the area a steady N.E. current of air prevailed, drawing into N. and N.W. in the northern part. A high pressure area lay in the West and South-West, and a depression was moving from the North-West of Scandinavia to Russia over the North of Europe.

*February 6th, 1908.*

Starting Point.	Lat.	Long.	A	B	C	D	E	F	G
	°	'	in.	miles.	° F.	miles.	° F.	miles.	
Manchester ....	53	30 N.	2	14 W.	30.95	6.9	-83	7.0	-83 85 S.S.E.
Pyrton Hill* ..	51	48 N.	1	0 W.	30.55	8.8	-80	9.2	-78 40 S. 19° W.
Uccle.....	50	51 N.	4	22 E.	30.63	7.0	-94	9.8	-78 44 S.
Hamburg .....	..	..	30.47	7.2	-94	9.8	-74	98	S.E.
Lindenberg ....	50	15 N.	14	10 E.	30.36	..	..	6.9	-67 63 S.E. by E.
Paris .....	..	..	30.63	7.2	-76	9.3	-70	84	S.W.
Strassburg ....	48	36 N.	7	42 E.	30.67	7.3	-87	7.8	-67 49 S.W. by S.
Munich .....	48	9 N.	11	37 E.	30.63	7.5	-85	10.0	-74 42 S.W. by S.
Vienna .....	48	12 N.	16	23 E.	30.51	7.5	-94	8.1	-83 93 S.W. by S.
Kuchino .....	..	..	29.73	7.2	-85	7.5	-76	57	E. by S.

\* At 4.30 p.m. on Feb. 5th. The balloon of Feb. 6th was not found.

A=Approximate barometric pressure reduced to sea-level.

B=Height in miles of commencement of isothermal column.

C=Temperature,  $F^{\circ}$ ., at bottom of column.

D=Greatest height of reliable record in miles.

E=Temperature,  $F^{\circ}$ ., at greatest height.

F=Distance in miles of point where balloon fell.

G=Bearing of falling point from starting point.

## PROFESSOR BJERKNES ON THE SYNOPTICAL REPRESENTATION OF ATMOSPHERIC MOTIONS.

In a lecture before the University of London, on May 27th, Professor Victor Bjerknes, of Christiania, brought forward a new suggestion for the development of research in dynamical meteorology which promises to throw fresh light on some of its problems.

No difficulty has hitherto been found, said Professor Bjerknes, in representing synoptically elements of a scalar nature (such as pressure, temperature, etc.), but no attempt has so far been made to include in that representation the vector element of velocity. The latter is the most important of all factors from the dynamic point of view, and as such requires the more care in treatment if the charting of meteorological phenomena is to lead to any useful result.

The method followed by the lecturer in attempting to meet this want has been as follows:—a map is constructed showing simultaneous wind observations expressed in the usual manner by means of arrows pointing in the direction of the current, and feathered to indicate velocity; this map is converted by joining the arrows in such a way as to produce continuous lines of flow showing the horizontal paths of the wind over the surface. The velocity is expressed by a separate set of lines crossing the lines of flow at right angles and indicating the speed of the wind by their comparative proximity one to the other. The resulting chart shows clearly the lines of convergence and divergence and also the centres of cyclonic or anticyclonic action. These may be used as indicative of areas in which ascending or descending movements are taking place, but the chart does not otherwise give any representation of the vertical component in the atmospheric circulation.

On drawing these lines of flow on a map showing contours of altitude it is possible to deduce mathematically the vertical movement due to the land slope, in millimetres per second, and it is convenient to express this on another chart. In order to emphasise the points upon which weather forecasts would depend, the areas in which descending currents are indicated are shaded, whilst those in which ascending currents are indicated are left unshaded. Thus ascending currents are obviously to be expected on the windward slopes of rising land, and, unless the downward current due to convergence is too powerful, descending currents occur on leeward slopes. On comparing charts thus obtained with those showing the actual precipitation which has occurred simultaneously with the conditions of air circulation which have been mapped a remarkable correspondence is demonstrated, the heaviest rainfall coinciding with the areas of most pronounced upward motion and the rainless areas with those of descending currents.

Excellent illustrations of this method and its results were exhibited in maps of India giving the wind values and the total rainfall for a month during the south-west monsoon period; and also for a shorter

period by maps of the storm of November 28th, 1905, in the United States. An interesting point to which we never remember to have seen attention drawn before was clearly shown by the latter series. This is the fact that, owing to the far greater velocity in a horizontal than in a vertical direction, the lines of wind-flow prefer, when the obstacle presented by rising land is of considerable magnitude, to travel round rather than over the obstruction, provided, of course, there is a possibility of their doing so. This is a point which should prove of value in the study of problems of rainfall distribution in connection with specific types of atmospheric circulation.

If a number of charts are drawn in the manner described above, showing the conditions existing over the same area at successive intervals of time, say three hours, certain resemblances become obvious, and it is possible to trace the causes to which the change from one map to the next must be attributed. The practical question arises as to whether it is possible from the earlier map with no further data than can be made available immediately on its production, to construct that for the later time. If this can be done with a reasonable degree of certainty, a step will have been taken in the direction of weather forecasting by dynamical methods. This question Professor Bjerknes answered in the affirmative, since we do actually possess the information which is necessary to link together the maps of the conditions at two successive time intervals, and he has actually demonstrated the possibility of producing such a map from the data available at an antecedent time. The prediction of the probable distribution of precipitation by the methods described follows as a natural corollary. There are, however, certain practical difficulties. The chart for the time being concerns itself with the lower strata of the atmosphere only, and, unless an allowance is made for changes in the upper air, there is the possibility that an unknown factor may be introduced. The effect which may result from movements in the upper strata may be brought about by (1) pressure, (2) friction, and (3) interchange of masses of air between upper and lower levels; but these effects can be shown to be very slow in operation, and, except in cases when the upper air is moving with a velocity greatly different from that of the lower air, the influence exerted is so small that we can afford to ignore it when dealing with so short a time interval as three hours. If upper air observations can be utilized in the process of construction of future maps for forecasting purposes the difficulty will be to a large extent eliminated, since pressure is the only one of these factors likely to be of importance.

The main obstacle confronting the meteorologist who would utilize Professor Bjerknes's methods is one which it would be possible to overcome by means of co-operation. This is the difficulty which arises from the difference in existing methods of tabulating the meteorological data upon which it is necessary to draw for the purpose of rapid plotting. To produce a forecast, even for so short a period



as three hours hence, would indeed, under present conditions, involve the labour of a far greater period of time, but although this precludes any probability of practical utility for the present it does not in any way compromise the theoretical value of the method nor the hope of practical utility resulting in the future. To meet this hope Professor Bjerknes outlined a suggestion for the grouping of meteorological observations which would in no way interfere with their value for climatological purposes, but which would have the effect of rendering them convenient for utilization in the work of constructing synoptic dynamical charts. He suggested the necessity of strictly synchronous hourly observations the results of which would be arranged in such a way that all information relating to each particular hour from all stations observing should appear together. For this purpose Greenwich time should be universally adopted. Upper air observations would be required at slightly longer intervals, and should be grouped in the same manner. He foresaw that the development of aeronautics will, in the near future, create a demand for a more rational co-operation with the object of increasing the utility and availability of meteorological data, and it is to be hoped that with the realization of the practical necessity will come the called for re-organization.

Although Professor Bjerknes's method of attacking the problems of dynamical meteorology can hardly be said to have emerged from the laboratory stage, it seems to open out a rich field for research in this direction, and to illuminate from a new point of view some of the most difficult, but at the same time some of the most vital, problems with which modern meteorology is concerned. The lines along which Dr. W. N. Shaw and his colleagues have been moving point towards similar goals, and we look forward to seeing in the not very distant future these lines converging to a common point with those which Professor Bjerknes has been following. As Dr. Shaw has remarked, if the conclusions arrived at by the two separate methods of reasoning are identical the conclusions will thereby be proved to be true.

C. S.

### ROYAL METEOROLOGICAL SOCIETY.

THE last meeting of this Society for the present session was held on Wednesday afternoon, June 15th, in the Society's Rooms, Mr. H. Mellish, President, in the chair.

A paper was read from Mr. J. I. Craig, of the Egyptian Survey Department, Cairo, entitled: "England—Abyssinia—The South Atlantic; a Meteorological Triangle." The idea that there may be an organic connection between the annual or seasonal total of rainfall in Western Europe, and the amount of the Nile flood, is no new one, for in 1882, Prof. Balfour Stewart gave reasons for claiming such a connection between the flood of the Nile and the flow in the Thames. More recently Colonel H. E. Rawson has indicated a connection between the weather in South Africa and that in Africa north of the

equator, and in particular the Nile flood. Dr. G. T. Walker has found a connection between the monsoon rainfall in India and pressure six months previously in Argentina, and Sir Norman Lockyer has proved the existence of an inverse barometric relationship between India and Argentina. Dr. W. N. Shaw has also drawn attention to certain correspondences between the velocity of the wind at St. Helena and the intensity of rainfall in the South of England, and pointed out that in the steady current of the south-east trade wind we may expect to find evidence of the throbbing of the aerial pulse consequent on the greater or smaller supply of solar radiation that reaches the Earth and is transformed into kinetic energy.

Another and much more efficient index of the same supply of energy and its transformation is afforded by the evaporation of moisture into the atmosphere, and since we may take it that the total amount of moisture in the air is fairly constant, increased evaporation in one place will mean increased rainfall in another. Thus the intensity of rainfall may reasonably become a measure of the rate at which energy is reaching ocean level, and so there are general reasons for expecting an underlying connection between atmospheric circulation, which we gauge by the south-east trade wind, and precipitation; and to test the relationship, Dr. Shaw has compared the former with the latter as measured by the rainfall in South England. His general conclusion is, that a strong case may be made out, but that further investigation is desirable.

Consideration of this suggestion of Dr. Shaw's led Mr. Craig to think that there might be a possibility of a connecting link between the velocity of the south-east trade wind and the rainfall in England. If, as it really appears, the two are correlated, this may be through direct dependence on some cause of world-wide operation, or through direct dependence of the rainfall on the trade wind. The latter seems to him the more likely and simple of the two suppositions, and if the association is direct, it must almost necessarily be due to the action of some atmospheric current.

Within the last ten years an organized Meteorological Service has been started in Egypt and the Sudan, and the results since obtained have enabled Mr. Craig to carry out this investigation more closely. He finds that there is a distinct tendency for the south-east trade wind of the South Atlantic to divide into two branches, the first continuing the general northward movement, and the second turning to the right, and moving across into the interior of Africa. He concludes that the moisture for the Nile flood comes from the South Atlantic, and that an increase in the velocity of the current will show itself in a proportional increase of the flood. There are too many gaps in the velocity records for the summer months to allow of a statistical test being applied, but it is not improbable that an intensification of the trans-African air-current is connected with a similar intensification of the south-east trade wind of the Atlantic, which again, as Dr. Shaw has shown, is not improbably connected with an

increase of rainfall in the South of England. Mr. Craig says that we may, therefore, expect to find some connection between the Nile flood and rainfall in the South of England during the summer months.

An interesting discussion followed the reading of this paper.

Mr. J. H. Casartelli was elected a Fellow of the Society.

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## REVIEWS.

*Meteorology, Practical and Applied.* By SIR JOHN MOORE, M.A., M.D., &c. Second revised and enlarged edition. London, Rebman, Limited, 1910. Size  $9 \times 5\frac{1}{2}$ . Pp. xxviii + 492. Price 10s. 6d. net.

WE welcome the new edition of this well-known work by the leading authority on meteorology in Ireland. In noticing it we need not repeat what is applicable to the new edition in our review of the first edition which appeared in 1894. But we have pleasure in seeing that the changes made have reduced the disparity in the treatment of the chief meteorological systems of the world, though the absence of reference to the Indian Meteorological Service and those of the continent of Europe is observable. The chapters which have not been re-written have been brought up to date, and several new illustrations have been introduced, while a new chapter on the Upper Atmosphere does justice to the latest developments of meteorological observing. The most valuable part of the book is undoubtedly Part IV., which deals with the influence of season and of weather on disease, and our only regret concerning it is that it has not been developed farther. We wish the new edition every success, and we hope that it will do good work in increasing the interest taken in meteorology amongst all English-speaking people, and most of all in Ireland where additional observing stations would be of great value.

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*Die Winde in Deutschland.* Im Auftrage der Motorluftschiff-Studien-gesellschaft in Berlin, bearbeitet von RICHARD ASSMANN, in Linden-berg. [The Winds in Germany. Prepared by Richard Assmann, in connection with the Berlin Research Society for Air-ships.] Braunschweig, Friedrich Vieweg & Sohn, 1910. Size  $13 \times 10$ . Pp. 62. Price 5 marks.

THE coming of aërial navigation has led to sudden demands being made on meteorologists which they are not always able to meet. For the public must learn that definite observations of a special kind cannot be obtained at a moment's notice; and it is just those people who most object to spending money on things of no practical utility to-day, who are loudest in their outcry at the want of foresight which prevented the accumulation of data which seemed useless yesterday but are now vital in the interests of practical developments. The experiments in Germany with lighter-than-air flying machines has created a general desire to know more about the winds to which the

destinies of these frail craft must be committed. Professor Assmann has discussed a great mass of data which were available—though when they were compiled they must have seemed useless enough to the airmen of to-day, then uninitiated—and got out average values for the frequency in different parts of Germany of winds from each direction and of five different forces. These are (1) from 0 to 2 metres per second, light winds in which an airship can exercise its full powers unhindered. (2) Moderate winds from 2 to 5 metres per second, in which a well found airship can be manœuvred without serious difficulty. (3) Fresh winds from 5 to 10 metres per second, by which all airships hitherto built would have their efficiency notably reduced. (4) Strong winds from 10 to 15 metres per second, which could only be met by an airship of exceptional power, and (5) storm winds exceeding 15 metres per second, which no airship yet built could face. To prepare this discussion 1,104,469 individual observations were dealt with, and 2,550 hours of work required to complete the volume before us. The result is a series of tables and diagrammatic wind-roses for winter, spring, summer, autumn and the year, at each of 49 stations in Germany, the average period being about 20 years at each. Tables are also given for wind frequencies at various heights in the free air.

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*Das Klima von Bergen.* I. Teil, Niederschläge. [The Climate of Bergen. Part I., Precipitation.] Von N. J. FÖRN. Bergen, John Greig, 1910. Size 9 × 6. Pp. 60.

A DISCUSSION of the rainfall of the town of Bergen, in which the records of several rainfall stations are worked up. Monthly values are given for the years 1765-70, and for every year from 1861 to 1908. The average annual rainfall comes out as 77·09 in. ; the year of greatest rainfall was 1887 (the driest year on record in the British Isles) with 111·58 in. ; the year with least rainfall was 1870, with 44·49 in. The average rainfall of the wettest month, October, is 9·02 in. ; of the driest month, April, 3·78 in. ; the greatest rainfall in any month was 19·76 in. in September, 1892, the least was 2·8 in. in March, 1865. The heaviest fall in 24 hours was 4·69 in. on 27th September, 1901.

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*Basis of Evaporation. Temperature of the Sea around the British Islands. Notes on the Climate of Ireland.* By RICHARD STRACHAN, F.R.Met.Soc. London, Williams & Strachan, 1910. Size 8½ × 5½. Pp. 70. Price 4s.

MR. STRACHAN has produced a thoroughly readable little book full of individuality and a wealth of references which shows a mind devoted to much reading and revelling in freedom from official modes of thought and expression. We wish that we had, and regret that we have not, space to enter at some length into the subject of evaporation, which is the main theme of these articles, and on which Mr. Strachan has much to say that deserves attention.

## RAINFALL TABLE FOR JUNE, 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	2'28	2'17
Tenterden.....	Kent.....	51 4	*0 41	190	2'03	1'88
Steyning.....	Sussex.....	50 53	0 20	80	2'23	3'61
Southampton (Cadland) ..	Hampshire.....	50 50	1 22	52	2'17	2'42
Hitchin.....	Hertfordshire ..	51 57	0 17	238	2'20	1'84
Oxford (Magdalen College).	Oxfordshire.....	51 45	1 15	186	2'27	2'83
Bury St. Edmunds(Westley)	Suffolk.....	52 15	*0 40	226	2'21	2'27
Geldeston [Beccles].....	Norfolk.....	52 27	*1 31	38	1'77	3'13
Polapit Tamar [Launceston]	Devon.....	50 40	4 22	315	2'18	1'76
Rousdon [Lyme Regis].....	".....	50 41	3 0	516	2'18	2'08
Stroud (Upfield).....	Gloucestershire..	51 44	2 13	226	2'43	3'73
Church Stretton (Wolstaston)..	Shropshire.....	52 35	2 48	800	2'59	2'54
Coventry (Kingswood).....	Warwickshire ..	52 24	1 30	340	2'52	1'60
Market Overton.....	Rutland.....	52 44	0 41	475	2'07	1'38
Boston.....	Lincolnshire.....	52 58	0 1	25	1'95	1'47
Worksop (Hodsock Priory).	Nottinghamshire	53 22	1 5	56	2'06	2'00
Macclesfield.....	Cheshire.....	53 15	2 7	501	2'85	2'14
Southport (Hesketh Park)..	Lancashire.....	53 38	2 59	38	2'26	2'95
Wetherby (Ribston Hall)...	Yorkshire, W.R.	53 59	1 24	130	2'17	2'40
Arncliffe Vicarage.....	".....	54 8	2 6	732	3'63	3'00
Hull (Pearson Park).....	"..... E.R.	53 45	0 20	6	2'09	3'02
Newcastle (Town Moor) ...	Northumberland	54 59	1 38	201	2'04	1'65
Borrowdale (Seathwaite) ...	Cumberland.....	54 30	3 10	423	6'94	3'05
Cardiff (Ely).....	Glamorgan.....	51 29	3 13	53	2'55	4'53
Haverfordwest(High Street)	Pembroke.....	51 48	4 58	95	2'74	3'16
Aberystwyth (Gogerddan)..	Cardigan.....	52 26	4 1	83	2'97	6'58
Llandudno.....	Carnarvon.....	53 20	3 50	72	1'97	2'37
Cargen [Dumfries].....	Kirkcudbright...	55 2	3 37	80	2'84	2'90
Marchmont House.....	Berwick.....	55 44	2 24	498	2'38	'85
Girvan (Pinnore).....	Ayr.....	55 10	4 49	207	3'05	2'96
Glasgow (Queen's Park) ...	Renfrew.....	55 53	4 18	144	2'41	1'73
Inveraray (Newtown).....	Argyll.....	56 14	5 4	17	3'64	2'35
Mull (Quinish).....	".....	56 36	6 13	35	3'30	1'92
Dundee (Eastern Necropolis)	Forfar ..	56 28	2 57	199	2'06	1'35
Braemar.....	Aberdeen.....	57 0	3 24	1114	2'18	2'42
Aberdeen (Cranford).....	".....	57 8	2 7	120	2'02	'70
Cawdor.....	Nairn.....	57 31	3 57	250	2'13	1'97
Fort Augustus(S. Benedict's)	E. Inverness ..	57 9	4 41	68	2'07	1'27
Loch Torridon (Bendamph)	W. Ross.....	57 32	5 32	20	4'07	2'83
Dunrobin Castle.....	Sutherland.....	57 59	3 56	14	2'10	'75
Wick.....	Caithness.....	58 26	3 6	77	1'83	'94
Killarney (District Asylum)	Kerry.....	52 4	9 31	178	2'92	4'46
Waterford (Brook Lodge)...	Waterford.....	52 15	7 7	104	2'79	3'88
Nenagh (Castle Lough).....	Tipperary.....	52 54	8 24	120	2'70	3'38
Miltown Malbay.....	Clare.....	52 52	9 26	400	3'12	3'33
Gorey (Courtown House) ..	Wexford.....	52 40	6 13	80	2'59	4'66
Abbey Leix (Blandsfort)....	Queen's County..	52 56	7 17	532	2'58	5'58
Dublin(FitzWilliamSquare)	Dublin.....	53 21	6 14	54	2'00	6'21
Mullingar (Belvedere).....	Westmeath.....	53 29	7 22	367	2'72	5'00
Ballinasloe.....	Galway.....	53 20	8 15	160	2'69	3'80
Crossmolina (Enniscoo).....	Mayo.....	54 4	9 18	74	3'17	5'20
Collooney (Markree Obsy.).	Sligo.....	54 11	8 27	127	3'11	5'52
Seaforde.....	Down.....	54 19	5 50	180	2'88	3'29
Bushmills (Dundarave).....	Antrim.....	55 12	6 30	162	2'56	2'83
Omagh (Edenfel).....	Tyrone.....	54 36	7 18	280	2'82	3'98

RAINFALL TABLE FOR JUNE, 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.	
— .11	95	.63	25	13	10.96	12.13	+1.17	111	25.11	Camden Square
— .15	93	.59	9	15	11.44	13.91	+2.47	122	27.64	Tenterden
+1.38	162	1.09	6	13	13.84	19.96	+6.12	144	33.58	Steyning
+ .25	112	.83	5	13	13.31	14.19	+ .88	107	31.87	Cadland
— .36	84	.53	30	14	10.81	11.99	+1.18	111	25.16	Hitchin
+ .56	125	1.00	9	14	10.60	11.21	+ .61	106	24.58	Oxford
+ .06	103	.46	24	11	10.76	12.62	+1.86	117	25.40	Westley
+1.36	177	.68	25	13	9.61	13.49	+3.88	140	23.73	Geldeston
— .42	81	.30	9	17	15.88	21.39	+5.51	135	38.27	Polapit Tamar
— .10	95	.46	9	16	14.33	14.66	+ .33	102	33.54	Rousdon
+1.30	153	.90	7	14	13.08	14.27	+1.19	109	29.81	Stroud
— .05	98	.42	4	18	14.30	13.50	— .80	94	32.41	Wolstaston
— .92	64	.35	25	8	12.75	11.17	—1.58	88	28.98	Coventry
— .69	67	.36	25	13	11.49	12.21	+ .72	106	27.10	Market Overton
— .48	75	.34	24, 27	9	9.86	10.59	+ .73	107	23.35	Boston
— .06	97	.46	7	13	10.80	9.93	— .87	92	24.46	Hodsock Priory
— .71	75	.46	28	13	14.76	15.49	+ .73	105	34.73	Macclesfield
+ .69	130	.69	29	15	12.96	15.20	+2.24	117	32.70	Southport
+ .23	111	.61	30	12	11.63	15.29	+3.66	131	26.87	Ribston Hall
— .63	83	.81	27	14	27.22	34.60	+7.38	127	61.49	Arncliffe
+ .93	144	1.48	24	13	11.08	11.26	+ .18	102	26.42	Hull
— .39	81	.37	2	14	11.55	12.86	+1.31	111	27.94	Newcastle
—3.89	44	.98	27	9	56.38	67.58	+11.20	120	129.48	Seathwaite
+1.98	178	1.56	5	16	17.22	23.59	+6.37	137	42.28	Cardiff
+ .42	115	.52	24	18	19.45	18.69	— .76	96	46.82	Haverfordwest
+3.61	221	1.55	5	17	18.12	24.82	+6.70	137	45.46	Gogerddan
+ .40	120	.37	29	15	12.37	16.23	+3.86	131	30.36	Llandudno
+ .06	102	1.06	8	7	19.06	25.29	+6.23	133	43.47	Cargen
—1.53	36	.17	2	11	14.38	10.83	—3.55	75	33.76	Marchmont
— .09	97	1.60	20	15	21.10	26.80	+5.70	127	49.77	Girvan
+ .68	72	.42	24	11	15.51	17.81	+2.30	115	35.97	Glasgow
—1.29	65	.75	21	15	29.32	34.98	+5.66	119	68.67	Inveraray
—1.38	58	.54	21	17	23.55	25.96	+2.41	110	56.57	Quinish
— .71	65	.55	28	10	12.02	9.54	—2.48	79	28.64	Dundee
+ .24	111	...	...	...	15.15	18.73	+3.58	124	34.93	Braemar
—1.32	35	.17	22	11	14.02	12.47	—1.55	89	32.73	Aberdeen
— .16	93	.52	29	11	12.51	14.96	+2.45	120	29.33	Cawdor
— .80	61	.29	20	12	20.22	25.26	+5.04	125	44.53	Fort Augustus
—1.24	70	.48	30	10	37.39	47.46	+10.07	127	83.61	Bendampf
—1.35	36	.19	29	12	14.28	12.66	—1.62	89	31.90	Dunrobin Castle
— .89	51	.25	29	13	12.71	12.75	+ .04	100	29.88	Wick
+1.54	153	1.12	26	19	24.87	32.85	+7.98	132	54.81	Killarney
+1.09	139	.90	1	17	17.40	16.49	— .91	95	39.57	Waterford
+ .68	125	.82	20	18	17.51	23.27	+5.76	133	39.43	Castle Lough
+ .21	107	.50	20	23	18.71	22.47	+3.76	120	45.11	Miltown Malbay
+2.07	180	1.51	1	15	15.42	16.02	+ .60	104	34.99	Courtown Ho.
+3.00	216	1.27	20	21	15.84	22.25	+6.41	141	35.92	Abbey Leix
+4.21	311	1.26	5	19	12.15	18.63	+6.48	153	27.68	Dublin
+2.28	184	1.70	20	20	16.01	20.88	+4.87	130	36.14	Mullingar.
+1.11	141	.77	5	21	16.15	19.44	+3.29	120	36.64	Ballinasloe
+2.03	164	1.18	20	20	23.38	30.29	+6.99	130	52.87	Enniscoe
+2.41	177	.75	8	20	18.83	28.23	+9.40	150	42.71	Markree
+ .41	114	.58	14	16	17.42	16.75	— .67	96	38.91	Seaforde
+ .27	111	1.11	21	14	15.49	19.68	+4.19	127	37.56	Dundarave
+1.16	141	1.25	20	18	17.10	21.73	+4.63	127	39.38	Omagh

## SUPPLEMENTARY RAINFALL, JUNE, 1910.

Div.	STATION.	Rain inches	Div.	STATION.	Rain. inches
II.	Warlingham, Redvers Road	2.43	XI.	Llangvhanfal, Plâs Draw....	3.58
„	Ramsgate .....	3.41	„	Dolgelly, Bryntirion .....	5.48
„	Hailsham .....	1.89	„	Bettws-y-Coed, Tyn-y-bryn	3.31
„	Totland Bay, Aston House.	3.29	„	Lligwy .....	2.10
„	Stockbridge, Ashley .....	2.93	„	Douglas, Woodville .....	...
„	Grayshott .....	3.40	XII.	Stoneykirk, Ardwell House	1.39
„	Reading, Calcot Place.....	3.29	„	Dalry, The Old Garroch ...	2.11
III.	Harrow Weald, Hill House.	2.87	„	Langholm, Drove Road.....	2.05
„	Pitsford, Sedgebrook .....	1.07	„	Moniaive, Maxwellton House	2.10
„	Huntingdon, Brampton.....	1.28	XIII.	St Mary's Loch, Cramilt Ldge	2.61
„	Woburn, Milton Bryant.....	2.42	„	Edinburgh, Royal Observty.	1.13
„	Wisbech, Monica Road.....	1.02	XIV.	Maybole, Knockdon Farm..	2.35
IV.	Southend Water Works.....	2.39	XV.	Campbeltown, Witchburn...	2.18
„	Colchester, Lexden.....	1.40	„	Glenreasdell Mains.....	2.10
„	Newport .....	1.36	„	Ballachulish House.....	1.66
„	Rendlesham .....	1.63	„	Islay, Ballabus .....	1.68
„	Swaffham .....	2.32	XVI.	Dollar Academy .....	.95
„	Blakeney .....	2.15	„	Balquhider, Stronvar .....	3.50
V.	Bishops Cannings .....	3.87	„	Coupar Angus .....	2.04
„	Winterbourne Steepleton ...	2.38	„	Blair Atholl.....	2.69
„	Ashburton, Druid House ..	2.11	„	Montrose, Sunnyside Asylum	1.07
„	Honiton, Combe Raleigh ...	2.65	XVII.	Alford, Lynturk Manse ...	.93
„	Okehampton, Oaklands.....	3.40	„	Keith Station .....	1.96
„	Hartland Abbey .....	2.91	XVIII.	Glencuoich, Laon .....	3.20
„	Lynmouth, Rock House ...	3.36	„	Skye, Dunvegan.....	1.73
„	Probus, Lamellyn .....	2.53	„	N. Uist, Lochmaddy .....	1.80
„	North Cadbury Rectory ..	6.38	„	Alvey Manse .....	2.19
VI.	Clifton, Pembroke Road ...	5.43	„	Loch Ness, Drumnadrochit.	2.25
„	Ross, The Graig .....	3.66	„	Glencarron Lodge .....	2.51
„	Shifnal, Hatton Grange.....	1.92	„	Fearn, Lower Pitkerrie.....	1.62
„	Blockley, Upton Wold .....	4.14	XIX.	Invershin .....	1.72
„	Worcester, Boughton Park.	3.20	„	Altnaharra .....	1.41
VII.	Market Rasen .....	2.67	„	Bettyhill .....	1.11
„	Bawtry, Hesley Hall.....	2.13	XX.	Dunmanway, The Rectory..	2.79
„	Derby, Midland Railway ...	1.58	„	Cork .....	3.93
„	Buxton .....	2.74	„	Mitchelstown Castle .....	4.43
VIII.	Nantwich, Dorfold Hall.....	2.04	„	Darrynane Abbey .....	3.37
„	Liscard .....	3.94	„	Glenam [Clonmel] .....	4.35
„	Chatburn, Middlewood .....	2.64	„	Nenagh, Traverston .....	3.58
„	Cartmel, Flookburgh .....	2.18	„	Newmarket-on-Fergus, Fenloe	...
IX.	Langsett Moor, Up. Midhope	3.65	XXI.	Laragh, Glendalough .....	4.51
„	Scarborough, Scalby .....	1.89	„	Moynalty, Westland .....	6.42
„	Ingleby Greenhow .....	1.90	„	Athlone, Twyford .....	4.57
„	Mickleton.....	1.17	XXII.	Woodlawn .....	4.58
X.	Bardon Mill, Beltingham ...	1.61	„	Westport, St. Helens .....	4.70
„	Ilderton, Lilburn Cottage...	1.67	„	Achill Island, Dugort .....	5.26
„	Keswick, The Bank .....	1.91	„	Mohill .....	4.49
XI.	Llanfrechfa Grange.....	...	XXIII.	Enniskillen, Portora .....	4.97
„	Treherbert, Tyn-y-waun ...	7.58	„	Dartrey [Cootehill].....	4.64
„	Carmarthen, The Friary.....	4.13	„	Warrenpoint, Manor House	4.23
„	Castle Malgwyn [Llechryd].	3.66	„	Banbridge, Milltown .....	4.32
„	Plynlimon.....	10.50	„	Belfast, Springfield .....	3.47
„	Crickhowell, Ffordlas.....	8.50	„	Glenarm Castle.....	4.29
„	New Radnor, Ednol .....	6.16	„	Londonderry, Creggan. Res.	4.60
„	Rhayader, Tyrmynydd .....	8.43	„	Killybegs .....	4.77
„	Lake Vyrnwy .....	4.57	„	Horn Head ...	4.13

## METEOROLOGICAL NOTES ON JUNE, 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.—Unsettled conditions with fluctuating temp., and frequent though not severe TSS, prevailed in the first half. Fine, sunny and hot weather set in on 14th lasting until 21st, after which the weather was of a showery and changeable nature. Duration of sunshine, 159·4\* hours, and of R 28·0 hours. Mean temp. 61°·8, or 1°·5 above the average. Shade max. 84°·3 on 20th, the highest shade temp. since 15th August, 1909; min. 45°·5 on 27th F 0, f 0.

TENTERDEN.—A fairly pleasant summer month with no extreme heat; showery in last week and very windy from 28th to 30th. Duration of sunshine, 197·0† hours. Shade max. 78°·0 on 20th; min. 44°·0 on 15th and 30th. F 0, f 0.

TOTLAND BAY.—There was an unusual number of TSS, and two buildings were struck. Duration of sunshine, 211·3\* hours. Shade max. 72°·1 on 8th; min 46°·8 on 4th. F 0, f 0.

PITSFORD.—R ·88 in. below the average. Mean temp. 59°·5. Shade max. 81°·4 on 20th; min. 42°·0 on 15th. F 0.

NORTH CADBURY.—The wettest month in 14 years record excepting October, 1903. Torrential R and unprecedented continuance of TSS from 5th to 10th with 3·85 in. of R in the 6 days. Four casualties were due to L. Shade max. 83°·0 on 19th; min. 41°·5 on 4th. F 0, f 0.

ROSS.—Heavy TSS with R amounting to 2·77 in. occurred from 5th to 10th, followed by 10 days of fine, warm weather. Towards the close the weather was very unsettled and haymaking was stopped. Shade max. 81°·5 on 20th; min. 40°·0 on 17th. F 0, f 0.

HODSOCK PRIORY.—At 1 30 a.m. on 8th, ·30 in. of R fell in 6 minutes. Shade max. 80°·1 on 19th; min. 38°·4 on 17th. F 0, f 0.

SOUTHPORT.—Duration of sunshine 216·7\* hours, and of R 43·9 hours. Mean temp. 57°·8, or 0°·9 above the average. Shade max. 77°·9 on 7th; min. 46°·2 on 17th. F 0, f 0.

HULL.—Generally fine, but often very cloudy to 21st; frequent TSS afterwards. Shade max. 79°·0 on 21st; min. 44°·0 on 14th. F 0, f 0.

HAVERFORDWEST.—Cold at first, but fine and warm from 7th to 21st. Duration of sunshine, 187·4\* hours. Shade max. 72°·5 on 8th; min. 40°·6 on 17th. F 0, f 0.

LLANDUDNO.—Shade max. 81°·0 on 20th; min. 47°·0 on 14th. F 0, f 0.

CARGEN.—Favourable weather for agricultural interests; crops of all kinds promise well. Shade max. 79°·0 on 10th; min. 42°·0 on 3rd and 15th. F 0.

EDINBURGH.—Shade max. 71°·2 on 12th; min. 42°·4 on 15th. F 0, f 0.

COUPAR ANGUS.—The month opened cold and unseasonable, but after 6th a period of dry warm days set in lasting two weeks when TSS brought about a lower temp. Mean temp. 56°·4, or 1°·5 above the average. Shade max. 80°·5 on 12th; min. 34°·0 on 5th and 6th. F 0, f 2.

FORT AUGUSTUS.—Shade max. 74°·2 on 18th; min. 36°·8 on 2nd. F 0.

WATERFORD.—No R fell from 9th to 19th inclusive. Shade max. 69°·0 on 20th; min. 45°·0 on 1st and 14th. F 0.

ABBEY LEIX.—The wettest June in 37 years.

DUBLIN.—Frequent torrential R establishing a record measurement. Remarkable successions of TSS from 7th to 9th, and from 20th to 24th. Mean temp. 57°·6. Temp. reached 70° on only 3 days. Shade max. 73°·6 on 20th; min. 42°·9 on 1st. F 0, f 0.

MARKREE.—The wettest June on record. Shade max. 74°·8 on 7th; min. 35°·3 on 3rd. F 0, f 1.

WARRENPOINT.—Although the R was heavy, there were many fine days. There was a good deal of T and vivid L, and the wind was E. for the greater part. Shade max. 71°·0 on 19th; min. 45°·0 on 13th. F 0, f 0.

\* Campbell-Stokes.

† Jordan.



## Climatological Table for the British Empire, January, 1910.

STATIONS.  (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
	Temp.	Date.	Temp.	Date.									
London, Camden Square	55·7	2	19·6	27	45·1	34·6	36·9	89	78·2	14·5	1·57	14	6·5
Malta ... ..	64·6	12	42·2	24	58·3	51·2	47·5	77	131·4	...	4·79	14	5·3
Lagos ... ..	90·0	20	65·0	14	86·9	72·2	67·3	63	141·0	61·0	·38	1	8·2
Cape Town ... ..	93·0	23	53·3	1	79·5	61·7	58·3	66	...	...	·01	...	2·0
Durban, Natal ... ..	88·4	9	63·2	16	81·6	67·2	...	...	148·3	...	3·99	16	5·1
Johannesburg ... ..	83·2	7	48·4	22	73·9	54·0	54·2	77	143·1	47·5	4·94	16	4·3
Mauritius ... ..	90·2	4	68·1	3	85·7	73·9	71·0	77	158·8	62·6	7·13	21	6·8
Calcutta... ..	80·5	31	49·8	30	75·7	56·1	55·4	69	...	44·4	1·67	2	2·0
Bombay... ..	88·6	28	60·3	18	83·7	67·3	63·6	69	135·6	55·9	·00	0	0·7
Madras ... ..	87·2	27	63·8	17	86·0	67·2	67·5	76	136·8	60·4	·20	4	3·2
Kodaikanal ... ..	68·9	21	42·9	22	62·9	46·3	38·9	56	122·7	23·9	1·77	5	3·5
Colombo, Ceylon ... ..	94·2	30	68·7	16	87·5	71·6	70·6	76	167·8	64·3	·95	4	5·7
Hongkong ... ..	77·8	9	44·2	25	66·5	57·8	55·0	76	128·9	...	·89	7	7·3
Melbourne ... ..	104·4	25	49·5	1	79·2	58·6	54·7	60	156·6	43·7	·98	11	5·3
Adelaide ... ..	105·1	25	50·5	17	88·8	64·3	53·6	45	168·9	42·2	·02	1	3·4
Coolgardie ... ..	113·0	24	52·0	18	94·8	63·1	50·4	37	179·0	50·0	·00	0	1·6
Perth ... ..	100·1	12	53·1	30	93·6	63·4	57·0	57	158·3	47·0	·77	6	2·9
Sydney ... ..	91·8	16	57·1	1	78·3	65·2	62·0	72	...	45·7	5·30	21	6·0
Wellington ... ..	75·0	11*	49·2	6	68·6	57·4	55·3	76	129·0	41·0	6·00	13	7·7
Auckland ... ..	80·0	26	54·0	6	74·9	62·3	62·5	82	100·0	51·0	4·52	15	5·7
Jamaica, Kingston ... ..	88·6	7	59·7	27	83·9	65·5	63·6	72	...	...	2·10	7	4·5
Grenada ... ..	85·6	23	70·0	7, 9‡	81·9	72·3	68·3	73	141·0	...	4·68	18	4·0
Toronto ... ..	41·2	16*	-7·0	4	31·9	19·0	...	87	48·7	-9·3	...	...	...
Fredericton ... ..	55·3	22	-20·0	15	29·3	10·0	...	87	...	...	4·60	8	5·8
St. John's, N.B. ... ..	52·5	22	-7·7	5	33·9	20·1	...	81	...	...	5·41	13	6·3
Victoria, B.C. ... ..	51·2	23	23·8	3	42·6	34·9	...	86	...	...	4·54	18	8·0
Dawson ... ..	29·0	28‡	-54·0	11	-12·5	-28·4	...	...	...	...	1·31	11	6·2

\* and 20. † and 29. ||. 18 and 24. ‡ and 10.

MALTA.—Mean temp. of air 54°·2. Average bright sunshine 5·8 hours per day.

Johannesburg.—Bright sunshine 261·8 hours.

Mauritius.—Mean temp. of air 0°·1 below, of dew point 0°·8 above, and R ·82 in. below, averages. Mean hourly velocity of wind 12·0 miles, or 1°·0 above average.

KODAIKANAL.—Bright sunshine 248 hours.

COLOMBO.—Mean temp. of air 77°·3, or 1°·8 below, of dew point 0°·5 above, and R 2·47 in. below, averages. Mean hourly velocity of wind 9°·0 miles.

HONGKONG.—Mean temp. of air 61°·8, or 1°·7 above, and R ·60 in. below, averages. Bright sunshine 141·1 hours. Mean hourly velocity of wind 12·7 miles.

Melbourne.—Mean temp. of air 1°·5 above, and R ·92 in. below, averages.

Adelaide.—Rainfall ·80 in. below average.

Coolgardie.—Mean temp. of air 2°·0 above average.

Sydney.—Mean temp. of air 0°·2 above, and R 1·86 in. above, averages.

Wellington.—Mean temp. of air 0°·3, and R 2°·78 in., above averages.

Auckland.—Mean temp. slightly above, and R considerably above, averages.

GRENADA.—Slight shocks of earthquakes on 23rd and 27th.

# Symons's Meteorological Magazine.

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No. 535.

AUGUST, 1910.

VOL. XLV.

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## INSURANCE AGAINST WET WEATHER.

By H. J. GOODING.

IN the world of insurance nothing is inviolate. Not only the issues of life and death on which millions hang, but also the issues of birth and marriage have at times paid toll to insurance. Our houses are insured against fire, burglary, and the breakage of glass, our servants against accident, and our carriages or motor cars against collision in the street. If a monarch dies, if war is declared, or if a Chancellor of the Exchequer increases the tax on tea or sugar, many thousands of pounds change hands under insurance policies. Every risk which involves a financial loss is liable sooner or later to become the subject of insurance by an enterprising Company, or by that wonderful institution called Lloyds. Lloyds is not, as so many people imagine, in the nature of an insurance company with which the public can do business direct, but is a place of resort (originally a Coffee House kept by Lloyd) where underwriters congregate, and subscribe such portion of any risk submitted to them as they may be disposed. Many classes of insurance, which are to-day recognized branches of the business, have had their origin at Lloyd's, and as wet weather frequently results in financial loss to the promoters of Agricultural, Horse or Flower Shows, and of Fêtes and Athletic Meetings, it is not surprising that insurance against wet weather is regularly undertaken.

In the absence of reliable or adequate statistics, a novel kind of insurance is based upon empirical methods, at premiums allowing a substantial margin for errors of judgment as well as for working expenses, and as experience is gained the premiums are reduced until the lowest profitable basis in practice is reached, and it frequently happens that this practical value is greater than would appear from the statistics when ascertained owing to the operation of other considerations. In this way, the adequate premium for an insurance against a rainfall of .10 in. during a day of 12 hours or less in the summer months, June—September, has been fixed at 20 to 25 per cent., according to the part of the country involved. This is for the simple risk of rainfall, which in point of fact, however, is seldom asked for, the common form being an indemnity against loss through rainfall, viz., against the receipts for admission falling short of the expenses of the venture in consequence of rain.

This form introduces a second consideration, the attractiveness of the meeting and its power to draw gate-money in spite of wet weather, with the result that premiums which are calculated on the expenses vary considerably. The risks are covered either for loss "reasonably attributable to rain," or upon a rainfall of  $\cdot 10$  in., and, in very general terms, the former costs 5 per cent. on the expenses more than the latter. It is evident that a country show which is a regular fixture, and where the show is of more importance than the frocks and frills of the ladies, is less likely to be interfered with by rain than a town fête where Dame Fashion is in the ascendant.

It is somewhat difficult to give a reliable indication of the rates ruling, because, owing to the indifferent weather of recent summers, underwriters with experience have shown an inclination to increase their charges, and, at the same time, others have entered into the business in the belief that lower rates can be charged with safety. However, it may be taken as an approximation, that 10% on the expenses is a normal rate subject to  $\cdot 10$  in. of rain falling during agreed hours, usually 9 a.m. to 8 p.m.; and 15% for loss reasonably attributable to rain. In the past, quotations have largely been governed by rule of thumb; but it is a healthy sign that there is now a tendency to consult statistical records, and to discriminate according to the district and the month, as well as the attractiveness of the meeting.

The cost of insurance at these rates naturally forms an appreciable item in the accounts, and while many institutions holding a meeting annually make it a practice to insure regularly, it is amusing to note in the case of those who have not insured before their anxiety to have the insurance, but their reluctance to pay the necessary premium, and not infrequently their strenuous endeavours to cheat the weather, which, it need hardly be said, generally fail. It is usual to stipulate that the premium must be paid three days before the day insured; and in one instance a proposal for £300 was made and accepted for Saturday. On Tuesday it rained heavily; on Wednesday it rained heavily, but no premium was paid. On Thursday it was still raining, and the premium was offered, and although late, accepted. On Friday it poured again, and on Saturday the sun beamed benignly on the gentleman who had attempted to "wait and see."

The nature of the meetings protected by Weather Insurance varies considerably, and the amounts involved frequently run into substantial figures. The form of the insurance itself is occasionally varied to meet particular cases. An important cricket match will be insured for £1,000 spread over the three days, and the policy will be to pay a specified sum if "no ball bowled" during a section of the period; the three days being cut up into six sections, viz., three mornings and three afternoons.

A big open-air political gathering, where there is no charge for admission and the expenses are borne by the Association, may be insured against the actual costs of postponement or abandonment.

Agricultural and Horse Shows, Athletic Meetings, Fireworks and Fêtes will insure from small amounts up to £500 or £600, and the vogue of Pageants and Aviation meetings has created a demand for policies reaching several thousands of pounds in many instances. Possibly the largest weather insurance was one for £8,000 in connection with fêtes at a French town lasting a week. There have been various larger policies, but on the basis of insuring the deficiency between the takings at the gate and a specified sum from whatever cause arising, commonly called "gate insurance;" a form of policy which the present writer has always looked upon as peculiarly hazardous, since it covers not only the risk of weather, but also of calamity and "public taste," the latter being exceedingly difficult to gauge in the case of a meeting which has not been held before. Weather insurance policies stand upon a firmer basis, and the more statistics of daily rainfall become available, the more\* will it be possible to discriminate in the rating of risks.

### COLD JULIES IN LONDON.

THE chill and gloomy month just past gave rise to many statements in the press as to the weather being of an unprecedented nature, and we had occasion to check many more statements of a similar kind by assuring a host of eager young journalists that the records of the past spoke of several years with a chillier July still.

The unprecedented may be common enough in a short record, but as year is added to year the unprecedented grows rarer and rarer. In the last line of the following table we have extracted the temperature figures for Camden Square in July, 1910, which come nearest the unprecedented, and above them in chronological order similar data for the twelve earlier years in which one or other of the values given was lower.

*Temperature Records at Camden Square in July.*

YEAR.	Shade Max. Temp.			Mean Shade Temp. of Month.	
	Mean.	Highest.	Lowest.	Mean.	Diff. from average.
1860 .....	69°·9	75°·9	59°·9	59°·6	— 4°·0
1861 .....	71°·9	76°·8	59°·2	62°·2	— 1°·4
1867 .....	70°·9	76°·9	57°·6	61°·0	— 2°·6
1871 .....	72°·6	82°·2	59°·2	62°·5	— 1°·1
1875 .....	69°·8	80°·4	59°·2	60°·3	— 3°·3
1879 .....	67°·7	80°·2	57°·6	59°·1	— 4°·5
1880 .....	72°·5	79°·2	66°·1	62°·6	— 1°·0
1882 .....	71°·5	77°·8	64°·8	61°·3	— 2°·3
1888 .....	67°·1	72°·7	55°·7	58°·9	— 4°·7
1890 .....	69°·3	76°·2	58°·1	60°·4	— 3°·2
1892 .....	70°·5	81°·7	55°·5	60°·7	— 2°·9
1909 .....	70°·4	77°·6	62°·6	61°·4	— 2°·2
1910 .....	68°·5	79°·2	59°·2	59°·9	— 3°·7

By this it will be seen that July, 1910, comes fourth in respect of low mean temperature, and that it was the fourth occasion in 53 years when the mean temperature of the month was below  $60^{\circ}$ . The mean temperature this year was however  $1^{\circ}0$  above that of July, 1888, which was the coldest July in the record. On no occasion during the month did the maximum temperature of any day mount to  $80^{\circ}$ , but this has been the case in eight previous Julies, all of which are quoted. The extraordinary frequency of low maxima is made more apparent by the mean daily maximum for the month, which was only  $68^{\circ}5$ , being  $6^{\circ}0$  below the average, and the third lowest on record. The lowest daily maximum of the month ( $59^{\circ}2$  on the 9th in 1910) has been lower eight times, the lowest of all on July 17th, 1892, reaching only  $55^{\circ}5$ . The minimum daily temperature was by no means so remarkable, the monthly mean having been lower in 18 years, and the absolute lowest very frequently. This may probably be attributed to the lack of terrestrial radiation at night on account of the abnormal prevalence of cloud, and the latter is confirmed by the sunshine record. The duration of sunshine has been recorded at Camden Square only since 1904, but even this comparatively short record provides an interesting comparison. Thus, for the three years, 1904-6, the average amount for July was 228.5 hours, for the following three years it fell to 162.4 hours, whilst in July, 1910, only 101.5 hours were observed. At the moment of writing we have just put on record the sunshine measured on August 10th, 10.3 hours, and were struck by the fact that this was the first day since June 20th, seven and a half weeks before, with so much as 10 hours of sunshine. During July, 1910, the greatest daily record was no more than 7.4 hours, and there were twenty-two days which failed to give more than 5 hours of bright sunshine, a state of things which is probably more nearly unprecedented than any other of the conditions of a most unsummerlike month.

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## THE WEATHER OF JULY.

By FRED. J. BRODIE.

OWING to an unusual prevalence of cool winds, chiefly from between west and north, and to a marked deficiency in the amount of bright sunshine, the eastern and central districts, normally the warmest in the whole kingdom, experienced last month a striking absence of summer heat. On only two occasions did the thermometer in any part of our eastern, midland and southern counties touch  $75^{\circ}$ , and in some few places it scarcely exceeded  $70^{\circ}$ . At Hereford on the 21st, and at Greenwich on the 28th, a shade maximum of  $76^{\circ}$  was registered, but at Westminster the thermometer never rose above  $74^{\circ}$ , the reading being the lowest absolute maximum recorded in July since the singularly inclement season of 1888, when the temperature



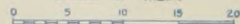
# RAINFALL OF THAMES VALLEY - JULY, 1910



ALTITUDE  
SCALE

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

SCALE OF MILES






in London failed to exceed  $72^{\circ}$ . The western and northern parts of the United Kingdom experienced also an undue prevalence of cool weather, but between the 12th and 14th, when a large anticyclone which covered the country reached its maximum intensity, the thermometer rose to  $80^{\circ}$  in several portions of Scotland, North Wales and the north-west of England, and to very nearly as high a level at some inland stations in Ireland. At Rothesay, Newton Rigg and Bettws-y-Coed, the shade maximum on the 13th was as high as  $81^{\circ}$ , and was  $5^{\circ}$  higher than anything recorded in the eastern or south-eastern parts of the country. In western and central Ireland the mean temperature of July was not much below the average, but in most English districts the deficiency amounted to between three and three and a half degrees, and in London to more than four degrees. The frequent presence of a heavy cloud canopy was inimical to the progress not only of solar but also of terrestrial radiation, and the night temperatures were, therefore, more nearly in accordance with the normal than the midday readings. Very few minima below  $40^{\circ}$  were recorded in any part of the country, but at Balmoral the sheltered thermometer on the 11th, and again on the 24th, sank to  $31^{\circ}$ , the readings on the surface of the grass being respectively as low as  $29^{\circ}$  and  $28^{\circ}$ . In London the thermometer scarcely went below  $50$  degrees, the absolute minimum of  $49^{\circ}$  on the 3rd, 19th and 24th being higher than in many recent Julies.

Between the 8th and 14th of the month an anticyclonic distribution of pressure was reported over the entire kingdom, and in Ireland and Scotland it continued until about the 18th, many places in all districts experiencing an absence of rain lasting between 10 and 12 days. At all other times a cyclonic type prevailed, the weather of the last 12 days being affected by numerous depressions which came in from the Atlantic. Some of these disturbances, notably that of the 24th-25th, were of unusual intensity for the season, and occasioned gales from between south-west and north-west on many parts of our western and southern coasts. Very few heavy falls of rain were experienced in the eastern districts, but in the west and north such occurrences were more frequent, the principal cases being reported on the 5th, the 20th and the 25th.

The total duration of bright sunshine for the month was considerably below the normal in nearly all parts of England and the east of Scotland. At Westminster only 102 hours were registered, as against an average of 181 hours, the number being smaller than in any July since the record commenced in 1883, with the single exception of 1888, when the total was no higher than 92. In the west of Scotland the duration last month agreed very closely with the average, while in Ireland there was an excess. At Birr Castle the total of 196 hours was 57 in excess of the normal.





## Correspondence.

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

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### LOW JULY MAXIMUM TEMPERATURE.

THE maximum shade temperature to-day (Stevenson screen, Kew verified thermometer) was  $56^{\circ}7$ .

According to the Greenwich Observatory Temperature Tables, 1841—1905, the lowest maximum for the 18th July was  $64^{\circ}5$  in 1883, nearly  $8^{\circ}$  warmer than to-day.

Is not such a low maximum very unusual in the south of England in the middle of July?

H. K. G. ROGERS.

*Glenart, Weybridge, 18th July, 1910.*

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### A BEAUTIFUL RAINBOW AFTER SUNSET.

THE sun had apparently set here this evening at about 7.30 behind a belt of trees, and the sky above it had a brilliant golden red glow. In the opposite direction a flame shot up from the horizon, the sky around it being suffused with orange and red, and the remark was made to me that there must be a fire in Watford. Presently the flame, rising higher, was seen to be curved, and proved to be a rainbow, which by 7.40 formed a complete arch, apparently on light clouds rather than on rain. Outside the bow the sky glowed with red, but inside down to the horizon in the centre of the arch it was uniformly much lighter, being of a pale gold colour, the contrast being very marked. This appearance lasted until 7.47, at least a quarter of an hour after the sun had entirely disappeared, and it seemed to fade from rain becoming general rather than from the setting of the sun. It was the most beautiful and peculiar rainbow effect I have ever seen, although the different colours of the rainbow itself were not so distinct as usual.

JOHN HOPKINSON.

*Westwood, Watford, August 4th, 1910.*

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### CLOUD FORMS SIMULATING A WATERSPOUT.

ON Sunday morning, July 17th, just after 11 a.m., a cloud form, closely allied to a waterspout, was seen from Detling over the Weald of Kent. The weather at the time was rough and stormy with heavy rain, cumulo-nimbus with pendulous banks of nimbus suspended at a low elevation being the prevalent cloud forms, the whole moving rapidly from an easterly point. In the rear of an exceptionally heavy rain squall violent disturbances were visible in these cloud

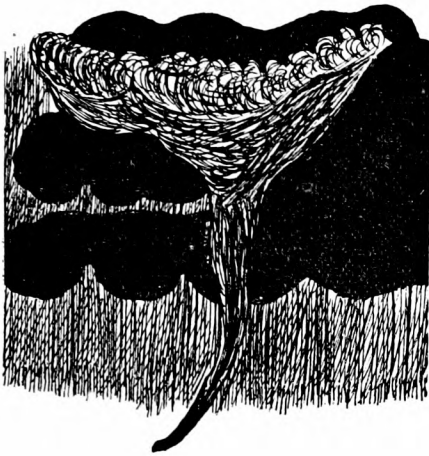


FIG. 1.

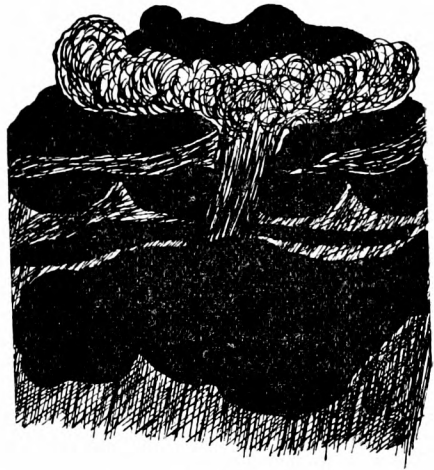


FIG. 2.

forms, developing rapidly into the shape of a waterspout, silhouetted very plainly against the clouds, with the end of the spout apparently below the nimbus. The nimbus appeared as though rapidly drawn up by the cumulo-nimbus and then deposited equally rapidly by a current with a spiral motion, rain descending in sheets. A well marked seething prevailed at the apex of the spout. The phenomenon was of short duration, with rapid alterations in shape and size.

Fig. 1 shows the general appearance at 11.14 a.m. from a rapid sketch made at the time, and Fig. 2 just prior to the landscape being entirely blotted out by a pall of nimbus.

*Epsom, July 30th, 1910.*

SPENCER C. RUSSELL.

### PARISH RECORDS AND WEATHER.

THE enclosed extract from the Churchwardens' Book, 1672, in *Archæologia Cantiana*, vol. xxii., page 46, may be of interest in continuation of my previous letters on the subject.

“Munday the 30th day of December, 1672, between 12 and 1 in the morning arose a storm of lightning and thunder, a hard gale of wind and some raine out of the south-west, which set fire to the steeple at Benenden, whereby the said steeple with the rooffe and all the timber work of the church was consumed in four or five howers time, the five large bells melted; also five houses ajoyning to the churchyard gate on the north side burnt to the ground. The steeple was built of timber from the ground.”

RICHARD COOKE.

## COMETS AND THE WEATHER.

By F. W. HENKEL, B.A., F.R.A.S.

*(late of Markree Observatory).*

IN general, comets were not regarded by the ancients as heavenly bodies at all, but as purely transient atmospheric "meteors," and they are accordingly not even mentioned in Ptolemy's great work, the *Almagest*. Aristotle, whose ideas on all subjects were held in the utmost reverence up to about two centuries ago, considered these bodies to be in general exhalations or vapours arising from the Earth. These vapours are drawn upwards and rising to the "region of fire" there condense and burn, being visible so long as the combustible material of which they are composed lasts.\* Xenocrates and Theon of Alexandria call comets "light clouds," to which Xenophanes adds the epithet of "wandering," but though this is in a sense true, their idea of the nature of cloud was very different from our own. Pliny's Natural History is full of references to cometary phenomena and their supposed influences. He divides these bodies into no less than 12 different kinds according to their form, and speaks of Sword Comets (*Xiphiae*), Disc-shaped Comets (*Discei*), Horse-manes (*Hippii*), &c. Many pages might be filled with quotations from ancient and modern writers, but we propose to confine ourselves as closely as possible to supposed influences on the weather and other meteorological phenomena.

Pliny in his Natural History says: "They distribute poison throughout the atmosphere when they appear in the head of the Northern or the Southern Serpent, it is not an unimportant matter whether they dart their beams towards certain regions or no, their influence varies accordingly." In curious contrast to this view we have another that the poisonous exhalations of the atmosphere rise up and are consumed in the form of comets, the latter thus serving to purify and not pollute the air! Virgil in the first "Georgic" referring to supposed portents at the time of Caesar's death, alludes to the darkening of the sun by day, and direful comets in the sky occurring with lightning in otherwise clear skies at night. Seneca, who almost alone amongst the classical writers, held sensible and consistent views as to the nature of comets, regarding them as distant planets returning at regular intervals, nevertheless says: "The comet which appeared during the Consulate of Paterculus and Vopiscus (A.D. 62) has been attended with the consequences that Aristotle and Theophrastus have attributed to this kind of star. Everywhere there have been *violent and continual storms*, in Achaia and Macedonia

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\* According to Aristotle the air is divided into three regions; (1) that in which animals and plants live, immovable like the earth on which it rests; (2) an intermediate region intensely cold; (3) the upper region contiguous to the region of fire, or the heavens, partaking of the diurnal motion of the latter. The vapours rising from the Earth ascend to this region and are heated, engendering igneous meteors and comets.

several towns have been overthrown by earthquake." Strabo and Diodorus Siculus in their works refer in a similar manner to the supposed connection between the apparition of brilliant comets and remarkable storms or earthquakes.

Throughout the writers of the middle ages, in addition to the "wars, pestilences and death of princes," supposed to be portended by comets, we find continual references to remarkable conditions of weather attributed with equal reason to the influence of these bodies. "In (536 A.D.) the ninth year of the reign of Justinian I. there occurred a darkness lasting through the greater part of that year and part of the following one" (Gregorius, *Abu'l Faragius*). "In the second year of Justinian II. (567 A.D.) there appeared a *flame of fire in the heavens* near the North Pole and it remained for a whole year, darkness was cast over the world from three o'clock until midnight so that nothing could be seen, and something resembling dust and ashes fell from the sky" (*Abu'l Farag.*). Humboldt has conjectured that this phenomenon may have been a long lasting magnetic storm (*aurora borealis*) and been followed by darkness and showers of meteoric dust. Many other quotations of a similar character might be given, the principle of *post hoc ergo propter hoc* being thought sufficient evidence of the causal connection between cometary and terrestrial phenomena.

Yet, though the wide spread and long continued belief in the influences of comets upon the weather has even survived the belief in their direct baleful influence upon the fortunes of humanity, we must, nevertheless, place it in the same category as the supposed lunar influence. In the words of the late Professor Young, we may say that "there is no *observable* change of temperature or of any meteorological condition, nor any effect upon vegetable or animal life produced by a comet, even of the largest size." Arago, more than half-a-century ago, made some attempts to deal statistically with the question. He took the mean temperature at Paris for the years 1735 to 1853, placing side by side the number of comets observed in each year, and thus showed that years fruitful in comets, such as 1808, 1819 and 1846, were marked by temperatures lower or hardly equal to those of years in which few or no comets were seen. Sixty-nine years with comets gave a mean annual temperature of  $51^{\circ}46$  F., twenty-seven years in which no comets were seen gave a mean of  $50^{\circ}94$ . He considered this slight difference as explained by the fact that years without comets were most frequently more cloudy than the others, the prevalence of clouds concealing comets from observation. Arago alludes to a singular modern fancy as to the influence of comets upon harvests, vintages, &c., and Humboldt states, "in our own day a singular belief has arisen ascribing to these once ill-omened bodies a beneficial influence on the ripening of the vine in German vineyards. The year 1811 was distinguished by the apparition of a particularly brilliant comet, and in France, at least, the vintage was especially good and abundant, and the wine thence pro-

duced was long known as the "Comet wine." A letter quoted by Arago runs thus: "Through the influence of the comet of 1811, the winter following was very mild, the spring was wet, the summer cool, and very little appearance of the sun to ripen the produce of the earth, yet the harvest was not deficient, and some fruits were not only abundant but deliciously ripe. Very few wasps appeared, and the flies became blind and disappeared early in the season. *A large number of females produced twins, some had more, and one woman was the mother of four children at one birth!* After the appearance of Halley's comet in 1835-6, the mild temperatures of the months of October and November were ascribed by some to the passage of the comet." On this Arago made the following remarks: "People wish to attribute the mild temperature of the north of France during these eight weeks to the influence of the comet! I could instance on the one hand Octobers and Novembers still milder when no comets were visible; on the other hand I could give instances of great cold being experienced during the same months when brilliant comets were in sight, but to come more directly to the point, I will remark that at the end of 1835, while Paris was enjoying a very mild temperature, it was especially cold in the south, so that if the temperature depended on the comet's influence, this action must vary with the position of the place!"

In a similar manner, the warm weather experienced about May 20th of the present year, and the colder weather later have, with equal reason, been attributed to the proximity of this comet to our own Earth. Coggia's comet of 1874 was visible at the hottest time of the year, and that summer in France was unusually hot, but in 1873 no less than seven comets passed their perihelion, and yet that year was not so hot as the following one.

Another meteorological phenomenon, the "dry fog," examples of which at times lasted for a month or more, has also been attributed to comets with about as much reason.

The great comet of 1861 passed very close to the Earth on June 30th of that year, and it was the opinion of Hind, Liais, and other astronomers that our planet was actually involved in its tail. Nothing definite seems to have been observed at the time, though one or two persons recorded a peculiar phosphorescence in the sky, and Mr. Lowe of Nottingham compared the appearance to that of a diffuse aurora borealis, "yet being daylight such aurora would be scarcely noticeable." It seems not improbable that a similar encounter between the Earth and what remains of Biela's comet took place in 1872, when a remarkable meteor shower was seen. Humboldt (*Cosmos*, vol. i.), however, records meteor showers seen by Capocci before the separation of the comet, so that it is by no means certain that "Biela's comet was shedding over us the pulverised products of its disintegration" at that time. The proximity of Halley's comet to the Earth during the present year has caused much interest to be manifested in the questions as to the possibility of detecting any action of this body upon terrestrial phenomena.

It seems probable that when nearest to us in the early morning of May 19th, the tail did not reach so far as the Earth, so that the suggested bottling of sample portions of our atmosphere to detect any new or unusual gases could have no result. Though there is no doubt of the existence of a strong action possibly of an electrical nature between the comet and the sun, all efforts to detect any influence of the former upon terrestrial magnetism have so far had negative results, the records at Kew and other magnetic observatories showing no unusual phenomena.

All that we know of these still mysterious bodies bears witness to the excessive tenuity of the substance of which they are composed. The faintest stars are visible with undiminished brightness through enormous thicknesses of cometary matter, though the least cloud in our own atmosphere would impair their lustre, render them invisible. Their paths are enormously affected by their approaches towards the planets, but no effect has ever been produced in the motions of these latter, "we have no balance delicate enough to weigh them (the comets)." Two centuries ago the fancy of Whiston attributed the "universal deluge" to the approach of a comet, causing an unprecedented tide in the waters of the globe, and he also ventured to predict that the same body will some day accomplish the destruction of our world by fire, but we now know that such speculations are utterly groundless. Laplace, at one time, amused himself with speculating on the consequences of a collision between a comet and the Earth, on the supposition *that the mass of the comet was comparable with that of our planet*, and even supposed that in some such way the "cataclysms" of the older geologists might be explained. The novelist, Edgar Allen Poe, in his "Extraordinary Histories," relates a conversation supposed to have taken place between Eiros and Charmion, after the destruction of the world by a comet. The comet approaching by its action removed the whole of the nitrogen of the terrestrial atmosphere, leaving pure oxygen. "Thus resulted an irresistible, all devouring, omni-prevalent combustion. A shouting and pervading sound, while the whole incumbent mass burst at once into a species of intense flame. . . . This ended all!" The cause for the abstraction of the nitrogen is not given, as is, perhaps, hardly to be expected from a novelist.

In conclusion, we may say that though the volume of a comet is often enormous, sometimes many times greater than that of the sun itself, yet the mass even of the largest comet is excessively small. Matter in such a condition must possess properties altogether different from any of which we have experience, the residual gas in the most perfect vacuum obtained by artificial means being a massive plenum by comparison. We may thus conclude that there is but the smallest possibility of any detectible influence of a comet upon terrestrial meteorological conditions, since the gravitational effect is absolutely imperceptible.

## RAINFALL TABLE FOR JULY, 1910.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH.	
					Aver. 1875— 1909. in.	1910. in.
Camden Square.....	<i>London</i> .....	51 32	0 8	111	2·57	2·53
Tenterden.....	<i>Kent</i> .....	51 4	*0 41	190	2·21	2·32
Steyning.....	<i>Sussex</i> .....	50 53	0 20	80	2·55	3·31
Southampton (Cadland) ..	<i>Hampshire</i> .....	50 50	1 22	52	2·42	2·88
Hitchin.....	<i>Hertfordshire</i> ...	51 57	0 17	238	2·55	1·70
Oxford (Magdalen College).	<i>Oxfordshire</i> .....	51 45	1 15	186	2·43	1·68
Bury St. Edmunds (Westley)	<i>Suffolk</i> .....	52 15	*0 40	226	2·68	3·62
Geldeston [Beccles].....	<i>Norfolk</i> .....	52 27	*1 31	38	2·37	4·03
Polapit Tamar [Launceston]	<i>Devon</i> .....	50 40	4 22	315	2·74	2·49
Rousdon [Lyme Regis] .....	„.....	50 41	3 0	516	2·68	3·08
Stroud (Upfield).....	<i>Gloucestershire</i> ..	51 44	2 13	226	2·75	2·23
Church Stretton (Wolstaston)..	<i>Shropshire</i> .....	52 35	2 48	800	2·58	2·43
Coventry (Kingswood) .....	<i>Warwickshire</i> ...	52 24	1 30	340	2·60	...
Market Overton.....	<i>Rutland</i> .....	52 44	0 41	475	2·64	2·28
Boston.....	<i>Lincolnshire</i> .....	52 58	0 1	25	2·35	2·36
Worksop (Hodsock Priory).	<i>Nottinghamshire</i>	53 22	1 5	56	2·35	2·49
Macclesfield.....	<i>Cheshire</i> .....	53 15	2 7	501	3·41	5·99
Southport (Hesketh Park)..	<i>Lancashire</i> .....	53 38	2 59	38	2·92	3·74
Wetherby (Ribston Hall) ...	<i>Yorkshire, W.R.</i>	53 59	1 24	130	2·56	3·03
Arneliffe Vicarage.....	„ „.....	54 8	2 6	732	4·75	5·09
Hull (Pearson Park) .....	„ „ <i>E.R.</i>	53 45	0 20	6	2·39	2·73
Newcastle (Town Moor) ...	<i>Northumberland</i>	54 59	1 38	201	2·90	2·22
Borrowdale (Seathwaite) ...	<i>Cumberland</i> .....	54 30	3 10	423	8·91	9·16
Cardiff (Ely).....	<i>Glamorgan</i> .....	51 29	3 13	53	3·26	3·05
Haverfordwest.....	<i>Pembroke</i> .....	51 48	4 58	95	3·39	2·89
Aberystwyth (Gogerddan)..	<i>Cardigan</i> .....	52 26	4 1	83	4·03	5·47
Llandudno.....	<i>Carnarvon</i> .....	53 20	3 50	72	2·52	3·11
Cargen [Dumtries].....	<i>Kirkcudbright</i> ...	55 2	3 37	80	3·20	...
Marchmont House.....	<i>Berwick</i> .....	55 44	2 24	498	3·30	4·05
Girvan (Pinmore).....	<i>Ayr</i> .....	55 10	4 49	207	3·73	5·46
Glasgow (Queen's Park) ...	<i>Renfrew</i> .....	55 53	4 18	144	2·91	5·26
Inveraray (Newtown) .....	<i>Argyll</i> .....	56 14	5 4	17	4·72	5·44
Mull (Quinish).....	„.....	56 36	6 13	35	4·12	3·96
Dundee (Eastern Necropolis)	<i>Forfar</i> .....	56 28	2 57	199	2·84	3·57
Braemar.....	<i>Aberdeen</i> .....	57 0	3 24	1114	2·65	3·51
Aberdeen (Cranford) .....	„.....	57 8	2 7	120	3·00	2·38
Cawdor.....	<i>Nairn</i> .....	57 31	3 57	250	3·14	4·74
Fort Augustus (S. Benedict's)	<i>E. Inverness</i> ...	57 9	4 41	68	2·98	3·12
Loch Torridon (Bendamph)	<i>W. Ross</i> .....	57 32	5 32	20	5·35	5·64
Dunrobin Castle.....	<i>Sutherland</i> .....	57 59	3 56	14	2·91	3·56
Wick.....	<i>Caithness</i> .....	58 26	3 6	77	2·67	2·49
Killarney (District Asylum)	<i>Kerry</i> .....	52 4	9 31	178	3·53	3·37
Waterford (Brook Lodge)...	<i>Waterford</i> .....	52 15	7 7	104	3·13	2·15
Nenagh (Castle Lough)...	<i>Tipperary</i> .....	52 54	8 24	120	3·02	3·40
Miltown Malbay.....	<i>Clare</i> .....	52 52	9 26	400	3·59	5·41
Gorey (Courtown House) ..	<i>Wexford</i> .....	52 40	6 13	80	2·90	1·99
Abbey Leix (Blandsfort)....	<i>Queen's County</i> ..	52 56	7 17	532	2·99	2·80
Dublin (Fitz William Square)	<i>Dublin</i> .....	53 21	6 14	54	2·60	2·40
Mullingar (Belvedere) .....	<i>Westmeath</i> .....	53 29	7 22	367	3·16	3·27
Ballinasloe.....	<i>Galway</i> .....	53 20	8 15	160	3·07	2·36
Crossmolina (Enniscoe).....	<i>Mayo</i> .....	54 4	9 18	74	3·26	3·69
Collooney (Markree Obsy.).	<i>Sligo</i> .....	54 11	8 27	127	3·36	5·94
Seaforde.....	<i>Down</i> .....	54 19	5 50	180	3·32	3·84
Bushmills (Dundarave).....	<i>Antrim</i> .....	55 12	6 30	162	3·28	3·26
Omagh (Edenfel).....	<i>Tyrone</i> .....	54 36	7 18	280	3·34	4·59

RAINFALL TABLE FOR JULY, 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.		
		in. Date.		in.	in.					
— .04	98	.55	5	17	13.53	14.66	+1.13	108	25.11	Camden Square
+ .11	105	.55	5	14	13.65	16.23	+2.58	119	27.64	Tenterden
+ .76	130	.77	5	16	16.39	23.27	+6.88	142	33.58	Steyning
+ .46	119	.62	16	14	15.73	17.07	+1.34	109	31.87	Cadland
— .85	67	.46	5	15	13.36	13.69	+ .33	102	25.16	Hitchin
— .75	69	.58	5	14	13.03	12.89	— .14	99	24.58	Oxford
+ .94	135	.69	17	16	13.44	16.24	+2.80	121	25.40	Westley
+1.66	170	.96	17	17	11.98	17.52	+5.54	146	23.73	Geldeston
— .25	91	.38	28	18	18.62	23.88	+5.26	128	38.27	Polapit Tamar
+ .40	115	.62	17	15	17.01	17.74	+ .73	104	33.54	Rousdon
— .52	81	.80	5	12	15.83	16.50	+ .67	104	29.81	Stroud
— .15	94	.56	5	13	16.88	15.93	— .95	94	32.41	Wolstaston
...	...	...	...	...	15.35	...	...	...	28.98	Coventry
— .36	86	.60	5	16	14.13	14.49	+ .36	103	27.10	Market Overton
+ .01	100	.81	5	16	12.21	12.95	+ .74	106	23.35	Boston
+ .14	106	.42	5	14	13.15	12.42	— .73	94	24.46	Hodsock Priory
+2.58	176	1.29	20	14	18.17	21.48	+3.31	118	34.73	Macclesfield
+ .82	128	1.16	20	12	15.88	18.94	+3.06	119	32.70	Southport
+ .47	119	.86	5	13	14.19	18.32	+4.13	129	26.87	Ribston Hall
+ .34	107	1.30	5	15	31.97	39.69	+7.72	124	61.49	Arneliffe
+ .34	114	.67	5	15	13.47	13.99	+ .52	104	26.42	Hull
— .68	77	.54	5	16	14.45	15.08	+ .63	104	27.94	Newcastle
+ .25	103	1.66	28	18	65.29	76.74	+11.45	117	129.48	Seathwaite
— .21	94	1.15	24	12	20.48	26.64	+6.16	130	42.28	Cardiff
— .50	85	.72	20	17	22.84	21.58	— 1.26	94	46.82	Gaverfordwest.
+1.44	136	1.91	20	14	22.15	30.29	+8.14	137	45.46	Hoverddan
+ .59	124	1.22	5	10	14.89	19.34	+4.45	129	30.36	Llandudno
...	...	...	...	...	22.26	...	...	...	43.47	Cargen
+ .75	123	.90	25	14	17.68	14.88	—2.80	84	33.76	Marchmont
+1.73	146	.80	20	16	24.83	32.26	+7.43	130	49.77	Girvan
+2.35	181	1.09	25	15	18.42	23.07	+4.65	125	35.97	Glasgow
+ .72	115	.90	5	17	34.04	40.42	+6.38	118	68.67	Inveraray
— .16	96	1.17	27	17	27.67	29.92	+2.25	108	56.57	Quinish
+ .73	126	.71	25	17	14.86	13.11	— 1.75	88	28.64	Dundee
+ .86	132	...	...	...	17.80	22.24	+4.44	125	34.93	Braemar
— .62	79	.76	21	14	17.02	14.85	—2.17	87	32.73	Aberdeen
+1.60	151	1.81	25	9	15.65	19.70	+4.05	126	29.33	Cawdor
+ .14	105	.86	24	16	23.20	28.38	+5.18	122	44.53	Fort Augustus
+ .29	105	.72	29	13	42.74	53.10	+10.36	124	83.61	Bendamp
+ .65	122	.80	25	14	17.19	16.22	— .97	94	31.90	Dunrobin Castle
— .18	93	1.28	25	19	15.38	15.24	— .14	99	29.88	Wick
— .16	96	.72	28	18	28.40	36.22	+7.82	127	54.81	Killarney
— .98	69	.60	28	13	20.53	18.64	— 1.89	91	39.57	Waterford
+ .38	113	.65	20	17	20.53	26.67	+6.14	130	39.43	Castle Lough
+1.82	151	2.00	28	16	22.30	27.88	+5.58	125	45.11	Miltown Malbay
— .91	69	.52	28	11	18.32	18.01	— .31	98	34.99	Courtown Ho.
— .19	94	.66	20	18	18.83	25.05	+6.22	133	35.92	Abbey Leix
— .20	92	.52	5	16	14.75	21.03	+6.28	143	27.68	Dublin
+ .11	103	.58	20	16	19.17	24.15	+4.98	126	36.14	Mullingar.
— .71	77	.61	28	16	19.22	21.80	+2.58	113	36.64	Ballinasloe
+ .43	113	.66	29	17	26.64	33.98	+7.42	127	52.87	Enniscoe
+2.58	177	1.13	28	18	22.19	34.17	+11.98	154	42.71	Markree
+ .52	116	.63	5	16	20.74	20.59	— .15	99	38.91	Seaforde
— .02	99	.48	20	18	18.77	22.94	+4.17	122	37.56	Dundarave
+1.25	137	.60	28	18	20.44	26.32	+5.88	129	39.38	Omagh



## SUPPLEMENTARY RAINFALL, JULY, 1910.

Div.	STATION.	Rain inches	Div.	STATION.	Rain. inches
II.	Warlingham, Redvers Road	3.17	XI.	Llangyhanfal, Plâs Draw...	3.56
"	Ramsgate .....	2.25	"	Dolgelly, Bryntirion .....	7.19
"	Hailsham .....	2.53	"	Bettws-y-Coed, Tyn-y-bryn	4.85
"	Totland Bay, Aston House.	3.02	"	Lligwy .....	2.54
"	Stockbridge, Ashley .....	1.83	"	Douglas, Woodville .....	...
"	Grayshott .....	2.73	XII.	Stoneykirk, Ardwell House	3.51
"	Reading, Calcot Place.....	2.09	"	Dalry, The Old Garroch ...	5.25
III.	Harrow Weald, Hill House.	2.33	"	Langholm, Drove Road.....	6.75
"	Pitsford, Sedgebrook.....	1.75	"	Moniaive, Maxwellton House	6.02
"	Huntingdon, Brampton.....	2.22	XIII.	St Mary's Loch, Cramilt Ldge	5.29
"	Woburn, Milton Bryant.....	2.22	"	Edinburgh, Royal Observty.	3.92
"	Wisbech, Monica Road.....	3.44	XIV.	Maybole, Knockdon Farm..	3.88
IV.	Southend Water Works....	1.93	XV.	Campbeltown, Witchburn...	4.05
"	Colchester, Lexden.....	1.55	"	Glenreassdell Mains.....	3.77
"	Newport .....	1.93	"	Ballachulish House.....	3.41
"	Rendlesham .....	2.49	"	Islay, Eallabus .....	2.75
"	Swaffham .....	3.40	XVI.	Dollar Academy .....	4.36
"	Blakeney .....	4.14	"	Balquhidder, Stronvar .....	7.67
V.	Bishops Cannings .....	2.30	"	Coupar Angus .....	4.79
"	Winterbourne Steepleton ...	3.52	"	Blair Atholl.....	4.16
"	Ashburton, Druid House ...	3.58	"	Montrose, Sunnyside Asylum	2.23
"	Honiton, Combe Raleigh ...	2.88	XVII.	Alford, Lynturk Manse ...	4.43
"	Okehampton, Oaklands.....	3.61	"	Keith Station .....	4.89
"	Hartland Abbey .....	2.37	XVIII.	Glenquoich, Laon .....	6.25
"	Lynmouth, Rock House ...	3.35	"	Skye, Dunvegan.....	4.01
"	Probus, Lamellyn .....	2.27	"	N. Uist, Lochmaddy .....	2.99
"	North Cadbury Rectory ...	3.25	"	Alvey Manse .....	2.80
VI.	Clifton, Pembroke Road ...	2.14	"	Loch Ness, Drumnadrochit.	3.79
"	Ross, The Graig .....	1.63	"	Glencarron Lodge .....	4.37
"	Shifnal, Hatton Grange.....	1.79	"	Fearn, Lower Pitkerrie.....	3.82
"	Blockley, Upton Wold .....	3.66	XIX.	Invershin .....	3.94
"	Worcester, Boughton Park.	1.97	"	Altnaharra .....	...
VII.	Market Rasen .....	2.95	"	Bettyhill .....	2.25
"	Bawtry, Hesley Hall.....	2.79	XX.	Dunmanway, The Rectory..	2.61
"	Derby, Midland Railway ...	2.84	"	Cork .....	2.12
"	Buxton.....	5.74	"	Mitchelstown Castle .....	4.13
VIII.	Nantwich, Dorfold Hall.....	3.11	"	Darrynane Abbey .....	3.08
"	Liscard .....	4.00	"	Glenam [Clonmel] .....	2.22
"	Chatburn, Middlewood .....	3.36	"	Nenagh, Traverston .....	4.01
"	Cartmel, Flookburgh .....	3.37	"	Newmarket-on-Fergus, Fenloe	...
IX.	Langsett Moor, Up. Midhope	3.25	XXI.	Laragh, Glendalough .....	4.33
"	Scarborough, Scalby .....	2.96	"	Moynalty, Westland .....	3.08
"	Ingleby Greenhow .....	2.65	"	Athlone, Twyford .....	2.83
"	Mickleton.....	2.71	XXII.	Woodlawn .....	4.26
X.	Bardon Mill, Beltingham ...	4.06	"	Westport, St. Helens .....	4.42
"	Ilderton, Lilburn Cottage...	2.73	"	Achill Island, Dugort .....	6.19
"	Keswick, The Bank .....	5.53	"	Mohill .....	3.99
XI.	Llanfrechfa Grange.....	2.39	XXIII.	Enniskillen, Portora .....	2.64
"	Treherbert, Tyn-y-waun ...	8.17	"	Dartrey [Cootehill].....	3.66
"	Carmarthen, The Friary....	4.15	"	Warrenpoint, Manor House	3.85
"	Castle Malgwyn [Llechryd].	2.06	"	Banbridge, Milltown .....	3.98
"	Plynlimon.....	12.30	"	Belfast, Springfield .....	5.38
"	Crickhowell, Ffordlas.....	2.90	"	Glenarm Castle.....	3.05
"	New Radnor, Ednol .....	3.85	"	Londonderry, Creggan. Res.	4.34
"	Rhayader, Tyrmynydd .....	5.57	"	Killybegs .....	6.09
"	Lake Vyrnwy .....	...	"	Horn Head ...	3.62

## METEOROLOGICAL NOTES ON JULY, 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.—Unusually cold and cheerless throughout with very scanty sunshine records (see p. ). Cold winds from some N. point prevailed until 19th, after which the direction was generally S.W. with frequent showers. Duration of sunshine, 101·5\* hours, and of R 40·5 hours. Mean temp. 59°·9, or 3°·7 below the average, and with three exceptions the lowest in 53 years. Shade max. 79°·2 on 28th; min. 47°·3 on 19th. F 0, f 0.

TENTERDEN.—A very dull and bad haymaking month though not specially wet. Duration of sunshine, only 117·0† hours, of which 25 per cent. was recorded in the last four days. Shade max. 73°·5 on 28th; min. 45°·5 on 4th. F 0, f 0.

RYDE.—Many damp and dull days and a lack of sunshine. Shade max. 74°·0 on 14th; min. 49°·0 on 4th.

PITSFORD.—R 1·96 in. below the average. Mean temp. 58°·6. Shade max. 76°·5 on 28th; min. 42°·6 on 19th. F 0.

ROUSDON.—Dull, changeable weather; a continuation of the weather of June with no genial warmth. Shade max. 70°·4 on 14th, this being the only day the temp. reached 70°.

ROSS.—The average shade max 67°·3 was the lowest with five exceptions in any July since 1861. Shade max. 77°·8 on 14th; min. 44°·4 on 14th. F 0, f 0.

HODSOCK PRIORY.—Shade max. 74°·9 on 14th; min. 40°·8 on 19th. F 0, f 0.

SOUTHPORT.—Duration of sunshine 215·3\* hours, and of R 69·4 hours. Mean temp. 57°·8, or 1°·9 below the average. Shade max. 78°·2 on 14th; min. 45°·2 on 18th. F 0, f 0.

HULL.—Cloudy and unsettled generally with fresh winds and varying temp. Shade max. 74°·0 on 31st; min. 47°·0 on 4 days. F 0, f 0.

HAVERFORDWEST.—Fine and warm generally to 16th, but wet and stormy after. The hay crops were good and well saved. Shade max. 72°·5 on 8th; min. 40°·6 on 17th. F 0, f 0.

LLANDUDNO.—Shade max. 77°·0 on 13th; min. 49°·0 on 18th. F 0, f 0.

MARCHMONT HOUSE.—Duration of sunshine, 146·6\* hours. Shade max. 71°·0 on 13th; min. 42°·0 on 3rd. F 0, f 0.

EDINBURGH.—Shade max. 70°·0 on 4th; min. 46°·1 on 2nd. F 0, f 0.

COUPAR ANGUS.—The wettest July since 1883. The month opened wet with a dry, warm period from 7th to 20th, followed by persistent and heavy R to the close. Mean temp. 57°·4. TSS were prevalent throughout. Shade max. 76°·0 on 13th; min. 37°·0 on 24th.

FORT AUGUSTUS.—Shade max. 68°·5 on 28th; min. 40°·3 on 11th. F 0.

WATERFORD.—Shade max. 76°·0 on 14th; min. 44°·0 on 9th. F 0.

DUBLIN.—The beginning was cold and showery, and the end, while showery, was seasonably warm. Mean temp. 58°·0, or 2°·5 below the average. Shade max. 72°·2 on 27th; min. 47°·1 on 8th. F 0, f 0.

MARKREE.—The first few days were wet and stormy, after which no R fell until 19th when wet weather again set in until the close. There was a strong gale on 25th, and heavy R on 28th causing considerable damage to roads and crops. Shade max. 78°·3 on 14th; min. 37°·3 on 9th. F 0, f 1.

WARRENPOINT.—A fine month until 19th when continuous and heavy R set in. Temp. below the average. Shade max. 71°·0 on 13th; min. 51°·0 on 17th. F 0, f 0.

\* Campbell-Stokes.

† Jordan.

## Climatological Table for the British Empire, February, 1910.

STATIONS.  (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain		Aver.	
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.		
	Temp.	Date.	Temp.	Date.										
	Temp.	Date.	Temp.	Date.	Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	Cloud.	
London, Camden Square	56°0	17	27°5	5	48°3	36°3	39°0	0.100	89	91·2	21°1	2·96	21	6·4
Malta ... ..	61·7	20	44·5	14	57·0	50·7	47·3	83	137·8	...	3·33	14	5·5	
Lagos ... ..	91·0	5*	75·0	3*	89·9	77·0	74·8	71	150·0	73·0	0·8	2	7·1	
Cape Town ... ..	98·4	6	47·8	9	80·5	62·1	58·0	64	...	...	·39	4	2·5	
Durban, Natal ... ..	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Johannesburg ... ..	79·1	19	50·3	15†	72·3	55·3	56·7	83	146·0	49·6	3·94	11	6·8	
Mauritius ... ..	87·5	6	65·2	20	85·2	71·0	69·4	76	163·4	58·1	4·00	17	5·8	
Calcutta... ..	92·3	25	53·3	3	84·1	59·1	56·7	61	...	47·7	·44	1	8·6	
Bombay... ..	89·1	1	64·8	18	86·3	69·1	63·6	64	135·6	56·9	·00	0	0·6	
Madras ... ..	90·9	21	62·5	9	87·5	69·2	67·8	73	139·4	59·5	·00	0	2·3	
Kodaikanal ... ..	67·5	13	40·8	8	63·6	47·0	40·5	59	131·4	23·2	1·30	7	3·4	
Colombo, Ceylon ... ..	91·7	5	67·0	7	88·2	72·4	71·9	78	161·8	63·3	1·00	4	5·8	
Hongkong ... ..	74·9	25	47·6	2	64·7	55·9	53·6	78	136·1	...	·41	6	6·4	
Melbourne ... ..	102·3	19	46·8	13	81·2	56·6	52·0	53	160·3	41·9	·38	5	3·9	
Adelaide ... ..	105·9	16	51·4	9	89·2	63·5	52·5	44	167·0	45·8	·06	2	3·3	
Coolgardie ... ..	103·4	12	55·0	22	87·0	62·3	53·9	49	175·2	53·0	·88	6	4·2	
Perth ... ..	103·0	17	57·7	21	98·4	66·4	58·3	51	157·7	49·1	·05	2	3·8	
Sydney ... ..	89·1	7	56·4	14	79·0	64·2	60·8	67	...	45·5	·65	16	4·4	
Wellington ... ..	78·2	25	49·8	1	70·7	58·5	55·5	72	135·0	44·0	4·25	7	6·1	
Auckland ... ..	82·0	23	56·0	2	76·7	64·6	63·6	78	156·0	50·0	6·05	11	5·5	
Jamaica, Kingston ... ..	87·6	22	60·4	5	84·7	65·5	63·5	70	...	...	·02	2	1·7	
Grenada ... ..	86·6	2	69·0	28	81·5	71·8	66·7	74	141·0	...	5·36	23	5·0	
Toronto ... ..	43·4	27	10·2	6	29·2	12·8	...	...	56·9	15·5	3·21	17	6·6	
Fredericton ... ..	72·0	6	20·0	12	54·0	35·1	...	76	...	...	4·10	10	6·0	
St. John's, N.B. ... ..	44·0	27	2·0	8	30·9	15·6	...	79	...	...	4·09	14	6·0	
Victoria, B.C. ... ..	49·0	26	19·0	21	41·7	31·7	...	80	...	...	4·73	20	8·0	
Dawson ... ..	5·0	10	54·0	2	15·0	31·2	...	...	...	...	·22	5	5·2	

\* days. † and 24.

MALTA.—Mean temp. of air 53°·1. Average bright sunshine 5·4 hours per day.

Johannesburg.—Bright sunshine 197·3 hours.

Mauritius.—Mean temp. of air 0°·8, of dew point 1°·5, and R 3·35 in., below averages. Mean hourly velocity of wind 8·1 miles, or 2·7 below average.

KODAIKANAL.—Bright sunshine 231 hours.

COLOMBO.—Mean temp. of air 78°·0, or 2°·2 below, of dew point 1°·3 above, and R 1·01 in. below, averages. Mean hourly velocity of wind 7·8 miles. TSS on 2 days.

HONGKONG.—Mean temp. of air 60°·0, or 2°·0 above, bright sunshine 141·2 hours, or 53 hours above, averages. Mean hourly velocity of wind 16·2 miles. R 1·35 in. below average.

Melbourne.—Mean temp. of air 2°·7 above, and R 1·34 in. below, averages.

Adelaide.—Rainfall ·52 in. below average.

Coolgardie.—Mean temp. of air 1°·1 below average.

Perth.—Mean temp. of air 3°·6 above average.

Sydney.—Mean temp. of air 0°·6 above, and R 4·04 in. below, averages.

Wellington.—Mean temp. of air 2°·3 above, and R 1·03 in. above, averages.

# Simons's Meteorological Magazine.

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No. 536.

SEPTEMBER, 1910.

VOL. XLV.

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## THE METEOROLOGICAL OUTLOOK IN SOUTH AFRICA.

BY A CONTRIBUTOR.

It is to be hoped that the new Union Parliament will take an early opportunity of considering the position of meteorology in South Africa. It cannot be said that any of the States of the Union, or Rhodesia has hitherto spent as much upon meteorology—or upon any other science for that matter, saving perhaps geology—as might reasonably have been expected. Besides, South Africa, like most other young countries, has not yet developed to any considerable extent the cultured class of people with leisure to take up the study of any pure science for its own sake. Consequently the pre-eminent vantage ground of South Africa for the study of world meteorology has not been utilized as it might have been.

Leaving out of account for the present the voluntary work of the thousand odd rainfall stations, and the fifty or sixty second and third order meteorological and climatological stations reporting regularly to Government Departments, the only stations of any importance in the country are the Royal Observatory at Cape Town, the Government Astronomical Observatory at Durban, the Government Observatory at Johannesburg, and the private Observatories at Kimberley and Bulawayo.

The Royal Observatory is kept up by the Admiralty, but some of the meteorological instruments there are the property of the Cape Government, and such meteorology as is done there is of course quite a side show. At Durban, while the Observatory is nominally an astronomical one, a large proportion of the work is meteorological, and is of excellent quality considering the limited equipment. The Observatory at Johannesburg possesses some fine meteorological instruments, and undertakes weather forecasts. For the Observatory at Kimberley meteorologists are under a great obligation to the De Beers Mining Company, whose example in this respect is probably altogether unique for a public company. This was the first station in South Africa to undertake systematic continuous records of all the principal recognised meteorological elements. Father Goetz, at Bulawayo, is assisted to a small extent, we believe, by the Rhodesian Government, but is largely dependent upon his own resources. In addition to these, Mr. Lyle has organised, under the auspices of the

Government of Orangia, a meteorological service with headquarters at Bloemfontein. His instrumental appliances are, however, not yet very elaborate.

None of these stations is wholly satisfactory. Our gratitude for what we have so far got from them is tempered by the feeling that we might have got more if only they could have made a better start. The site in nearly every case, considered from a meteorologist's ideal standpoint, was bad from the beginning—"born bad," as Professor Lowell would say. So far as Cape Town, Durban and, perhaps, Johannesburg are concerned, these places having been chosen with a view to astronomical observations were not likely to be the best for meteorological purposes. Whenever meteorology is associated with astronomy it must necessarily suffer to a large extent, not, perhaps, in the matter of routine observations (Greenwich is a standing example of how excellent these may be), but certainly on the experimental—the most important—side. Also at Kimberley Dr. Sutton has to do the best he can for the disposal of his instruments in his own garden, where he is crowded for room, and surrounded outside by the nuisance of growing trees. And all this in an ideal country of ideal sites for meteorological study. Another drawback is that none of these observatories can hope to undertake magnetic work of passable quality, which every good meteorological observatory ought to do to some extent.

What South Africa would appear to want is a series of first order independent meteorological observatories, one at least of which should be furnished with tools for the exploration of the upper air; and all for some amount of magnetic observation, suitably distributed in latitude and longitude, say in one line across the country from Durban to Port Nolloth, and in another line from Bulawayo to East London. With these in working order, a systematic discussion of the great mass of second-order observations already in existence could be made; and in particular, of the years of continuous wind records understood to be preserved at some of the ports. Of these, so far as we can gather, only the East London records have been examined at all, and only for a period of three years; so that scarcely more has been done in this direction than to show how extremely important and interesting the whole matter of the coastal winds of South Africa is.

A single service for the whole country could obviously be run more cheaply and more efficiently than separate services for each State as at present. The only, and not very serious, difficulty to be arranged would be that the standard times of observation for voluntary Observers have been selected at random by the different State services. Apparently these times have been chosen not with the idea of what is best for meteorology, but with the idea of what is the most convenient for local use. Preferably, the standard time used by the Cape Meteorological Commission should have been adopted throughout, even at the expense of some little sacrifice of convenience, the Cape having

been first in the field by many years. There is, however, one small matter in which the amalgamation of the different services can be anticipated: the barometric observations made at Johannesburg, the headquarters of the Transvaal service, are printed in millimetres, whereas those for the Transvaal out-stations are printed in inches. Now every meteorologist is capable of converting the one into the other, but it is hardly fair to expect him to do such a work of supererogation. Is it impossible to have the conversion into inches done at headquarters before publication? Or better still, cannot the blank forms for the barograph curves be graduated in English measures?

## INTERNATIONAL BALLOON ASCENTS, MARCH 5th, 1908.

By W. H. DINES, F.R.S.

THE conditions were remarkable, inasmuch as the commencement of the isothermal column was lower than usual and the temperature also lower. In general the temperature and height show a connection with opposite signs, so that if the temperature is above, the height is below the average. The figures for Pyrton Hill are remarkable also, and suggestive of some error in the record, but the temperature is the easiest element to measure. It is more likely that this high temperature was associated with the small but deep depression, with the barometer below 29·00 in., that crossed the south of England the next day.

Barometric condition.—On March 4th pressure was highest over Russia, Spain and the south-east of Europe. The conditions were somewhat similar on the 5th, but the barometer was falling on the west coast of Ireland. During the night a small depression travelled rapidly across the south of Ireland, and slowly across the south of England during the next day.

*March 5th, 1908.*

Starting Point.	A	B	C	D	E	F	G
	in.	miles.	° F.	miles.	° F.	miles.	
Manchester, England..	30·0	6·4	—72	7·9	—62	59	E. by S.
Pyrton Hill, „ ..	29·9	6·4	—36	9·9	—36	82	E. by S.
Uccle, Belgium.....	29·9	7·1	—78	10·0	—71	131	E.S.E.
Lindenberg, Germany..	30·0	6·2	—78	6·6	—76	25	N.E. by N
Strassburg „ ..	30·1	5·0	—69	6·9	—69	48	E. by N.
Munich „ ..	30·1	5·3	—74	7·6	—62	59	E.N.E.
Vienna, Austria .....	30·1	5·8	—80	9·4	—62	75	E.N.E.
Pavia, Italy .....	30·2	6·0	—76	6·8	—74	60	E.

A=Approximate barometric pressure reduced to sea-level.

B=Height in miles of commencement of isothermal column.

C=Temperature, F°, at bottom of column.

D=Greatest height of reliable record in miles.

E=Temperature, F°, at greatest height.

F=Distance in miles of point where balloon fell.

G=Bearing of falling point from starting point.

## BRITISH RAINFALL, 1909.

THE annual volume embodying the year's work of the British Rainfall Organization was first completed on February 15th, 1862, when it consisted of 18 pages; it was completed in February until the issue for 1867, which had 126 pp., and dealt with 1292 records. The last to be completed in March was for 1870, with 184 pp. and 1509 records. In the following year the preface was not signed until May, but the next three years saw it done in April, the last being for 1874, with 214 pp. and 1727 records. *British Rainfall*, 1878, was the latest to be finished in May, with 216 pp. and 2071 records. Except for two sporadic spurts the volume was not completed in June since 1884, with 290 pp. and 2463 records. Except for 1902, 1903 and 1904, which were completed in June or July, the last to be finished before August was that for 1898, with 320 pp. and 3404 records, and *British Rainfall*, 1909, was completed, so far as the editorial work is concerned, on August 22nd, 1910, with 428 pp. and 4681 records. The growth of the volume and the retardation of publication are dealt with in a historical article of 24 pp., which concludes with a recital of the essential clauses of the Trust Deed. Mr. Gethin Jones, the chief authority on the rainfall of the Snowdonian region, contributes an illustrated article describing the spot in North Wales where snow lies latest into the summer. One of the photographs shows a large patch of snow lying on June 29th, 1910.

All the usual features are present in the volume, and special care has been devoted to the sections on "The Staff of Observers," in which the special interest of the records which appear for the first time, or have ceased to appear, are touched upon in detail. The Obituary Notices are as numerous and as full as the information accessible to the Editor and the space at his disposal permit. It is only by means of these notices that the remarkably varied and interesting careers of their fellow Observers can be realized by the Observers of to-day, for the few who die each year are typical of the thousands who live.

In Part II. the long series of remarks by Observers on the days, the months and the year are still inserted, although it may perhaps be found more serviceable to use the 80 pp. so occupied for printing monthly values of the rainfall at all stations, and so doubling the size of the General Table. No consideration save expense keeps out monthly values. In the section on Heavy Falls on Rainfall Days, all cases where the wettest day in the year at any station had a rainfall exceeding either 2.50 in. or  $7\frac{1}{2}$  per cent. of the total for the year are dealt with, and maps are given of the eight most wide-spread falls. These occurred on April 2nd and 3rd, when the area with more than 1 inch of rain (for the two days together) was 27,108 square miles in Ireland; on July 27th, when it was 17,502 square miles in England; on August 17th, when it was 12,378 square miles in England; on September 27th-28th, when (for the two days) it was 35,291 square

miles in Great Britain and Ireland ; on October 26th-28th, when (in the three days) more than 1 inch fell over 21,920 square miles in the south of England ; on December 2nd, when 23,659 square miles in Great Britain and Ireland had more than an inch of rain ; and on December 21st, with 13,072 square miles in the south of England. All these were ordinary cases of cyclonic or thunderstorm rains, in which the splash of the rain on the map showed no relation to the configuration of the ground, but was related solely to the meteorological condition of the atmosphere. But the heavy fall of December 9th, which is also mapped, is of another type. Here the isobars ran straight across the British Isles with practically no curvature to proclaim them part of a cyclone or of an anticyclone, and the area with rainfall over an inch on that day in Great Britain measured 14,783 square miles, and was concentrated on the high land against which the wind appeared to blow with apparently no ascensional movement due to meteorological as distinguished from geographical causes.

The rainfall for each month is mapped for the whole country, each map being constructed from about 2000 observations, and maps showing the percentage of the average for the month, compiled from a smaller number of stations, are also given for comparison.

The price of the volume to Observers remains the same as when it was one quarter of the size, and the cost of production was a much smaller fraction of what it is to-day.

A list of donors to the Endowment Fund, of which Mr. F. Druce is the Treasurer for the Trustees, shows that one donation of £500 was received, four of £100 each, one of £50 and 24 smaller sums make up £150 between them. This fund is invested and the interest will be devoted to the expenses of the British Rainfall Organization. It is right to mention that the Director of the Organization is unpaid, and that he has contributed £300 during the last two years to cover the deficit caused by increasing the staff and improving the publications. The number of permanent assistants is five, there is also a housekeeper, and a considerable amount of outside help has to be called in, the total outlay on salaries and wages in 1909 having been nearly £600, and the cost of printing and postage of the publications, £570. Establishment expenses, stationery, etc., amounted to £272, and the income from subscriptions was £1,080, and from sales of publications to the public, advertisements, supplying certificates for rain gauges and glasses, supplying copies of rainfall data, and from other sources, £210.

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## THE METEOROLOGICAL LUNCHEON, British Association, Sheffield, 1910.

By E. GOLD, M.A.

THE experiment, initiated at Winnipeg last year, of substituting a luncheon for the time-honoured meteorological breakfast, was repeated at Sheffield on Tuesday, September 6th. The luncheon came appropriately after a morning's discussion of problems in cosmical physics, and the stimulus of the double event was apparent in the speeches. Dr. W. N. Shaw presided over a company which included the following ladies and gentlemen interested in meteorology :—

Sir Norman Lockyer, K.C.B.  
Lady Lockyer  
Mr. R. F. Stupart  
Professor Bigelow  
Dr. Aitken  
Professor F. G. Bailey  
Dr. W. Schmidt  
Professor A. W. Porter  
Mr. G. G. Chisholm  
Dr. W. G. Duffield  
Mrs. Duffield  
Miss White  
Mr. M. McCallum Fairgrieve  
Mrs. Fairgrieve  
Mr. J. Smith  
Mr. J. Bisset

Mr. W. L. Fox  
Dr. H. Borns  
Dr. W. Makower  
Mr. T. L. Bennett  
Mr. A. A. Robb  
Mr. H. Bateman  
Dr. J. W. Nicholson  
Mr. Edward Kitto  
Mrs. Kitto  
Mr. E. Gold  
Mrs. Gold  
Mr. J. S. Dines  
Mr. E. Howarth  
Mr. R. S. Whipple  
Mr. Watts

In addressing the company after the luncheon, Dr. Shaw referred to some recent events in the meteorological world which, he believed, would hereafter be found to have had considerable influence on the direction and progress of meteorological research in this country, and on meteorology generally. First, by an evolutionary process, an arrangement had been made to terminate the isolation of seismological and magnetic work, and by the direct connection of Kew and Eskdalemuir Observatories with the Meteorological Office, the advantages of co-operation and co-ordination were secured for geophysical work in this country. Secondly, the transference of the Meteorological Office to its new abode at South Kensington marked an important step, because the institution would have in future, not only a building for clerks and scientific workers worthy of the subject in which they were engaged, but it would provide, in addition, a library which looked like a library and a museum for the exhibition of objects of scientific interest which might be contributed to it. Specimens of what such objects might be, the company had an opportunity of seeing in the Lumière photographs of the rainbow and the sun-pillar shown by Dr. Aitken, in the drawings of aurora by Mr. Clarke of Aberdeen, and in a work, humorously illustrative of the description of the Beaufort scale given in Dr. Simpson's memoir, designed by a young naval officer, and indicative at least of an interest in meteorology in that important service, and perhaps also.

instructive in other ways. In proposing a toast to the progress of meteorology, Dr. Shaw referred to the presence at the luncheon of Mr. Stupart, Director of the Canadian Meteorological Service, Professor Bigelow, late of the U.S. Weather Bureau, and widely known for his contributions to dynamical meteorology, Dr. Schmidt, of the Meteorological Institute at Vienna, and Mr. Bennett, who represented a younger member of the family, the meteorological service of Egypt. He coupled the names of those gentlemen with the toast.

Mr. Stupart said he had recently experienced the difficulties of moving an office, in fact, he had had a double removal, and he assured Dr. Shaw that it would be a considerable time before things settled down satisfactorily in the new quarters. He referred also to the inter-dependence of meteorologists of different countries, and instanced the general relationships between Canadian and European weather conditions.

Professor Bigelow expressed the interest he felt at seeing men face to face whom he knew well by name, and who were all co-operating in the advance of meteorological science. He acknowledged fully how closely the United States, Canada and England were bound together by meteorological ties. He referred humorously to the possibility of a forecaster in the U.S.A., who foretold fair weather every day, obtaining 75% of accurate forecasts, while the official forecaster, who tried to apply the principles of the science, might predict accurately in only 68% to 70% of the whole number of cases. He related also some experiences on a recent expedition to California for the study of evaporation; and mentioned a new way of catching fish by trolling from a moving train crossing a bridge over a certain inlet in that region.

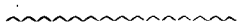
Dr. Schmidt said that at Vienna the combination of the various branches of geophysics under a central authority, took place some time ago, and that now the tendency was rather to decentralization. He trusted that Dr. Shaw's expectations would not be disappointed by such a termination. He expressed also his gratification at the hospitable reception which England had accorded him.

Mr. Bennett regretted that Captain Lyons, who had practically created the meteorological service of Egypt was not present. His own claim to represent Egypt there rested on the rather slender foundation that for two months every summer he took Mr. Craig's place in meteorological affairs. It might be not uninteresting to note that for these two months 99% of the forecasts were accurate, always fair weather. The great problem for Egyptian meteorology was the origin and prediction of the Nile flood. Mr. Craig's expedition to Abyssinia had thrown much light on this question, and his recent conclusion that the rain-bearing winds came as a S.W. current from the Atlantic, might lead to further valuable results.

Mr. Gold proposed that the thanks of all present should be accorded to Mr. Howarth, the local observer. He felt that all

meteorologists ought to be grateful to men who looked after meteorology with interest and ability in what might be called the outlying districts of the meteorological world.

Mr. Howarth, in the course of an interesting speech, expressed the hope that the time would soon arrive when the collection of observations, which was now so lengthy and extensive, would be utilized for developing a scheme for the practical forecasting of the general character of the weather some distance ahead. In common with many others he felt profoundly dissatisfied that we were unable to obtain a forecast for a longer period than 24 hours. We had been in the present position for more than 30 years.



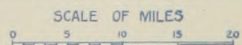
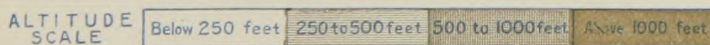
### THE RAINFALL OF AUGUST, 1910.

THE month of August proved to be very near the average as regards rainfall in the south-east of England, although rain fell on many days. To the east and south of a line drawn from Weymouth to Skegness there was a total fall of less than 3 inches, except for a patch in East Anglia, and the detached areas shown on our map of the Thames Valley and its neighbourhood. The least rain fell in two areas, one round the Thames estuary, the other between Northampton and Cambridge, less than 2 inches having fallen in each of these. The portion of country covered by the Thames Valley map had rainfall of a normal type, the higher ground having the larger fall and the lower ground the less. It is only in the extreme west of the map that the appearance of the lines of 4, 5 and 6 inches shows the severe conditions which prevailed outside the favoured triangle of the south-east.

The greater part of Cornwall, Devon, Somerset and Gloucestershire, Worcestershire, Herefordshire, and practically the whole of Wales, had more than 5 inches, and a very large area more than 7 inches. A somewhat drier belt separated the Pennine Chain and Lake District, where the extent of the high rainfall was even greater, culminating in an area with more than 8 inches stretching for 70 miles from Skipton to Cockermouth, and for 30 miles from Cartmel to beyond Shap. In the heart of the Lake District several stations recorded more than 20 inches of rain in the month, and even at Seathwaite more than 20 inches has only been recorded for August on three previous occasions in the last 50 years, viz., in 1861, 1891 and 1903.

Except for a broad strip along the east coast and a small area in the south-west, practically the whole of Scotland had more than 6 inches of rain, and two large areas—one in the Southern Uplands, the other in the Southern Highlands—had more than 8 inches, each enclosing a substantial stretch of country with more than 10 inches. The most remarkable wet area was in Stirling, Argyll and Perth, stretching for 80 miles from the Kyles of Bute to beyond Dunkeld,

# RAINFALL OF THAMES VALLEY — AUGUST, 1910.



Symons's Meteorological Magazine.

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

Isohyets  
Rainfall Stations reporting .....





and for 40 miles from Bridge of Allan to near Rannoch, over the whole of which there was more than 10 inches of rain. Except at one isolated station, nothing above 8 inches occurred north-west of the Great Glen through which the Caledonian Canal runs. The very wet area in Perthshire was the scene of some remarkable floods, doing damage to property and crops.

All Ireland, except a narrow strip in the east round Dublin, and a much larger area in the west including Galway, had more than 5 inches, and a patch in the north round Londonderry, which was the wettest part of Ireland in August, had more than 8 inches.

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## THE WEATHER OF AUGUST.

By FRED. J. BRODIE.

THE concluding summer month of 1910 proved even more disappointing than its two immediate predecessors. Owing to a general deficiency in the amount of bright sunshine, the thermometer failed to rise to anything like a high seasonable level, and had it not been for a remarkable burst of warmth in the extreme north the month would have passed without any shade temperature as high as  $80^{\circ}$  in any part of the United Kingdom. At Balta Sound in Shetland the thermometer on the 6th rose to a maximum of  $77^{\circ}$ , while 60 miles or so farther south at Sumburgh Head, it succeeded in touching  $82^{\circ}$ . The latter reading was  $12^{\circ}$  higher than anything observed at the same station since the year 1871\*.

In other parts of these islands the thermometer last month seldom rose as high as  $75^{\circ}$ , and was often much lower. During by far the larger portion of the time the country lay between a large anticyclone, which occupied a normal position over the central southern portions of the North Atlantic, and a similar system which hung quite abnormally over Iceland and the neighbouring oceanic regions. Between these two areas numerous low pressure systems formed over the eastern half of the Atlantic, and moved slowly across the United Kingdom, causing much cloud and frequent falls of rain, often of considerable weight. Irrespective of the sudden burst of warmth in the extreme north, the highest temperatures of the month occurred between the 10th and 16th, when the thermometer rose to  $75^{\circ}$  or a little above it in many parts of England, and touched  $78^{\circ}$  at Whitby on the 11th. In London the highest readings occurred on the 12th, when a maximum of  $76^{\circ}$  was recorded in St. James's Park, and a reading of  $77^{\circ}$  at Greenwich. Between the 27th and 29th of the month the thermometer at many northern stations failed to reach  $60^{\circ}$ , and in a few isolated places it scarcely exceeded  $55^{\circ}$ . Owing to the presence of much cloud, which served to hinder the progress of

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\* This remarkable phenomenon is fully described in Mr. Lempfert's letter on another page. ED. S.M.M.

terrestrial radiation, the nights were relatively speaking warmer than the days. In the south of England few temperatures below  $50^{\circ}$  were observed; but over the northern half of Great Britain the thermometer on the 4th and 23rd fell below  $40^{\circ}$ , a reading of  $37^{\circ}$  being recorded at Balmoral on the former date, and a reading of  $32^{\circ}$  at West Linton on the latter occasion.

The mean temperature of the month was below the average in all districts excepting the north of Scotland, the deficit varying from about half a degree on our north-east and north-west coasts, to about a degree and a half in the extreme south and south-west of England. The amount of bright sunshine was also below the normal, but the deficiency varied greatly in extent in different parts of the country, being upon the whole greatest in the extreme south and south-west. In London (at Westminster) the total duration, 156 hours, was only 12 hours short of the average, but was the smallest recorded in August since the year 1902.

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### Correspondence.

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

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#### HIGH TEMPERATURE IN SHETLAND ON AUGUST 6th, 1910.

THE present summer has been regarded very generally as one of particularly unsettled weather, and I am not prepared to defend it against its accusers. It may, however, be of interest to point out that even within the limits of the United Kingdom there are regions where the weather has been unusually fine, and one of these is the Shetland Islands. At Sumburgh Head the rainfall for June was just about equal to the average, while that for July was  $1.59$  inches below it. The two months combined had only 22 days with rain, or only about two-thirds of the average number. Simultaneously the sunshine recorder at Balta Sound, in the extreme north of the group, has been rivalling and even outdoing the performances of the instruments on our favoured south coast. We must, of course, bear in mind the great length of the days at midsummer in those northern latitudes, but the present is the first year since the establishment of a sunshine recorder at Balta Sound in which the total for June or July has approached those of our south coast stations. Dr. Saxby writes to me from Balta Sound, "It has really been a glorious summer, but farmers are all complaining of the want of rain, and I do not remember ever seeing the ground so dry."

It is, however, to some extraordinarily high temperatures which have been recorded recently in Shetland that I wish to draw special attention. On Saturday, August 6th, Sumburgh Head reported a maximum as high as  $82^{\circ}$ . Seeing that the records from 1871

onwards disclose no other reading above  $70^{\circ}$  a telegraphic error was at first suspected, but inquiry of the Observer confirmed the figure, and a reading as high as  $77^{\circ}$  at Balta Sound lends it additional support. What makes the occurrence all the more remarkable is that the temperatures in the Orkneys and on the Scottish mainland were low for the time of year. Both Deerness (Orkney) and Wick reported maxima no higher than  $58^{\circ}$ . The circumstances seemed to me so unusual that I was induced to write to Dr. Saxby for further particulars. Here is his reply: "On Saturday, August 6th, I awakened at 5 a.m., and was unable to go to sleep again on account of the 'closeness' of the air, so rose and went out at 5.30 a.m. The sun was shining brightly, and from the card had been shining since a few minutes past 3 a.m. Black, calm, cloudless sky, air oppressive, *sultry* not *scorching*; 9 a.m. temperatures, dry bulb  $76^{\circ}\cdot5$ , wet bulb  $69^{\circ}\cdot0$ , humidity 65%. The air was just perceptibly moving, I recorded it as E. 1. Sky still clear. At 11 a.m. the dry bulb showed  $73^{\circ}\cdot0$ , wet  $67^{\circ}\cdot2$ , humidity 71%. The maximum thermometer recorded  $77^{\circ}$ , so that the highest reading was apparently between 9 a.m. and 11 a.m. During the rest of the day there was a light wind veering to south, the sun felt scorching not sultry. Duration of sunshine 15.6 hours."

As to the causes of this very unusual state of things, Dr. Saxby's account indicates that insolation can have had little to do with the phenomenon. At 5 a.m. radiation cannot have been very intense, and the sun cannot be looked upon as more than a contributory cause. Convection of warm air from the neighbouring continent suggests itself as a possible cause. The Daily Weather Report for the day shows a low pressure system centred over the North Sea, and under such circumstances we can conceive of air following an east to west trajectory and passing from Scandinavia to Shetland. The temperatures recorded on the mainland on August 5th were high: Bodö, maximum  $75^{\circ}$ , Christiansund  $77^{\circ}$ , Skudesnaes  $70^{\circ}$ ; more detailed information might well reveal even higher values. We are, however, faced with the difficulty that this warm air would have had to pass over a cold ocean during its passage from Norway to Shetland. The temperature of the surface water recorded at Lerwick was only  $55^{\circ}$ , or  $27^{\circ}$  below the air temperature recorded at Sumburgh Head. One of the most striking facts brought out by a study of a set of daily temperature charts of the North Atlantic, is the rapidity with which the temperature of the air adjusts itself to within a few degrees of that of the water surface over which it is flowing. In the present case warm surface air from Norway could not have passed over nearly 200 miles of cool sea without having its temperature very considerably reduced, particularly as the wind was so light that the journey would have occupied at least twelve hours.

The hypothesis of the convection of warm air by surface currents thus breaks down, and we are driven back upon a dynamical explanation. We know that air, of which the motion has a downward



component, has its temperature raised by one degree Centigrade for each hundred metres of descent owing to the compression which it undergoes in the process. In the warm Föhn wind we have a familiar example of an air current which has had its temperature raised in this way. The high temperatures in Shetland must have been due to a similar cause. The cloudless sky supports such a hypothesis. It must be admitted that we should expect greater dryness than that recorded by Dr. Saxby. Still the surface layers of air in which our observations have perforce to be made may have been moistened by evaporation from the ground. The suggestion that the north-west quadrant of a depression is a region of descending air is no new one, but it is startling to find the process resulting in air at a temperature of  $82^{\circ}$ , remaining anchored at the Earth's surface in close proximity to air at a temperature below  $60^{\circ}$ . The densities of the masses of air respectively over Shetland and Orkney on the morning of August 6th were approximately in the ratio 29:30. Under normal circumstances we should expect that upward motion of the lighter air would remove it from the Earth's surface long before the difference of density reached anything like this magnitude.

R. G. K. LEMPFT.

*Meteorological Office, London, S. W., September 2nd, 1910.*

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### EVAPORATION CORRECTED FOR RAINFALL.

IN determining the quantity of evaporation from the various types of evaporation gauge exposed in the open air, it seems to be generally the custom to allow for the rainfall by first of all deducting the depth of rain as shown by the rain gauge from the final height of the water in the evaporation gauge. The difference between the original height and the final height thus reduced is called the evaporation in the given interval. Thus, if the water level in the open evaporation gauge sinks  $\cdot 20$  inch in any time and  $\cdot 20$  inch of rain has fallen in the same time, the evaporation is called  $\cdot 40$  inch. My own experience at Kimberley with large and small evaporimeters, however, agrees with that of Dr. Scott, that such an allowance is rarely to be trusted. A moderate South African shower will splash some water out of the evaporimeter; a heavy rain will sometimes, and a hail storm nearly always, splash more out than falls in, even when the evaporimeter is immersed to about its own level in a large cistern of water which serves as a guard ring. An interesting instance of this occurred here on January 10th, 1908, when  $\cdot 220$  inch of rain fell as hail in about a quarter of an hour; and instead of the water level in the evaporation tank (surrounded by an outer cistern) rising  $\cdot 220$  inch, it actually fell  $\cdot 894$  inch. According to the usual rule this would give an "evaporation" of  $\cdot 894 + \cdot 220 = 1\cdot 114$  inch in fifteen minutes!

J. R. SUTTON.

*Kimberley, July 11th, 1910.*

## A SIGN OF EAST WIND.

I SHOULD be interested to learn if any of your readers have observed the following warning of east winds to come. It only applies to winter months, and is as follows:—

The wind is in the south with damp and mild air. Gradually the percentage of humidity goes down, and temperature shows no tendency to rise during the day or to fall during the night; all this time the sky is entirely overcast. In the meanwhile the wind backs to the east. These signs are, of course, associated with an anticyclone over central Europe, moving north to Scandinavia. So far I have tested this three times—twice successfully, before the cold easterly spell of Christmas, 1908, and the short spell in the beginning of December, 1909. It would be interesting to hear your readers' opinions as to the reliability of this sign. C. H. E. RIDPATH.

*Great Malvern, September 4th, 1910.*

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REVIEWS.

*Fifth Annual Report of the Meteorological Committee to the Lords Commissioners of His Majesty's Treasury, for the Year ended 31st March, 1910.* London. Printed for H.M. Stationery Office, and to be purchased from Wyman & Sons, Ltd., Fetter Lane, E.C., &c. Size 9½ x 6. Pp. 148. Price 1s. 10d.

THE Report now before us shows a condition of high efficiency and great activity in the Meteorological Office. The use of wireless telegraphy as an aid to weather forecasting has been tested and found to be capable of becoming a valuable aid if only more rapid transmission could be secured from ship to shore. The upper-air research carried on by the Office does not yet seem to have led to any practical results in forecasting, but there are indications of useful information being forthcoming in connection with aerial navigation. The accounts of the Meteorological Office show a total income of just over £20,000; but the very large item of printing is also met by Government and has not to be provided for from income. The *personnel* consists of a Director at £1000 per annum, and 52 other workers whose salaries and wages amount to £7000.

A great deal of time during the year was absorbed in preparations for moving the Meteorological Office to the new building prepared for it in Kensington, and we hope to be able to describe the new quarters in an early number. A great deal of time was also given to the important rearrangement of scientific institutions by its new relations with which the Meteorological Office is removed far beyond the status of a Weather Bureau, and appears to have entered upon a course of expansion as a result of which marine meteorology and weather forecasting will bulk relatively less in the work of the Office than they did when it was first established. Not only is Kew

Observatory taken over as the central observatory for the Meteorological Office, which is little more than reverting to an earlier arrangement from which the bodies concerned had drifted apart, but the new Eskdalemuir Magnetic Observatory brings in the subject of Terrestrial Magnetism and apparently of Seismology also. It is pointed out that "the variations of terrestrial magnetic force which it is the object of a magnetic observatory to record, seem to be due to movements in the upper regions of the atmosphere, and may therefore reasonably be included in the subject of meteorology." But we feel that a question may arise as to what could reasonably be excluded from meteorology if every influence which affects the upper atmosphere—where the air is of the rarefaction of a vacuum tube—were to be included.

We see signs of promise in the bringing together of cognate subjects, hitherto poorly provided for out of the national exchequer, under one head, and we could even dare to hope that the movement will not cease until all the activities of the scientific departments, including those concentrated under the Meteorological Office, those concentrated under the Board of Education, those concentrated under the Board of Agriculture and Fisheries, and many which are still scattered, are all brought together in a great Scientific Department, with a scientific man at its head, to represent the scientific services of the country as a Minister responsible to Parliament.

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*The Conquest of the Air or the Advent of Aerial Navigation* by A. LAWRENCE ROTCH, S.B., A.M. Illustrated. New York, Moffat, Yard and Company, 1909. Size  $7\frac{1}{2} \times 5$ . Pp. x. + 192. Price 1 dollar.

THIS exceedingly interesting historical account of the use of the air as a highway deserves to be known on both sides of the Atlantic. Professor Rotch has done so much for the scientific study of the Upper Air, beginning at a time when such observations were looked on as a harmless form of recreation, that now, when they have developed practical interests of an absorbing kind, his opinions become extremely valuable. In sketching the origin of ballooning, Mr. Rotch reprints a series of letters from Benjamin Franklin, then United States Minister in France, to Sir Joseph Banks, describing the ascents of 1783 by Montgolfier and his rivals. The development of the dirigible balloon and of the aeroplane is traced, and Mr. Rotch in his final chapters has some very wise words on the tendency to exaggerate the importance of new developments. He points out how the first balloons were hailed as precursors of a veritable revolution in means of locomotion and of war; and though the balloon failed to fulfil the expectations of its admirers, the airmen of to-day are quite as bold in their surmises as to the far-reaching changes which the aeroplane will bring.

## METEOROLOGICAL NEWS AND NOTES.

**METEOROLOGICAL OFFICE APPOINTMENTS.**—In view of the removal of the work of the Meteorological Office to the new building in Exhibition Road, South Kensington, which is being arranged to take place in the autumn, Mr. R. G. K. Lempfert, M.A., Superintendent of Statistics, has been appointed by the Meteorological Committee to be Superintendent of the Forecast Division; Mr. E. Gold, M.A., Fellow of St. John's College, Cambridge, Schuster Reader in Dynamical Meteorology, has been appointed Superintendent of the Statistics and Library Division; Mr. R. Corless, M.A., has been re-appointed Special Assistant to the Director, with additional duties as Secretary and Clerk of Publications. The appointments date from October 1st, 1910.

THE BRITISH ASSOCIATION met at Sheffield from August 31st to September 7th, and we hope to give an account of the papers of meteorological interest in an early number. An important circumstance of the meeting was the rejection by the General Committee, which, although it is sometimes forgotten, is the governing body of the Association, of a proposal made by the Council to rearrange the Sections in a manner which was not considered to be for general advantage by those best entitled to judge.

A PICTORIAL BAROGRAPH CHART, which may appeal to those who like to have a barograph as an ornament of the entrance hall, has been introduced by Mr. John Browning, 146, Strand. It is designed by Mr. Ackroyd, and shows a cloud panorama very black along the line of 28 inches, a little lighter at 29 inches, and fleecy white or pale blue, with birds in flight, above 30 inches. It is of course of no scientific value, and we fear may prove disappointing if taken as an indication of the weather to expect at various pressures.

"YSTORMYDD A GWLAWOGYDD Mynyddoedd Eryri, yn nghyda'u dylanwad ar hinsawdd cylch Llandudno Junction" is the title of a lecture delivered by Mr. J. R. Gethin-Jones in the language quoted, a translation of which runs, "The storms and rains of the Snowdonian Range, with their influence on the climate of the district around Llandudno Junction." Mr. Gethin-Jones, whose name is familiar to our readers, has done much to convey scientific conceptions of the weather to his less-instructed compatriots; and we should be glad if the Welsh School Committees were to avail themselves of his services in teaching elementary meteorology in the mother tongue of the children.

DAMAGE BY SNOW TO TELEPHONE WIRES in January, 1910, cost the National Telephone Company £20,331 to repair, "a large figure as the result of the visitation of Providence," as the Report of the Company quaintly observes.

## RAINFALL TABLE FOR AUGUST, 1910.

| STATION.                       | COUNTY.            | Lat.<br>N.<br>° / | Long.<br>W.<br>[°E.]<br>° / | Height<br>above<br>Sea.<br>ft. | RAINFALL<br>OF MONTH.          |              |
|--------------------------------|--------------------|-------------------|-----------------------------|--------------------------------|--------------------------------|--------------|
|                                |                    |                   |                             |                                | Aver.<br>1875—<br>1909.<br>in. | 1910.<br>in. |
| Camden Square.....             | London.....        | 51 32             | 0 8                         | 111                            | 2'39                           | 1'64         |
| Tenterden.....                 | Kent.....          | 51 4              | *0 41                       | 190                            | 2'42                           | 1'98         |
| Steyning.....                  | Sussex.....        | 50 53             | 0 20                        | 80                             | 2'91                           | 3'29         |
| Southampton (Cadland) ..       | Hampshire.....     | 50 50             | 1 22                        | 52                             | 2'85                           | 2'18         |
| Hitchin.....                   | Hertfordshire..... | 51 57             | 0 17                        | 238                            | 2'48                           | 1'95         |
| Oxford (Magdalen College).     | Oxfordshire.....   | 51 45             | 1 15                        | 186                            | 2'44                           | 1'50         |
| Bury St. Edmunds (Westley)     | Suffolk.....       | 52 15             | *0 40                       | 226                            | 2'52                           | 2'50         |
| Geldeston [Beccles].....       | Norfolk.....       | 52 27             | *1 31                       | 38                             | 2'22                           | 2'23         |
| Polapit Tamar [Launceston]     | Devon.....         | 50 40             | 4 22                        | 315                            | 3'17                           | 4'83         |
| Rousdon [Lyme Regis].....      | ".....             | 50 41             | 3 0                         | 516                            | 2'84                           | 3'72         |
| Stroud (Upfield).....          | Gloucestershire..  | 51 44             | 2 13                        | 226                            | 2'90                           | 4'87         |
| Church Stretton (Wolstaston).. | Shropshire.....    | 52 35             | 2 48                        | 800                            | 3'43                           | 4'01         |
| Coventry (Kingswood).....      | Warwickshire ..    | 52 24             | 1 30                        | 340                            | 2'81                           | 4'09         |
| Market Overton.....            | Rutland.....       | 52 44             | 0 41                        | 475                            | 2'69                           | 3'78         |
| Boston.....                    | Lincolnshire.....  | 52 58             | 0 1                         | 25                             | 2'39                           | 3'25         |
| Worksop (Hodsock Priory).      | Nottinghamshire    | 53 22             | 1 5                         | 56                             | 2'55                           | 3'59         |
| Macclesfield.....              | Cheshire.....      | 53 15             | 2 7                         | 501                            | 3'76                           | 5'46         |
| Southport (Hesketh Park)..     | Lancashire.....    | 53 38             | 2 59                        | 38                             | 3'73                           | 4'70         |
| Wetherby (Ribston Hall) ...    | Yorkshire, W.R.    | 53 59             | 1 24                        | 130                            | 2'78                           | 3'40         |
| Arneliffe Vicarage.....        | ".....             | 54 8              | 2 6                         | 732                            | 5'62                           | 8'39         |
| Hull (Pearson Park).....       | "..... E.R.        | 53 45             | 0 20                        | 6                              | 3'05                           | 3'61         |
| Newcastle (Town Moor) ...      | Northumberland     | 54 59             | 1 38                        | 201                            | 3'20                           | 2'73         |
| Borrowdale (Seathwaite) ...    | Cumberland.....    | 54 30             | 3 10                        | 423                            | 11'47                          | 18'02        |
| Cardiff (Ely).....             | Glamorgan.....     | 51 29             | 3 13                        | 53                             | 4'54                           | 5'99         |
| Haverfordwest.....             | Pembroke.....      | 51 48             | 4 58                        | 95                             | 4'21                           | 6'98         |
| Aberystwyth (Gogerddan)..      | Cardigan.....      | 52 26             | 4 1                         | 83                             | 4'88                           | 6'41         |
| Llandudno.....                 | Carnarvon.....     | 53 20             | 3 50                        | 72                             | 3'16                           | 3'74         |
| Cargen [Dumtries].....         | Kirkcudbright...   | 55 2              | 3 37                        | 80                             | 4'23                           | 8'71         |
| Marchmont House.....           | Berwick.....       | 55 44             | 2 24                        | 498                            | 3'54                           | 3'89         |
| Girvan (Pinmore).....          | Ayr.....           | 55 10             | 4 49                        | 207                            | 4'54                           | ...          |
| Glasgow (Queen's Park) ...     | Renfrew.....       | 55 53             | 4 18                        | 144                            | 3'62                           | 5'29         |
| Inveraray (Newtown).....       | Argyll.....        | 56 14             | 5 4                         | 17                             | 6'02                           | 8'28         |
| Mull (Quinish).....            | ".....             | 56 36             | 6 13                        | 35                             | 5'00                           | 7'11         |
| Dundee (Eastern Necropolis)    | Forfar.....        | 56 28             | 2 57                        | 199                            | 3'34                           | 7'51         |
| Braemar.....                   | Aberdeen.....      | 57 0              | 3 24                        | 1114                           | 3'63                           | 5'39         |
| Aberdeen (Cranford).....       | ".....             | 57 8              | 2 7                         | 120                            | 3'07                           | 4'07         |
| Cawdor.....                    | Nairn.....         | 57 31             | 3 57                        | 250                            | 3'05                           | 2'57         |
| Fort Augustus (S. Benedict's)  | E. Inverness ..    | 57 9              | 4 41                        | 68                             | 3'52                           | 3'23         |
| Loch Torridon (Bendamph)       | W. Ross.....       | 57 32             | 5 32                        | 20                             | 6'61                           | 7'89         |
| Dunrobin Castle.....           | Sutherland.....    | 57 59             | 3 56                        | 14                             | 2'71                           | 4'70         |
| Wick.....                      | Caitness.....      | 58 26             | 3 6                         | 77                             | 2'73                           | 3'97         |
| Killarney (District Asylum)    | Kerry.....         | 52 4              | 9 31                        | 178                            | 4'57                           | 6'95         |
| Waterford (Brook Lodge)...     | Waterford.....     | 52 15             | 7 7                         | 104                            | 3'73                           | 7'56         |
| Nenagh (Castle Lough).....     | Tipperary.....     | 52 54             | 8 24                        | 120                            | 4'04                           | 4'64         |
| Miltown Malbay.....            | Clare.....         | 52 52             | 9 26                        | 400                            | 4'98                           | 4'09         |
| Gorey (Courtown House).....    | Wexford.....       | 52 40             | 6 13                        | 80                             | 3'31                           | 6'39         |
| Abbey Leix (Blandsfort)....    | Queen's County..   | 52 56             | 7 17                        | 532                            | 3'94                           | 6'14         |
| Dublin (Fitz William Square)   | Dublin.....        | 53 21             | 6 14                        | 54                             | 3'08                           | 3'35         |
| Mullingar (Belvedere).....     | Westmeath.....     | 53 29             | 7 22                        | 367                            | 4'00                           | 6'94         |
| Ballinasloe.....               | Galway.....        | 53 20             | 8 15                        | 160                            | 3'96                           | 4'64         |
| Crossmolina (Enniscoe).....    | Mayo.....          | 54 4              | 9 18                        | 74                             | 4'68                           | 6'38         |
| Collooney (Markree Obsy.).     | Sligo.....         | 54 11             | 8 27                        | 127                            | 4'30                           | 6'94         |
| Seaforde.....                  | Down.....          | 54 19             | 5 50                        | 180                            | 3'64                           | 5'91         |
| Bushmills (Dundarave).....     | Antrim.....        | 55 12             | 6 30                        | 162                            | 4'06                           | 6'42         |
| Omagh (Edenfel).....           | Tyrone.....        | 54 36             | 7 18                        | 280                            | 4'22                           | 6'87         |

## RAINFALL TABLE FOR AUGUST, 1910—continued.

| RAINFALL OF MONTH (con.) |          |                   |             |     | 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.                    |                 |
| — .75                    | 69       | .35               | 25          | 21  | 15.92                 | 16.30 | + .38                | 102      | 25.11                  | Camden Square   |
| — .44                    | 82       | .55               | 29          | 15  | 16.07                 | 18.21 | +2.14                | 113      | 27.64                  | Tenterden       |
| + .38                    | 113      | .70               | 5           | 20  | 19.30                 | 26.56 | +7.26                | 138      | 33.58                  | Steyning        |
| — .67                    | 76       | .58               | 29          | 17  | 18.58                 | 19.25 | + .67                | 104      | 31.87                  | Cadland         |
| — .53                    | 79       | .29               | 28          | 18  | 15.84                 | 15.64 | — .20                | 99       | 25.16                  | Hitchin         |
| — .94                    | 62       | .33               | 28          | 16  | 15.47                 | 14.39 | —1.08                | 93       | 24.58                  | Oxford          |
| — .02                    | 99       | .52               | 4           | 18  | 15.96                 | 18.74 | +2.78                | 117      | 25.40                  | Westley         |
| + .01                    | 100      | .32               | 25          | 22  | 14.20                 | 19.75 | +5.55                | 139      | 23.73                  | Geldeston       |
| +1.66                    | 152      | .79               | 14          | 25  | 21.79                 | 28.71 | +6.92                | 132      | 38.27                  | Polapit Tamar   |
| + .88                    | 131      | 1.65              | 28          | 16  | 19.85                 | 21.46 | +1.61                | 108      | 33.54                  | Rousdon         |
| +1.97                    | 168      | 1.63              | 28          | 27  | 18.73                 | 21.37 | +2.64                | 114      | 29.81                  | Stroud          |
| + .58                    | 117      | .75               | 3           | 23  | 20.31                 | 19.94 | — .37                | 98       | 32.41                  | Wolstaston      |
| +1.28                    | 128      | ...               | ...         | ... | 18.16                 | 17.73 | — .43                | 98       | 28.98                  | Coventry        |
| +1.09                    | 140      | .84               | 18          | 25  | 16.82                 | 18.27 | +1.45                | 109      | 27.10                  | Market Overton  |
| + .86                    | 136      | .55               | 18          | 22  | 14.60                 | 16.20 | +1.60                | 111      | 23.35                  | Boston          |
| +1.04                    | 141      | .74               | 14          | 18  | 15.70                 | 16.01 | + .31                | 102      | 24.46                  | Hodsock Priory  |
| +1.70                    | 145      | 1.60              | 28          | 24  | 21.93                 | 26.94 | +5.01                | 123      | 34.73                  | Macclesfield    |
| + .97                    | 126      | .62               | 18          | 24  | 19.61                 | 23.64 | +4.03                | 121      | 32.70                  | Southport       |
| + .62                    | 122      | .57               | 14          | 24  | 16.97                 | 21.72 | +4.75                | 128      | 26.87                  | Ribston Hall    |
| +2.77                    | 149      | 1.58              | 28          | 26  | 37.59                 | 48.08 | +10.49               | 128      | 61.49                  | Arneliffe       |
| + .56                    | 118      | .57               | 25          | 24  | 16.52                 | 17.60 | +1.08                | 107      | 26.42                  | Hull            |
| — .47                    | 85       | .44               | 25          | 20  | 17.65                 | 17.81 | + .16                | 101      | 27.94                  | Newcastle       |
| +6.55                    | 157      | 4.51              | 26          | 25  | 76.76                 | 94.76 | +18.00               | 123      | 129.48                 | Seathwaite      |
| +1.45                    | 132      | 1.04              | 28          | 24  | 25.02                 | 32.63 | +7.61                | 130      | 42.28                  | Cardiff         |
| +2.77                    | 166      | 1.14              | 23          | 23  | 27.05                 | 28.56 | +1.51                | 106      | 46.82                  | Haverfordwest   |
| +1.53                    | 131      | 1.38              | 29          | 22  | 27.03                 | 36.70 | +9.67                | 136      | 45.46                  | Gogerddan       |
| + .58                    | 118      | .64               | 26          | 24  | 18.05                 | 23.08 | +5.03                | 128      | 30.36                  | Llandudno       |
| +4.48                    | 206      | 1.94              | 28          | 21  | 26.49                 | 39.09 | +12.60               | 148      | 43.47                  | Cargen          |
| + .35                    | 110      | .65               | 28          | 21  | 21.22                 | 18.77 | —2.45                | 88       | 33.76                  | Marchmont       |
| ...                      | ...      | ...               | ...         | ... | 29.37                 | ...   | ...                  | ...      | 49.77                  | Glirvan         |
| +1.67                    | 146      | 1.09              | 28          | 21  | 22.04                 | 28.36 | +6.32                | 129      | 35.97                  | Glasgow         |
| +2.26                    | 138      | 1.80              | 28          | 25  | 40.06                 | 48.70 | +8.64                | 122      | 68.67                  | Inveraray       |
| +2.11                    | 142      | 1.46              | 28          | 22  | 32.67                 | 37.03 | +4.36                | 113      | 56.57                  | Quinish         |
| +4.17                    | 225      | 1.36              | 28          | 22  | 18.20                 | 20.62 | +2.42                | 113      | 28.64                  | Dundee          |
| +1.76                    | 149      | ...               | ...         | ... | 21.43                 | 27.63 | +6.20                | 129      | 34.93                  | Braemar         |
| +1.00                    | 133      | .81               | 25          | 21  | 20.09                 | 18.92 | —1.17                | 94       | 32.73                  | Aberdeen        |
| — .48                    | 84       | .48               | 18          | 15  | 18.70                 | 22.27 | +3.57                | 119      | 29.33                  | Cawdor          |
| — .29                    | 92       | .43               | 18          | 20  | 26.72                 | 31.61 | +4.89                | 118      | 44.53                  | Fort Augustus   |
| +1.28                    | 119      | 1.08              | 31          | 25  | 49.35                 | 60.99 | +11.64               | 124      | 83.61                  | Bendamp         |
| +1.99                    | 174      | .65               | 26          | 21  | 19.90                 | 20.92 | +1.02                | 105      | 31.90                  | Dunrobin Castle |
| +1.24                    | 145      | .85               | 5           | 23  | 18.11                 | 19.21 | +1.10                | 106      | 29.88                  | Wick            |
| +2.38                    | 152      | 1.17              | 4           | 30  | 32.97                 | 43.17 | +10.20               | 131      | 54.81                  | Killarney       |
| +3.83                    | 203      | 2.10              | 1           | 22  | 24.26                 | 26.20 | +1.94                | 108      | 39.57                  | Waterford       |
| + .60                    | 115      | .79               | 14          | 27  | 24.57                 | 31.31 | +6.74                | 127      | 39.43                  | Castle Lough    |
| — .89                    | 82       | 1.36              | 25          | 30  | 27.28                 | 31.97 | +4.69                | 117      | 45.11                  | Miltown Malbay  |
| +3.08                    | 193      | 1.84              | 1           | 21  | 21.63                 | 24.40 | +2.77                | 113      | 34.99                  | Courtown Ho.    |
| +2.20                    | 156      | 1.29              | 14          | 27  | 22.77                 | 31.19 | +8.44                | 137      | 35.92                  | Abbey Leix      |
| + .27                    | 109      | 1.10              | 1           | 22  | 17.83                 | 24.38 | +6.55                | 137      | 27.68                  | Dublin          |
| +2.94                    | 173      | 1.08              | 14          | 28  | 23.17                 | 31.09 | +7.92                | 134      | 36.14                  | Mullingar.      |
| + .68                    | 117      | .83               | 25          | 27  | 23.18                 | 26.44 | +3.26                | 114      | 36.64                  | Ballinasloe     |
| +1.70                    | 136      | 1.80              | 24          | 24  | 31.32                 | 40.36 | +9.12                | 129      | 52.87                  | Enniscoe        |
| +2.64                    | 161      | 2.30              | 25          | 25  | 26.49                 | 41.11 | +14.62               | 155      | 42.71                  | Markree         |
| +2.27                    | 162      | 1.18              | 1           | 24  | 24.38                 | 26.50 | +2.12                | 109      | 38.91                  | Seaforde        |
| +2.36                    | 158      | 1.73              | 20          | 20  | 22.83                 | 29.36 | +6.53                | 129      | 37.56                  | Dundarave       |
| +2.65                    | 163      | 1.45              | 14          | 23  | 24.66                 | 33.19 | +8.53                | 135      | 39.38                  | Omagh           |

## SUPPLEMENTARY RAINFALL, AUGUST, 1910.

| Div.  | STATION.                     | Rain<br>inches | Div.   | STATION.                     | Rain.<br>inches |
|-------|------------------------------|----------------|--------|------------------------------|-----------------|
| II.   | Warlingham, Redvers Road     | 3.22           | XI.    | Llangyhanfal, Plás Draw....  | 2.71            |
| "     | Ramsgate .....               | 2.84           | "      | Dolgelly, Bryntirion .....   | 6.48            |
| "     | Hailsham .....               | 2.56           | "      | Bettws-y-Coed, Tyn-y-bryn    | 6.39            |
| "     | Totland Bay, Aston House.    | 1.98           | "      | Lligwy .....                 | 5.47            |
| "     | Stockbridge, Ashley .....    | 1.89           | "      | Douglas, Woodville .....     | ...             |
| "     | Grayshott.....               | 3.20           | XII.   | Stoneykirk, Ardwell House    | 6.82            |
| "     | Reading, Calcot Place.....   | 2.56           | "      | Dalry, The Old Garroch ...   | 10.67           |
| III.  | Harrow Weald, Hill House.    | 3.00           | "      | Langholm, Grove Road.....    | 8.69            |
| "     | Pitsford, Sedgebrook .....   | 2.79           | "      | Montaive, Maxwelton House    | 9.28            |
| "     | Huntingdon, Brampton.....    | 1.71           | XIII.  | St Mary's Loch, Cramilt Ldge | 8.00            |
| "     | Woburn, Milton Bryant.....   | 1.92           | "      | Edinburgh, Royal Observty.   | 5.18            |
| "     | Wisbech, Monica Road.....    | 2.63           | XIV.   | Maybole, Knockdon Farm...    | 4.81            |
| IV.   | Southend Water Works.....    | 1.90           | XV.    | Campbeltown, Witchburn...    | 6.26            |
| "     | Colchester, Lexden.....      | 2.45           | "      | Glenreasdell Mains.....      | 6.94            |
| "     | Newport .....                | 2.02           | "      | Ballachulish House.....      | 5.98            |
| "     | Rendlesham.....              | 2.74           | "      | Islay, Eallabus .....        | 5.71            |
| "     | Swaffham .....               | 1.98           | XVI.   | Dollar Academy .....         | 9.61            |
| "     | Blakeney .....               | 2.02           | "      | Balquhidder, Stronvar .....  | 10.72           |
| V.    | Bishops Cannings .....       | 3.89           | "      | Coupar Angus .....           | 7.19            |
| "     | Winterbourne Steepleton ..   | 3.35           | "      | Blair Atholl.....            | 6.79            |
| "     | Ashburton, Druid House ..    | 6.11           | "      | Montrose, Sunnyside Asylum   | 4.56            |
| "     | Honiton, Combe Raleigh ..    | 4.85           | XVII.  | Alford, Lynturk Manse ...    | 4.44            |
| "     | Okehampton, Oaklands.....    | 7.02           | "      | Keith Station .....          | 4.87            |
| "     | Hartland Abbey .....         | 4.47           | XVIII. | Glenquoich, Laon .....       | 13.20           |
| "     | Lynmouth, Rock House ...     | 5.22           | "      | Skye, Dunvegan.....          | 7.53            |
| "     | Probus, Lamellyn .....       | 4.37           | "      | N. Uist, Lochmaddy .....     | 6.26            |
| "     | North Cadbury Rectory ..     | 4.39           | "      | Alvey Manse .....            | 3.54            |
| VI.   | Clifton, Pembroke Road ...   | 6.36           | "      | Loch Ness, Drumnadrochit.    | 3.86            |
| "     | Ross, The Graig .....        | 5.46           | "      | Glen carron Lodge .....      | 5.43            |
| "     | Shifnal, Hatton Grange.....  | 4.26           | "      | Fearn, Lower Pitkerrie.....  | 2.79            |
| "     | Blockley, Upton Wold .....   | 4.33           | XIX.   | Invershin .....              | 4.91            |
| "     | Worcester, Boughton Park.    | 5.35           | "      | Altnaharra .....             | 4.96            |
| VII.  | Market Rasen .....           | 4.28           | "      | Bettyhill .....              | 5.87            |
| "     | Bawtry, Hesley Hall.....     | 2.87           | XX.    | Dunmanway, The Rectory..     | 6.22            |
| "     | Derby, Midland Railway ...   | 3.56           | "      | Cork .....                   | 5.24            |
| "     | Buxton.....                  | 5.44           | "      | Mitchelstown Castle .....    | 5.98            |
| VIII. | Nantwich, Dorfold Hall.....  | 4.39           | "      | Darrynane Abbey .....        | 6.21            |
| "     | Liscard .....                | 3.96           | "      | Glenam [Clonmel] .....       | 6.25            |
| "     | Chatburn, Middlewood .....   | 6.16           | "      | Nenagh, Traverston .....     | 6.14            |
| "     | Cartmel, Flookburgh .....    | 6.46           | "      | Newmarket-on-Fergus, Fenloe  | 4.84            |
| IX.   | Langsett Moor, Up. Midhope   | 4.06           | XXI.   | Laragh, Glendalough .....    | 7.77            |
| "     | Scarborough, Scalby .....    | 4.75           | "      | Moynalty, Westland .....     | 6.53            |
| "     | Ingleby Greenhow .....       | ...            | "      | Athlone, Twyford .....       | 5.59            |
| "     | Mickleton.....               | 4.42           | XXII.  | Woodlawn .....               | 5.03            |
| X.    | Bardon Mill, Beltingham ...  | 4.16           | "      | Westport, St. Helens .....   | 4.97            |
| "     | Ilderton, Lilburn Cottage... | 3.85           | "      | Achill Island, Dugort .....  | 7.43            |
| "     | Keswick, The Bank .....      | 8.35           | "      | Mohill .....                 | 6.95            |
| XI.   | Llanfrecfa Grange.....       | 6.43           | XXIII. | Enniskillen, Portora .....   | ...             |
| "     | Treherbert, Tyn-y-waun ...   | 12.36          | "      | Dartrey [Cootehill].....     | 6.06            |
| "     | Carmarthen, The Friary.....  | 8.05           | "      | Warrenpoint, Manor House     | 5.23            |
| "     | Castle Malgwyn [Llechryd].   | 7.08           | "      | Banbridge, Milltown .....    | 3.81            |
| "     | Plynlimon.....               | 7.00           | "      | Belfast, Springfield .....   | 6.18            |
| "     | Crickhowell, Ffordlas.....   | 5.00           | "      | Glenarm Castle.....          | 5.52            |
| "     | New Radnor, Ednol .....      | 5.80           | "      | Londonderry, Creggan. Res.   | 9.28            |
| "     | Rhayader, Tyrmynydd .....    | 6.67           | "      | Killybegs .....              | 8.61            |
| "     | Lake Vyrnwy .....            | 6.96           | "      | Horn Head ... ..             | 6.87            |

## METEOROLOGICAL NOTES ON AUGUST, 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.—Evaporation, 2.12 in. Duration of sunshine, 139.6\* hours, and of R 31.7 hours. Mean temp. 62°·5, or 0°·4 above the average. Shade max. 77°·7 on 12th; min. 48°·9 on 7th. F 0, f 0.

TENTERDEN.—Windy and unsettled, but rain in small quantities, except on 28th and 29th. Duration of sunshine, 183.0† hours. Shade max. 74°·0 on 14th; min. 46°·0 on 7th. F 0, f 0.

WEST DEAN.—Very cool and unsummerlike month. Max. temp. never reached average. Shade max. 74°·0 on 12th; min. 40°·0 on 23rd. F 0, f 2.

PITSFORD.—R .92 in. above the average. Mean temp. 60°·2. Shade max. 75°·3 on 11th; min. 54°·4 on 23rd and 25th. F 0.

ROUSDON.—Very dull and wet, with remarkably dense fog at times. Shade max. 71°·9 on 10th.

NORTH CADBURY.—Extremely windy and cloudy; never hot and never cold. Dry up to 23rd, then very wet. Shade max. 79°·0 on 14th; min. 48°·0 on 23rd. F 0, f 0.

ROSS.—The wettest August since 1879, and with two exceptions since 1859. Shade max. 75°·0 on 14th; min. 43°·2 on 3rd. F 0, f 0.

HODSOCK PRIORY.—TS on 24th, with black rain and unusual darkness. Shade max. 75°·1 on 11th; min. 44°·3 on 1st. F 0, f 0.

SOUTHPORT.—Excessive cloud amount and humidity. Duration of sunshine 143.5\* hours, and of R 86.3 hours. Mean temp. 59°·2, or 0°·3 below the average. Shade max. 73°·2 on 11th; min. 47°·7 on 5th. F 0, f 0.

HULL.—Very cloudy, with frequent rains, low temp., and little sunshine throughout the month. Shade max. 75°·0 on 14th; min. 47°·0 on 23rd. F 0, f 0.

HAVERFORDWEST.—Cold, wet and stormy; crops greatly damaged. Duration of sunshine, 154.4\* hours. Shade max. 71°·5 on 14th; min. 47°·9 on 1st. F 0, f 0.

LLANDUDNO.—Shade max. 75°·0 on 14th; min. 49°·8 on 1st. F 0, f 0.

MARCHMONT HOUSE.—Duration of sunshine, 140.8\* hours. Shade max. 72°·0 on 11th; min. 45°·0 on 3rd and 10th. F 0, f 0.

EDINBURGH.—Shade max. 71°·2 on 12th; min. 45°·1 on 23rd. F 0, f 0.

COUPAR ANGUS.—The wettest August for 30 years. Mean temp. 58°·3, or 2° above the average owing to high night temp. Shade max. 75°·0 on 12th; min. 44°·0 on 10th. F 0, f 0.

FORT AUGUSTUS.—Shade max. 70°·0 on 12th; min. 43°·0 on 4th.

WATERFORD.—The wettest August since 1850. Shade max. 71°·5 on 8th and 10th; min. 48°·0 on 4th, 6th and 22nd. F 0.

DUBLIN.—A cloudy, rainy, windy month; gales on 19th and 26th; fogs on 8th and 9th. Mean temp. 59°·1, or 0°·6 below the average. Shade max. 69°·5 on 12th; min. 49°·1 on 22nd. F 0, f 0.

MARKREE.—Heavy floods with strong gales on 25th and 26th. Shade max. 75°·3 on 7th; min. 41°·5 on 6th. F 0, f 0.

WARRENPOINT.—Wet, but comparatively mild, with light winds constantly varying; barometer very unsteady. Shade max. 69°·0 on 9th, 12th and 21st; min. 52°·0 on 21st. F 0, f 0.

HORN HEAD.—A great deal of thunder. Shade max. 78°·0 on 28th; min. 44°·0 on 24th.

\* Campbell-Stokes.

† Jordan.



## Climatological Table for the British Empire, March, 1910.

| STATIONS.<br><br>(Those in italics are<br>South of the Equator.) | Absolute. |       |          |       | Average. |       |               |           | Absolute.       |                   | Total Rain |       | Aver. |
|------------------------------------------------------------------|-----------|-------|----------|-------|----------|-------|---------------|-----------|-----------------|-------------------|------------|-------|-------|
|                                                                  | Maximum.  |       | Minimum. |       | Max.     | Min.  | Dew<br>Point. | Humidity. | Max. in<br>Sun. | Min. on<br>Grass. | Depth.     | Days. |       |
|                                                                  | Temp.     | Date. | Temp.    | Date. |          |       |               |           |                 |                   |            |       |       |
| London, Camden Square                                            | 58°·2     | 30    | 27°·3    | 20    | 51°·5    | 35°·4 | 33°·2         | 84        | 96°·8           | 22°·7             | ·97        | 9     | 6·1   |
| Malta ... ..                                                     | 67°·1     | 16    | 46°·5    | 1     | 59°·9    | 50°·4 | 46°·8         | 78        | 133°·1          | ...               | 1°·28      | 5     | 4·7   |
| Lagos ... ..                                                     | 93°·0     | 9     | 70°·0    | 10*   | 90°·6    | 76°·0 | 74°·2         | 68        | 156°·0          | 67°·0             | ·94        | 2     | 7·6   |
| Cape Town ... ..                                                 | 86°·8     | 24    | 43°·5    | 21    | 77°·1    | 59°·1 | 56°·4         | 68        | ...             | ...               | 1°·27      | 3     | 2·5   |
| Durban, Natal ... ..                                             | ...       | ...   | ...      | ...   | ...      | ...   | ...           | ...       | ...             | ...               | ...        | ...   | ...   |
| Johannesburg ... ..                                              | 80°·0     | 16    | 45°·7    | 31    | 72°·9    | 54°·2 | 52°·7         | 73        | 143°·9          | 43°·8             | 6°·50      | 8     | 4·6   |
| Mauritius ... ..                                                 | 84°·5     | 3, 12 | 68°·0    | 28    | 82°·9    | 72°·5 | 71°·3         | 83        | 156°·5          | 62°·6             | 9°·70      | 23    | 6·9   |
| Calcutta... ..                                                   | 98°·0     | 24    | 57°·3    | 7     | 91°·5    | 69°·7 | 66°·6         | 65        | ...             | 51°·3             | °·66       | 1     | 1·6   |
| Bombay ... ..                                                    | 93°·8     | 12    | 67°·5    | 6     | 87°·8    | 73°·1 | 68°·0         | 69        | 139°·8          | 59°·9             | °·00       | 0     | 0·6   |
| Madras ... ..                                                    | 97°·2     | 20    | 65°·6    | 18    | 89°·8    | 71°·0 | 70°·7         | 76        | 140°·2          | 61°·7             | °·00       | 0     | 1·4   |
| Kodaikanal ... ..                                                | 74°·1     | 20    | 46°·9    | 15    | 68°·6    | 50°·8 | 39°·4         | 48        | 136°·7          | 33°·1             | °·01       | 1     | 1·5   |
| Colombo, Ceylon ... ..                                           | 92°·1     | 15    | 72°·0    | 30    | 90°·6    | 74°·1 | 71°·7         | 73        | 156°·2          | 68°·8             | °·84       | 2     | 3·8   |
| Hongkong ... ..                                                  | 80°·3     | 16    | 50°·9    | 3     | 67°·0    | 60°·1 | 59°·0         | 84        | 131°·6          | ...               | °·58       | 9     | 8·7   |
| Melbourne ... ..                                                 | 94°·9     | 23    | 44°·4    | 11    | 75°·6    | 55°·9 | 51°·2         | 59        | 145°·3          | 40°·1             | 2°·19      | 7     | 4·5   |
| Adelaide ... ..                                                  | 97°·6     | 24    | 48°·8    | 16    | 78°·8    | 58°·1 | 52°·6         | 56        | 154°·0          | 39°·3             | 4°·10      | 5     | 2·5   |
| Coolgardie ... ..                                                | 102°·0    | 19    | 45°·0    | 29    | 85°·5    | 58°·6 | 49°·0         | 44        | 168°·0          | 40°·2             | °·05       | 2     | 2·4   |
| Perth ... ..                                                     | 97°·4     | 2     | 50°·9    | 29    | 84°·2    | 62°·6 | 55°·0         | 52        | 153°·6          | 43°·6             | °·05       | 2     | 2·1   |
| Sydney ... ..                                                    | 84°·8     | 8     | 57°·8    | 26    | 73°·8    | 62°·5 | 59°·1         | 74        | 145°·8          | 48°·8             | 7°·54      | 29    | 5·7   |
| Wellington ... ..                                                | 77°·4     | 2     | 45°·2    | 24    | 67°·9    | 56°·5 | 53°·9         | 75        | 125°·0          | 37°·0             | 2°·39      | 16    | 7·5   |
| Auckland ... ..                                                  | 78°·5     | 12    | 51°·0    | 23    | 73°·1    | 61°·1 | 62°·4         | 85        | 156°·0          | 48°·0             | 7°·61      | 13    | 6·3   |
| Jamaica, Kingston ... ..                                         | 88°·1     | 1     | 62°·1    | 9     | 84°·7    | 66°·2 | 63°·7         | 69        | ...             | ...               | 1°·45      | 7     | ...   |
| Grenada ... ..                                                   | 85°·6     | 8     | 69°·0    | 1, 3  | 78°·8    | 71°·8 | 68°·5         | 75        | 141°·0          | ...               | 6°·65      | 19    | 5°·0  |
| Toronto ... ..                                                   | 75°·2     | 28    | 11°·5    | 15    | 47°·6    | 30°·1 | ...           | ...       | 91°·3           | 7°·2              | °·66       | 8     | 4·3   |
| Frederickton ... ..                                              | 54°·0     | 30    | 0°·0     | 11†   | 39°·2    | 20°·3 | ...           | 77        | ...             | ...               | 1°·86      | 9     | 5°·5  |
| St. John's, N.B. ... ..                                          | 52°·7     | 29    | 10°·0    | 19    | 39°·6    | 27°·8 | ...           | 74        | ...             | ...               | 1°·72      | 11    | 5°·9  |
| Victoria, B.C. ... ..                                            | 64°·1     | 13    | 31°·4    | 25    | 52°·4    | 39°·8 | ...           | ...       | ...             | ...               | 2°·37      | 16    | 7°·0  |
| Dawson ... ..                                                    | 45°·5     | 15    | -44°·0   | 3     | 17°·3    | -5°·9 | ...           | ...       | ...             | ...               | °·68       | 9     | 5°·5  |

\* and 28. † and 19.

MALTA.—Mean temp. of air 54°·6. Bright sunshine 7·7 hours per day.

Johannesburg.—Bright sunshine 239·3 hours.

Mauritius.—Mean temp. of air 0°·4 below, of dew point 0°·7, and R ·49 in., above averages. Mean hourly velocity of wind 8·9 miles, or 1·5 below average. L, T on 5 days.

KODAIKANAL.—Bright sunshine 280 hours. Hoar frost on 10 days.

COLOMBO.—Mean temp. of air 81°·0, or 1°·0 below, of dew point 1°·2 below, and R 3°·54 in. below, averages. Mean hourly velocity of wind 4·5 miles. TS on 29th.

HONGKONG.—Mean temp. of air 63°·3. Bright sunshine 91·1 hours. Mean hourly velocity of wind 14°·0 miles. R 2°·28 in. below average.

Melbourne.—Mean temp. of air 1°·0 above, and R ·8 in. above, average.

Adelaide.—Rainfall 3°·01 in. above average.

Perth.—Mean temp. of air 2°·4 above average.

Sydney.—Mean temp. of air 1°·0 below, and R 2°·40 in. above, averages.

Wellington.—Mean temp. of air 1°·7 above, and R 1°·24 in. below, averages. Bright sunshine 166°·5 hours.

Auckland.—Heavy R on the 29th, 3°·85 in., and total three times the average for the month.

# Symons's Meteorological Magazine.

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No. 537.

OCTOBER, 1910.

VOL. XLV.

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## ON THE STORING OF HAILSTONES AND THE INVESTIGATION OF THEIR MICROSTRUCTURE.

By BORIS WEINBERG,

*Professor of Physics at the Technicological Institute, Tomsk.*

THE investigation of the microstructure of hailstones being hitherto very difficult if not impossible in summer, I constructed an apparatus (Fig. 1) for storing them until winter. It consists of three coaxial cylinders; the inner space is intended for the hail, the middle space for a mixture of ice and copper sulphate (approximately in proportion corresponding to eutectics  $t = -1^{\circ}6$ ), the outer space for ice, which forms a sort of protective mantle.

During the summers of 1908 and 1909 I had only once the chance of meeting a hailstorm, on the 2/15 August, 1909, when I was at sea near Helsingfors on my way from Aaland to St. Petersburg. This hail lasted from three to seven minutes; the hailstones were very small (2 to 3 mm. diameter), but still I gathered 200 to 300 grams of them, and immersed them in order to avoid their freezing together in glass boxes containing a mixture of nearly equal parts of benzol and tolnol, which I presumed to be of a density equal to the density of hailstones, but which proved to be lighter. These hailstones I brought later to Tomsk (Siberia), and in December sent them to the Twelfth Congress of Russian Naturalists and Physicians in session at Moscow. These facts demonstrate thoroughly the possibility of storing and transporting hailstones. My experiment has also shown that it would be preferable to preserve one or two hundred hailstones separate from each other than a greater number of them, but partly, and especially in the lower layers, frozen together. That can be attained by inserting the hailstones individually into some very viscous liquid of a density nearly equal to that of the hail, such as cylinder oil, vaseline, or castor oil.

For the investigation of the microstructure of a single hailstone, Mr. W. Dudecki and I made a thin section of it by first rubbing one side on emery paper or by melting it with the heat of the finger. This side was laid on a microscope slide and frozen to it by touching during some time the other side of the glass with the finger. The other side of the hailstone was then polished in the same way as the

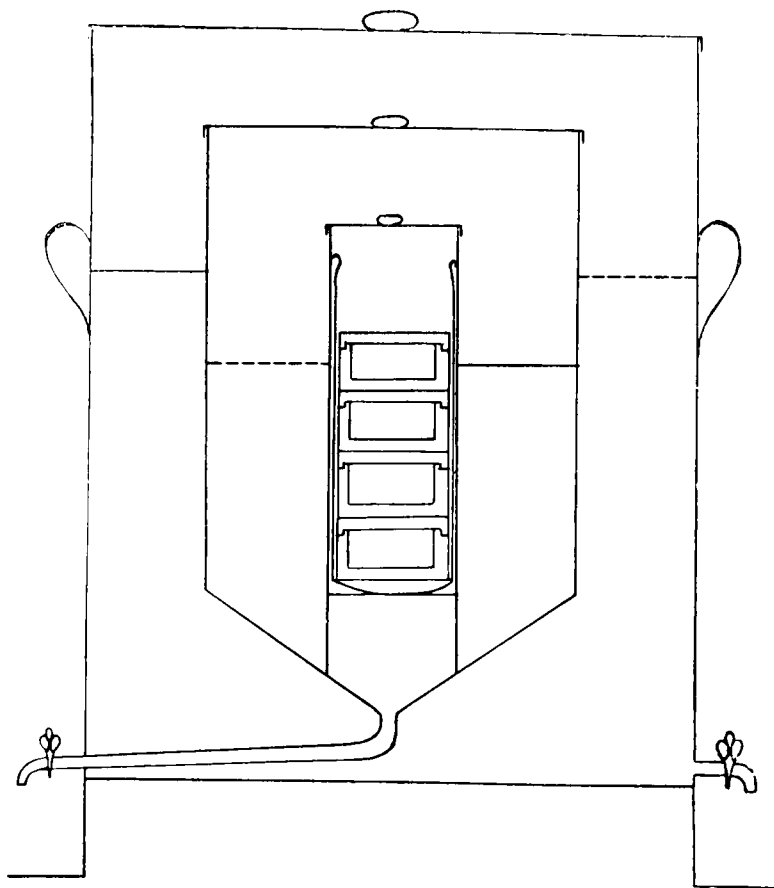


FIG. 1.—APPARATUS FOR STORING HAILSTONES.  
ONE-SIXTH ACTUAL SIZE.

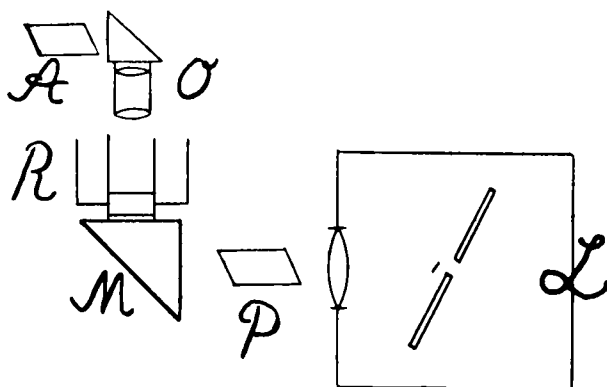


FIG. 2.—APPARATUS FOR OPTICAL INVESTIGATION OF HAILSTONES.

L. PROJECTING LANTERN. P=POLARISER. M=MIRROR.  
R=REFRIGERATING VESSEL. O=OBJECTIVE. A=ANALYSER.

first till the requisite thickness was attained. These operations were made in the open air, and were so much the easier because the temperature of the air was below the freezing point. Still it was found possible to grind hailstones in the laboratory at the room temperature by means of cooling the slide, the emery paper, &c., in double-walled vessels with a mixture of ice and salt.

For the optical investigation of thin sections a polarising microscope was used in the open air, and in a lecture room a projecting lantern. In the latter case (Fig. 2) the section was laid in a refrigerating vessel with double walls and double bottom—to avoid the condensation of aqueous vapour from the surrounding air—of plane-parallel glass plates; the space between the walls contained a mixture of ice and salt. The real image of the section was thrown on a screen or on a photographic (autochrome) plate.

The greater number of hailstones were crystallic individuals, as also was the case with “artificial hailstones,” drops of water frozen in a mixture of cinnamon and linseed oil of suitable density. In those hailstones, which consisted of several crystallic individuals, there was no regularity in the boundaries between crystals, nor in the angles between the boundaries, nor in the directions of the axes, which lay indifferently to each other, as well as to the milky nucleus which appeared in the section as a lot of air-bubbles of different size.

I would like to hope that my attempt will call forth similar researches, and would be glad if any other investigator had an opportunity to preserve and study some larger or more peculiar hailstones than I have been able to do, and in this way improve our deficient knowledge as to the origin of the hail and the details of its formation.

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## THE RAINFALL OF SEPTEMBER, 1910.

DRY Septembers are probably on the whole less uncommon than are dry months either in the middle of the summer or in the later autumn, and a dip in the average rainfall curve between August and October is a feature common to practically all the types of seasonal variation which are to be found in the British Isles. The past month has, no doubt, had a rainfall in excess of that of several of the dry spring months during the last half century, but it seems not impossible that it may prove, so far as England and Wales are concerned, to have been one of the driest Septembers of which we have any record.

These islands came under the influence of an anticyclone at the end of August, and until within a few days of the end of September remained more or less affected by it, with the result that with unimportant exceptions rainless weather persisted throughout. On the map, which we reproduce in a generalized form, the isohyets which limit the areas with less than .25 in. and .50 in. are shown as broken lines, those for the higher values being drawn solid, whilst

the limited areas, where as much as 2·00 in. fell, are indicated by a tint. It is at once seen that the rainfall reached 1·00 in. at only a few isolated places in England and Wales, the only patches of any considerable size being over the central hills of Wales, and over the greater part of East Anglia, extending to Kent on the south. It is interesting to observe that in the eastern districts nearly all the rainfall of the month was the result of one day's fall, and that but for the thunder rains of the 13th, which in some cases extended to the 14th, this part of the country would have been as dry as, or drier than, any other part. A curiously local storm occurred at Ulcombe, near Maidstone, on the 7th, producing ·74 in., but we can find no trace of this except in the immediate neighbourhood.

The rainfall was smallest, both actually and in relation to the average, in two large areas occupying, respectively, the south-west of England and Wales, from Pembrokeshire to Dungeness, and the north of England as far as the borders of Northumberland, excluding the Lake District, which was slightly wetter. In both these dry areas the fall was everywhere less than ·50 in., and over a very large part less than ·25 in., the culminating points lying in the west of Yorkshire and on the south coast of England, where, in some places, the total rainfall was returned as little more than ·10 in. An unbroken band, with more than 1·00 in. of rain, lay across Ireland and Scotland, and the fall was less than 1·00 in. over a comparatively restricted area, nowhere falling to ·50 in. outside England and Wales. It, however, hardly anywhere reached half the average amount, and in the west of Scotland, where there is by far the largest stretch of normally great rainfall, only a few stations returned so much as 4·00 in.

The general rainfall over the three Kingdoms, as calculated from the tables on pages 172—173, was

|                        |                          |
|------------------------|--------------------------|
| England and Wales..... | 26 per cent. of average. |
| Scotland .....         | 41   "   "               |
| Ireland .....          | 32   "   "               |
| British Isles .....    | 32   "   "               |

In spite of the widespread dryness of September the general rainfall, since January 1st, 1910, was still considerably above the average in most parts of the British Isles, the only exceptions being the English Midlands and the east coast of Great Britain as far south as the Humber.

## THE WEATHER OF SEPTEMBER.

By FRED. J. BRODIE.

LATE amends for the misdeeds of the past summer were forthcoming in September, which proved for the most part fair and exceedingly dry. In striking contrast with the conditions which had hitherto prevailed, the type of weather was almost continuously anticyclonic; but owing to the position occupied by the area of maximum pressure (usually over our western and northern districts, or adjacent portions

# RAINFALL OF THAMES VALLEY, SEPTEMBER, 1910.



ALTITUDE SCALE

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

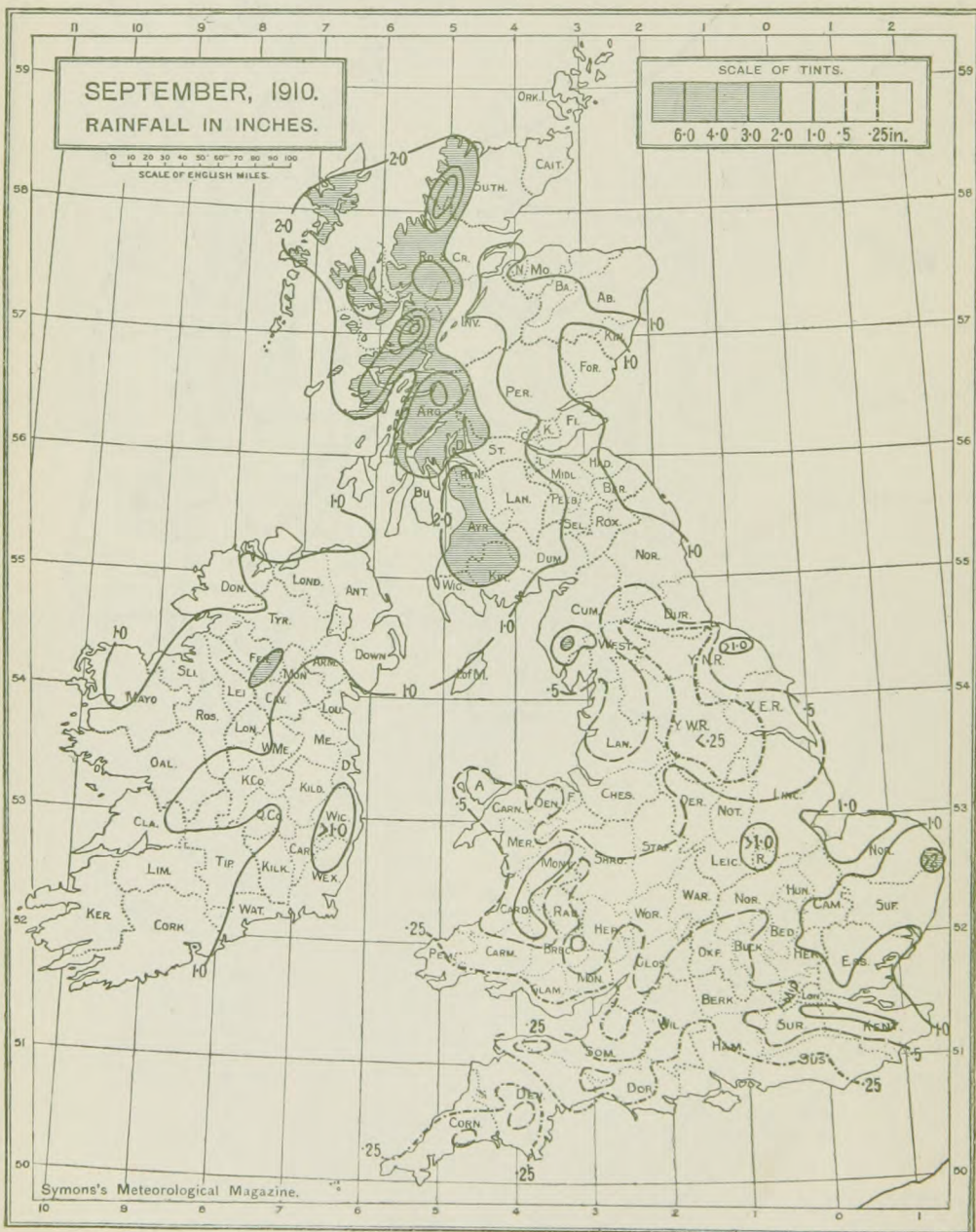
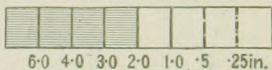
SCALE OF MILES  
0 5 10 15 20



SEPTEMBER, 1910.  
RAINFALL IN INCHES.

0 10 20 30 40 50 60 70 80 90 100  
SCALE OF ENGLISH MILES.

SCALE OF TINTS.



of the Atlantic) the prevailing winds for the first three weeks were from some northerly point, and were accompanied by a considerable amount of cloud. Temperature, therefore, failed to rise to any high level, and was more often than not below the average. Between the 1st and the 3rd the thermometer rose to  $70^{\circ}$  or a little above it in many English districts, and also in the south of Ireland, and on the 4th similar values were recorded in some parts of central Scotland. Again, on the 11th and 12th, when the central portion of the anti-cyclone advanced more directly over the country, the thermometer rose well above  $65^{\circ}$  in several parts of England and Ireland, and touched  $69^{\circ}$  at Stonyhurst. The second spell of warmth was followed by a drift of cool air from the northward, and in many places the thermometer on the 13th and 14th failed to reach  $60^{\circ}$ . Owing to the cloudiness of the sky, and to the consequent absence of brisk terrestrial radiation, the nights were as a rule fairly mild; but on the 1st or 2nd the sheltered thermometer fell to  $35^{\circ}$  in some Scottish districts; while at various times between the 5th and 16th it sank to about the same level in many parts of Great Britain, a reading as low as  $30^{\circ}$  being recorded at Balmoral on the 8th, and at West Linton on the 16th. The low screen temperatures were accompanied in many instances by ground frosts, but in the southern districts these were too slight to cause any injury to vegetation. On the 14th the long run of anticyclonic weather was temporarily interrupted by the formation of a shallow barometrical depression over the Netherlands, and, as this moved south-westwards over France, a heavy fall of rain, accompanied by local thunderstorms, was experienced at many places situated in the south-eastern quarter of England.

In the closing days of the month the area of highest pressure was transferred to central and southern Europe, and the weather over the United Kingdom was influenced by shallow cyclonic disturbances which came in from the Atlantic. The general conditions now became less settled, but the influx of a current of air from the southward resulted in a rise of temperature to a higher level than at any previous time in the month. On the 27th and 28th readings above  $70^{\circ}$  were recorded in many parts of England, the thermometer on the latter date reaching  $75^{\circ}$  in the London district (at Greenwich, Westminster and Tottenham), and  $76^{\circ}$  at Raunds, in Northamptonshire. In London the readings were higher than at any time since August 12th.

The touch of warmth failed, however, to compensate for the longer period of cool weather, and the mean temperature of the month was therefore below the average, the deficit being greatest (a degree to a degree and a half) over central and southern England. The total duration of bright sunshine was slightly in excess of the normal on many parts of our west and south coasts, but was deficient at most northern stations. At Westminster the record, 118 hours, agreed almost precisely with the average.



## METEOROLOGY AT THE BRITISH ASSOCIATION, SHEFFIELD MEETING, 1910.

By E. GOLD, M.A.

It had been hoped that time would permit of the whole of Tuesday morning (September 6th) being devoted by the full section to Cosmical Physics, but finally it proved necessary to divide immediately after the discussion on Atmospheric Electricity, opened by Dr. Chree, who gave an excellent resumé of the present state of our knowledge of this subject. The discussion was a success with the consequence that it took up a large portion of the available time and the meteorological papers which followed were nearly all closed without permitting any expression of opinion on the points raised.

The following is a brief account of Dr. Chree's opening statement. Excluding Aurora as a subject inviting separate discussion, we may include under the term Atmospheric Electricity, the potential gradient in the atmosphere, the influence of the potential gradient and electrical changes on the growth of vegetation, the phenomena of thunderstorms, the number and nature of the negative and positive ions in the air, the vertical current between the earth and the atmosphere, and the phenomena of radio-activity. The potential gradient and its diurnal and annual variation have been studied for a long time and we know that there is considerable variation with the season of the year at any given station and that different stations show large differences both in the mean values and in the variations. At the same time it ought to be pointed out that improvements in the instruments have resulted in increased mean values, both at Kew and Potsdam, so that the results for different places, depending on different instruments, may not be strictly inter-comparable. The gradient must be much greater than the normal over the tops of trees of even moderate height, and it is easily conceivable that growth may be affected by variations in this quantity. The influence of electricity on growth was first studied by Lemstrom, and it may prove to be of economic importance. In connection with thunderstorms, apart from theories as to their origin, there are several facts of a more human interest which deserve explanation, *e.g.*, only one out of every five persons killed by lightning is a woman; oak trees are struck by lightning more frequently than others, while beech trees are rarely struck. So far as protection from danger is concerned, the method described by a golfing acquaintance, *viz.*, to lie flat down in a bunker, has points in its favour.

The loss of charge of insulated bodies and the ionic charges in the atmosphere have received attention, especially in Austria and Germany, Elster and Geitel being among the pioneers in this work. C. T. R. Wilson has investigated the change brought down by rain and snow, and has devised an instrument for measuring the earth-air current. Few, if any, of the theories advanced to explain the different phenomena have received anything like universal acceptance.

Sir Oliver Lodge spoke of the possibility of influencing the weather by varying the potential gradient, and thought that rain might be produced in this way and that here was a field of experiment for the enterprising capitalist. Referring to the effect of electricity on plant life, he explained that the experiments with which he was connected, showed that in dull weather the plants were stimulated by high tension wires overhead, and the effect was good, but in bright sunny weather they were over stimulated with consequent bad results. He mentioned humorously an experiment which he could not get the farmer to repeat, because in the single case in which it had been tried, the crop had proved a failure.

Dr. Shaw pointed out that in order to produce rain in considerable quantities, it would be necessary to find a source for an enormous amount of energy. He referred also to the question whether the clouds acted as tea-trays, *i.e.*, as flat conductors in the presence of the earth.

Sir J. J. Thomson thought the real difficulty about producing rain by electrical methods would be political. Making rain for oneself would be all very well if it could be confined to oneself; but when it came to deluging neighbouring countries with rain they did not want, or depriving them of their normal supply, difficulties would begin. As he understood Sir Oliver Lodge, it was not a question of supplying energy, but of transforming energy already existent in the atmosphere, in order to produce rain. He referred also to the difficulty of explaining the return to earth of the outward flowing negative electricity, and mentioned, in conclusion, the relation between the radio-active contents of the air and its previous history; air which had travelled over the sea was much less radio-active than that which had been for some time over the land.

After the section divided, Dr. W. Schmidt, of Vienna, communicated an interesting description of a new instrument, the Variograph, designed by him for measuring short waves in atmospheric pressure. He showed records obtained by it at Innsbrück and Vienna. Conditions at Innsbrück, especially in the winter months, are very favourable for the production of waves, the cold air in the valley lying beneath a warmer upper layer, so that it is sometimes possible to see the snow melting on the mountains before it begins to thaw at Innsbrück. By recording with two instruments, 2 km. apart, Dr. Schmidt deduced that both progressive and standing waves occurred, the period of the latter being considerably greater than that of the former; in a particular case the periods were 9 minutes and 3.5 minutes respectively, and the resultant curve showed the interference of the two sets of waves. Dr. Schmidt showed too that in Föhn weather, when regular waves were recorded, the regularity ceased when the Föhn wind actually broke through the cold layer and blew at Innsbrück, proving that the layer of discontinuity of temperature was essential to the formation of the waves. He found also in some cases that regular waves

preceded, by several hours, the occurrence of line-squalls, a result in agreement with Mr. Russell's interesting observations of cirrus clouds.

Mr. Dines communicated some observations on the Upper Atmosphere during the passage of the Earth through the tail of Halley's Comet. The traces obtained by Mr. Dines in ordinary cases are of two kinds; one in which the up and down curves coincide, the other in which loops are formed. The traces at the time of the Comet showed an abnormally large proportion of the second kind, but it was not possible to say if the peculiarity was due to the Comet, or to the type of weather prevailing.

After a paper by Dr. Nicholson on Cosmical Applications of Radiation Pressure, Miss Margaret White showed a series of slides giving the results of the hourly balloon ascents made from Manchester, in March, 1910. The results corroborated in their main features those obtained in June, 1909, and communicated at the Winnipeg meeting.

Mr. Stupart gave some results of an enquiry into the vertical temperature gradients in Canada in the winter months. The principal conclusions were (1) that in cold winters in Manitoba the temperature increased upwards, the mountains being warmer than the plains, and the inversion (in mean temperatures for the month) amounting to as much as  $6^{\circ}\text{F.}$ ; (2) that in warm winters the mountains were colder than the plains, and the vertical gradient approached the adiabatic value.

Mr. Gold communicated the results of an investigation into the effects of radiation on  $H_c$ , the height, and  $T_c$ , the temperature, of the Advertive Region. So far as radiation is concerned, the variation, both in the temperature and in the absolute humidity of the atmosphere, tend to increase the value of  $H_c$  with approach towards the equator, but their effects on  $T_c$  are in opposite directions. A necessary condition for the existing state of affairs, is that the atmosphere should be very nearly transparent to low temperature radiation for considerable regions in the spectrum,

Professor Bailey described a sensitive bifilar seismograph for recording undulatory movements of the earth's surface of short period.

On Wednesday morning, the Report of the Seismological Committee was read. In it reference is made to the interesting results on the semi-diurnal change in level, caused by the tide, obtained by Plummer at Bidstone; and to the small thickenings of the trace ascribed to large surface waves set up by great earthquakes.

The Report of the Joint Committee for the Investigation of the Upper Atmosphere was also presented. During the International week, Dec. 6th—11th, 1909, 18 records were obtained from registering balloons sent up in this country. In the earlier part of the week, the results from different stations agreed in showing that the value of  $H_c$  was between 7.5 and 8.5 km., *i.e.*, very much below the

average. These islands were situated then in a region of low pressure with small gradients. As this became transformed into the ridge between a low and a high pressure system, the heights observed increased to 12 km. or more, falling again when a fresh cyclone advanced from the Atlantic.

### Correspondence.

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

#### A WET FIRST HALF, AND AFTER.

IN the first half of this year, Greenwich had a rainfall of 12·5 in. The average is 10·37 in.

Consider all previous cases of 12 in. or more. There are 17 ; and it is a curious fact that in no fewer than 16 of these the August following was wet. The exceptional year is 1869.

We might make this universal statement: the thirteen wettest first halves (all over 12·3 in.) were each followed by a wet August. These are given, in descending order, in the following table, with the rainfall of August (which has an average of 2·33 in.).

|          | Year.      | Rainfall,<br>First Half.<br>in. | Rainfall,<br>August.<br>in. | Rainfall,<br>October—December.<br>in. |
|----------|------------|---------------------------------|-----------------------------|---------------------------------------|
| 1. ....  | 1866 ..... | 17·4 .....                      | 2·42 .....                  | 5·42                                  |
| 2. ....  | 1879 ..... | 17·3 .....                      | 5·19 .....                  | 2·32                                  |
| 3. ....  | 1878 ..... | 16·2 .....                      | 5·38 .....                  | 6·27                                  |
| 4. ....  | 1903 ..... | 15·6 .....                      | 4·82 .....                  | 7·64                                  |
| 5. ....  | 1860 ..... | 15·5 .....                      | 3·68 .....                  | 6·85                                  |
| 6. ....  | 1848 ..... | 14·2 .....                      | 4·25 .....                  | 7·25                                  |
| 7. ....  | 1877 ..... | 13·7 .....                      | 2·90 .....                  | 7·07                                  |
| 8. ....  | 1862 ..... | 13·4 .....                      | 3·01 .....                  | 6·66                                  |
| 9. ....  | 1865 ..... | 13·1 .....                      | 3·97 .....                  | 9·16                                  |
| 10. .... | 1851 ..... | 12·8 .....                      | 2·60 .....                  | 3·38                                  |
| 11. .... | 1867 ..... | 12·6 .....                      | 2·64 .....                  | 4·53                                  |
| 12. .... | 1905 ..... | 12·6 .....                      | 2·54 .....                  | 4·63                                  |
| 13. .... | 1853 ..... | 12·5 .....                      | 2·75 .....                  | 6·98                                  |
|          |            | Average.....                    | 3·55 .....                  | 6·01                                  |

The rainfall of August this year, 2·42 in. adds a fourteenth case.

An opposite tendency may be noted on the other side. Thus, where the first half has had a rainfall under 8 in., which has happened in 11 years, August has been dry in 9 cases.

It would further appear that there is a tendency to dryness in the last quarter of those years. A column of the rainfall added, shows that, with an average of 6·96 in. in the last quarter, those quarters are in excess only five times ; and in four the excess is slight (+·68 in. at most). The average of the column is 6·01 in. We might say that in only two cases (1848 and 1865) was the last quarter wet in the twofold sense of a preponderance of wet months and an excess of rainfall.

Some discussion of these facts and relations might be interesting.

ALEX. B. MACDOWALL.

## THE DRY SEPTEMBER.

OUR rainfall for September is only  $\cdot 26$  in., the driest September I have record of here. Rainfall on 6 days as follows:—

|                     |                |                     |                |
|---------------------|----------------|---------------------|----------------|
| September 1st ..... | $\cdot 01$ in. | September 25th..... | $\cdot 01$ in. |
| „ 10th.....         | $\cdot 01$ „   | „ 26th.....         | $\cdot 02$ „   |
| „ 14th.....         | $\cdot 17$ „   |                     |                |
| „ 15th.....         | $\cdot 04$ „   |                     | $\cdot 26$ „   |

*Chewton Priory, Bath, October 1st, 1910.*

WALDEGRAVE.

WE have only had five rain days, with a total of  $\cdot 23$  in. during this month; and to-day an open sky leads one to expect another perfect summer's day.

There have been two ten-day periods without any rain.

H. SATCHELL.

*Chelwood Rectory, North Somerset, 30th September, 1910.*

THE partial drought here has now extended from 31st August to 30th September, both inclusive. There has been an absolute drought from 16th September (inclusive) to date hereof.

The rainfall for the month has only been  $\cdot 21$  in. on 5 days, viz.:—

|                    |                |                     |                |
|--------------------|----------------|---------------------|----------------|
| September 7th..... | $\cdot 02$ in. | September 14th..... | $\cdot 07$ in. |
| „ 9th.....         | $\cdot 02$ „   | „ 15th.....         | $\cdot 01$ „   |
| „ 13th .....       | $\cdot 09$ „   |                     |                |

With amounts under  $\cdot 005$  on 30th and 31st from heavy dew. All the field ponds about here are dried up.

J. F. LEIGH CLARE.

*The White Cottage, Heathfield, Sussex, 1st October, 1910.*

As the rainfall here for September constitutes a record—or something very near it—for that month, I enclose my figures; the total was  $\cdot 22$  in. falling on 5 days, on the wettest of which  $\cdot 12$  in. fell. In the past 50 years of my observations in the S.E. district I find no record of so low a figure for September. During the 22 years at Croydon, 1860 to 1881 (inclusive), the minimum fall was  $\cdot 35$  in. in 1865; during the 15 years at Tunbridge Wells, 1884 to 1899, the minimum was  $\cdot 53$  in. in 1898; during the past 10 years at Eastbourne, 1900 to 1909, the minimum was  $\cdot 76$  in. in 1902. Of course a more extreme minimum may have occurred at Eastbourne previously to 1900, but I see on reference to *British Rainfall* that there is no indication of such an extreme in the years for which I have no record at all, viz., 1882, 1883 and 1899.

JAMES WESTON.

*Staveley Cross, Eastbourne, 1st October, 1910.*

## HEAVY RAIN.

THE thunderstorms of June, 1910, have been supplemented by heavy rains in August. On the high ground at or near Durdham Down, Clifton, the figures were :—

*August 28th Rain.*

|                        | Depth.   |       | Heaviest Fall. |
|------------------------|----------|-------|----------------|
| Stoke Bishop .....     | 6·65 in. | ..... | 1·84 in.       |
| Durdham Down .....     | 6·44 „   | ..... | 1·93 „         |
| Westbury-on-Trym ..... | 6·20 „   | ..... | 1·81 „         |

Average for August is about  $3\frac{1}{2}$  inches.

Dr. G. F. Burder, at Clifton, registered in August, 1865, 8·508 in., and in 1891, 7·439 in. In 1879 I recorded 7·464 in.; 1897 also furnished a very wet August in this locality, the Clifton fall being 7·77 in., and 2·49 in. of this fell on the 30th of that month.

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

*Bristol, September 2nd, 1910.*

## REMARKABLE SOLAR HALO.

A most remarkable Solar Halo, with Parhelia, (mock suns) was seen here between noon and 1 p.m. on Saturday, September 10th. Is not this phenomenon a very exceptional one in these latitudes? The largest halo appeared on the north side of the sun, the southern edge apparently passing through the sun. A smaller one in the shape of an ellipse, was seen round the sun, and on the zenith were wonderfully brilliant segments of circles showing the spectral colours; the mock suns were, of course, due east and west of the sun. I called the attention of many to this wonderful spectacle. It would be interesting to know whether it was visible in other parts of the country.

GEO. J. KIMMINS.

*Brooklands, Tonbridge, September 14th, 1910.*

The phenomenon referred to by Mr. Kimmins forms the subject of a letter to *The Times* by Sir Thomas Fraser, dated from Eastbourne, on September 10th. The following extract is abbreviated somewhat.

A cold north-east wind had been blowing for many days, and the weather this morning was very fine. The north-east wind suddenly died out, and a light south-west wind came up, bringing some damp haze which kept increasing. There were some light cirrus clouds. At 12.48 p.m. the sun being west of south, I saw it apparently surrounded by two rainbow-like nimbi. The inner one was circular with true rainbow colours, red outside, then yellow, then blue inside. The second rainbow, of which the colours were reversed, was apparently elliptical, with the longer axis horizontal. This rainbow enveloped the circular one. The striking feature was that the ellipse and circle appeared to overlap for one or more degrees on each side of the vertex of the short axis, and the two spectra blended very

brilliantly here, while the divergence of the two figures was very marked as they separated further out. Combined with these two phenomena there was a third. This was a white circular or elliptical annulus, a narrow, colourless ribbon of more or less opaque mist or cloud lying in an horizontal plane above us. The plane of this ring intersected that of the nimbi at right angles, the ring cutting the elliptical nimbus, a little below the poles of the long axis and in an attenuated form, but quite definite; it appeared across the plane of the nimbi till it seemed to pass through or behind the apparent position of the sun on that plane, as it shone through it. The diameter of the annulus appeared so large that only some 60 degrees or less of its south-western circumference was involved in the nimbi. It did not affect the circular nimbus, but at each of the two points where it crossed the fading prismatic bands of the outer one, a short section of the prismatic colours became very vivid and quite blazed out in the broad daylight. This lasted till about 1.30 p.m.

These two short prismatic sections seemed each to have a colourless reflection opposite to it in the north-eastern circumference of the great annulus, where the ribbon was enlarged to about twice its width by a white elliptical blob. The connection was evident, for, when the more western bright patch was clouded over for a time its corresponding blob almost disappeared from the ring and reappeared as that bright patch cleared. At first I noticed a detached prismatic patch of colour at a distance from the sun of four or five times the diameter of the inner nimbus. It proved to be a section of the western haunch of an ordinary rainbow over the sea, the remainder of which was obscured by mist.

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### LOW SEPTEMBER TEMPERATURE.

THE minimum temperature to-day in the screen, by Kew certified thermometer, was  $31^{\circ}7$ . This is the lowest temperature I have ever observed in September.

On September 27th, 1885, the minimum temperature at Greenwich was  $30^{\circ}6$ .

H. K. G. ROGERS.

*Glenart, Weybridge, 21st September, 1910.*

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### A SIGN OF EAST WIND.

I MUST apologize for a mistake in my letter *re* east wind (this Vol., p. 149). Instead of saying "Temperature shows no tendency to rise by day or fall by night," I should have said, "Temperature shows little tendency to rise by day, but much more to fall by night." The reliability of this sign would seem to depend on whether the anti-cyclone, once started in its northward drift, continues in the same.

C. H. E. RIDPATH.

*157, Finchley Road, South Hampstead, September 30th, 1910.*

## INTERNATIONAL BALLOON ASCENTS, IN APRIL, 1908.

By W. H. DINES, F.R.S.

*April 1st, 1908.*

| Starting Point. | Country.     | A<br>miles. | B<br>° F. | C<br>miles. | D<br>° F. | E<br>miles. | F          |
|-----------------|--------------|-------------|-----------|-------------|-----------|-------------|------------|
| Manchester....  | England .... | 6·2         | -73       | 8·2         | -70       | 140         | S.E.       |
| Paris.....      | France ..... | 7·2         | -80       | 8·7         | -62       | 175         | S.E.       |
| Hamburg.....    | Germany....  | 5·6         | -52       | 5·8         | -52       | 22          | E.S.E.     |
| Lindenberg....  | " .....      | 10·6        | -72       | 10·8        | -72       | 28          | S.E. by E. |

*April 2nd, 1908.*

|                 |              |     |     |      |     |     |          |
|-----------------|--------------|-----|-----|------|-----|-----|----------|
| Pyrton Hill.... | England .... | 8·0 | -71 | 8·8  | -65 | 58  | E.N.E.   |
| Ditcham Park    | " .....      | 7·4 | -74 | 8·0  | -74 | 57  | E. by N. |
| Paris .....     | France.....  | 6·5 | -79 | 9·0  | -80 | 146 | S.E.     |
| Uccle .....     | Belgium .... | 6·6 | -82 | 10·1 | -72 | 91  | S.S.E.   |
| Hamburg.....    | Germany....  | 7·0 | -70 | 7·3  | -67 | 89  | S. by E. |
| Strassburg .... | " .....      | 7·1 | -71 | 9·1  | -67 | 80  | S. by E. |

*April 3rd, 1908.*

|                 |               |     |     |      |     |     |            |
|-----------------|---------------|-----|-----|------|-----|-----|------------|
| Manchester....  | England ....  | 6·8 | -56 | 7·1  | -54 | 66  | S.E. by E. |
| Ditcham Park    | " .....       | 6·0 | -39 | 7·0  | -38 | 219 | E.S.E.     |
| Paris.....      | France.....   | 6·6 | -74 | 7·8  | -65 | 145 | E.         |
| Hamburg.....    | Germany....   | 6·4 | -74 | 8·4  | -65 | 34  | E.N.E.     |
| Lindenberg....  | " .....       | ?   | ?   | 9·2  | -76 | 18  | S.S.E.     |
| Strassburg .... | " .....       | 7·2 | -77 | 8·9  | -63 | 42  | E.S.E.     |
| Munich.....     | " .....       | 7·0 | -72 | ?    | ?   | 58  | S.S.E.     |
| Zurich .....    | Switzerland.. | 6·9 | -72 | ?    | ?   | 41  | S.E.       |
| Vienna.....     | Austria.....  | 6·9 | -72 | 11·6 | -65 | 75  | S.S.E.     |
| Pavia.....      | Italy.....    | 7·5 | -87 | 8·5  | -83 | 36  | S.E. by S. |

A=Height in miles of commencement of isothermal column.

B=Temperature, F°, at bottom of column.

C=Greatest height of reliable record in miles.

D=Temperature, F°, at greatest height.

E=Distance in miles of point where balloon fell.

F=Bearing of falling point from starting point.

There are two noticeable points in the figures. The great height of the commencement of the isothermal column at Lindenberg on April 1st, 10·6 miles (17 kms.), constitutes, I think, the record for the temperate latitudes. Also the temperature of  $-38^{\circ}$  only at Ditcham Park on April 3rd is unusually high.

On April 1st the lowest pressure lay over the south-west of Scandinavia. On the 2nd this depression seems to have filled up, and the lowest pressure lay between Scotland and Iceland. The charts for the 3rd and 4th show a small well-marked depression, with complete circulation round it, passing to the south-east across the North Sea.

## METEOROLOGICAL NEWS AND NOTES.

THE KING has been pleased to intimate that he will continue the annual subscription to the General Fund of the British Rainfall Organization which was given by His late Majesty King Edward VII.

THE INTERNATIONAL METEOROLOGICAL COMMITTEE met at Berlin in the end of September under the presidency of Dr. W. N. Shaw, with Professor Hellmann as Secretary. The places of those members



who have died since the last meeting were filled by the appointment of Dr. G. T. Walker, F.R.S., Dr. W. Trabert, C. H. Ryder and Dr. E. van Everdingen.

MESSRS. AITCHISON & Co., of London, Leeds and Manchester, send us an attractive illustrated catalogue of Meteorological Instruments extending to 90 pages. We suppose it is inevitable that such catalogues must contain rain gauges of obsolete types ; but this also shows the standard instruments to which alone we would direct attention.

## REVIEW.

*Descriptive Meteorology.* By WILLIS L. MOORE, LL.D., Sc.D., Professor of Meteorology and Chief of United States Weather Bureau, &c. With forty-five charts, many in color, and eighty-one illustrations in text. New York and London: D. Appleton & Company, 1910. Size  $9\frac{1}{2} \times 6\frac{1}{2}$ , pp. xviii. + 344. Price 12s. 6d. net.


PROFESSOR WILLIS MOORE, at the head of the United States Weather Bureau, is in a unique position amongst the meteorologists of the world. The system he controls is the largest and the most generously supported, and it creates by the number of persons it employs a class of professional meteorologists to whose training the Chief must necessarily give much thought. It is mainly the young men entering the service of the Weather Bureau that Professor Moore had in mind when writing his book ; and he has striven with success to make the volume interesting, up-to-date, and intelligible to anyone of alert intelligence, even if ignorant of mathematics. As he very truly remarks, a book which suits the class aimed at will "provide equally well for all others who are beginning seriously this important science." Except in so far as the superabundance of data at the author's disposal is mainly American, and the illustrations and maps relate mainly to the western hemisphere, the book should prove as interesting and attractive to readers in this country, and in "all the Britains," as to their American kindred.

The arrangement and treatment of the subject present several points of originality, which strike one pleasantly in reading what is physically the heaviest book of its size we have ever handled (it weighs 3 lbs.). For one thing, it is the first book on meteorology which has been planned and written since the complexity of the composition of the atmosphere, and the remarkable distribution of temperature vertically in the free air, have been known ; and there is something refreshingly unfamiliar in the picture of an atmosphere above 100 kilometres consisting solely of hydrogen and helium, the oxygen and nitrogen being all left far below, while water vapour practically vanishes within 5 miles of the surface of the land. The part played by dust also falls into its place in the original plan ; but

we do not think we are wrong in saying that the essential characteristic of the book is the vivid realization of the importance of the vertical range of atmospheric phenomena in all discussions. When meteorology is treated as merely the description of what occurs in the air at the surface of the Earth, the maps depicting the various distribution only show momentary sections of the heaving and throbbing mass of the atmosphere, from which it is impossible to picture the changes actually in progress. Professor Moore makes large use of maps, of course, but he always keeps in view that the map is merely the ground plan of the aerial structure which is ever before his mind. The correlation of the horizontal plan of cyclone and anticyclone with the vertical movements connecting the isobars at various levels, is very clearly brought out in the treatment of the movement of the winds, where Professor Bigelow's diagrams are expounded in a manner which should be understood by every reader. Approached from this point of view, a tornado or water-spout becomes a typical, and not an abnormal, feature of atmospheric activity.

There is no reason to suppose that the chapter on Precipitation is treated more summarily than those on other departments of meteorology; but in reading Professor Moore's treatment of the subject specially studied by the reviewer, the skill of the "leaving out," which must have been as great or greater in other chapters, appears specially striking.

The chapter on Forecasting the Weather and Storms will naturally be viewed as the kernel of the book, for it is in this department that the unrivalled experience of the author makes itself most plainly felt; and it is here also that his self-control is most apparent, for he resists the temptation to dwell on the magnitude and the routine of the U.S. Weather Bureau in order to give all the space available to the description of weather types and the way of interpreting the daily weather charts. An excellent chapter on climate completes the work, and after reading it we are amazed at the amount of well-digested, clearly-arranged material which has been set out in the 284 pages of text. The plates which occupy pp. 287 to 331 are well chosen. Those of a general character are of course familiar, like Buchan's isotherms and isobars; but others, such as the maps of the diurnal pressure wave on pp. 294-297, will be new to most English readers. We must congratulate Professor Willis Moore on the production of a book which is bound to have a great future in moulding the thoughts of the rising generation of meteorologists; and while there are, of course, points where future editions can improve upon the present, we have very rarely indeed met with a work on Meteorology which presented so few opportunities for correcting details or questioning conclusions.



## RAINFALL TABLE FOR SEPTEMBER, 1910.

| STATION.                       | COUNTY.            | Lat.<br>N. | Long.<br>W.<br>[*E.] | Height<br>above<br>Sea.<br>ft. | RAINFALL<br>OF MONTH.          |              |
|--------------------------------|--------------------|------------|----------------------|--------------------------------|--------------------------------|--------------|
|                                |                    |            |                      |                                | Aver.<br>1875—<br>1909.<br>in. | 1910.<br>in. |
| Camden Square.....             | London.....        | 51 32      | 0 8                  | 111                            | 2'00                           | '58          |
| Tenterden.....                 | Kent.....          | 51 4       | *0 41                | 190                            | 2'25                           | '48          |
| Steyning.....                  | Sussex.....        | 50 53      | 0 20                 | 80                             | 2'77                           | '16          |
| Southampton (Cadland) ..       | Hampshire.....     | 50 50      | 1 22                 | 52                             | 2'60                           | '15          |
| Hitchin.....                   | Hertfordshire..... | 51 57      | 0 17                 | 238                            | 1'98                           | '91          |
| Oxford (Magdalen College).     | Oxfordshire.....   | 51 45      | 1 15                 | 186                            | 1'98                           | '45          |
| Bury St. Edmunds (Westley)     | Suffolk.....       | 52 15      | *0 40                | 226                            | 2'18                           | 1'27         |
| Geldeston [Beccles].....       | Norfolk.....       | 52 27      | *1 31                | 38                             | 2'13                           | 2'06         |
| Polapit Tamar [Launceston]     | Devon.....         | 50 40      | 4 22                 | 315                            | 3'11                           | '21          |
| Rousdon [Lyme Regis].....      | „.....             | 50 41      | 3 0                  | 516                            | 2'69                           | '29          |
| Stroud (Upfield).....          | Gloucestershire..  | 51 44      | 2 13                 | 226                            | 2'39                           | '79          |
| Church Stretton (Wolstaston).. | Shropshire.....    | 52 35      | 2 48                 | 800                            | 2'40                           | '98          |
| Coventry (Kingswood).....      | Warwickshire.....  | 52 24      | 1 30                 | 340                            | 2'35                           | '72          |
| Market Overton.....            | Rutland.....       | 52 44      | 0 41                 | 475                            | 2'30                           | 1'46         |
| Boston.....                    | Lincolnshire.....  | 52 58      | 0 1                  | 25                             | 2'07                           | 1'09         |
| Worksop (Hodsock Priory).      | Nottinghamshire    | 53 22      | 1 5                  | 56                             | 1'84                           | '16          |
| Macclesfield.....              | Cheshire.....      | 53 15      | 2 7                  | 501                            | 2'92                           | '36          |
| Southport (Hesketh Park)..     | Lancashire.....    | 53 38      | 2 59                 | 38                             | 3'09                           | '54          |
| Wetherby (Ribston Hall) ...    | Yorkshire, W.R.    | 53 59      | 1 24                 | 130                            | 2'11                           | '28          |
| Arnccliffe Vicarage.....       | „ E.R.             | 54 8       | 2 6                  | 732                            | 4'55                           | '46          |
| Hull (Pearson Park).....       | „ E.R.             | 53 45      | 0 20                 | 6                              | 2'05                           | '24          |
| Newcastle (Town Moor) ...      | Northumberland     | 54 59      | 1 38                 | 201                            | 2'00                           | '74          |
| Borrowdale (Seathwaite) ...    | Cumberland.....    | 54 30      | 3 10                 | 423                            | 11'28                          | 1'38         |
| Cardiff (Ely).....             | Glamorgan.....     | 51 29      | 3 13                 | 53                             | 3'61                           | '15          |
| Haverfordwest.....             | Pembroke.....      | 51 48      | 4 58                 | 95                             | 3'91                           | '23          |
| Aberystwyth (Gogerddan)..      | Cardigan.....      | 52 26      | 4 1                  | 83                             | 3'89                           | '61          |
| Llandudno.....                 | Carnarvon.....     | 53 20      | 3 50                 | 72                             | 2'50                           | '52          |
| Cargen [Dumtries].....         | Kirkcudbright...   | 55 2       | 3 37                 | 80                             | 3'34                           | ...          |
| Marchmont House.....           | Berwick.....       | 55 44      | 2 24                 | 498                            | 2'67                           | 1'09         |
| Girvan (Pinmore).....          | Ayr.....           | 55 10      | 4 49                 | 207                            | 4'30                           | 2'00         |
| Glasgow (Queen's Park) ...     | Renfrew.....       | 55 53      | 4 18                 | 144                            | 2'99                           | 1'69         |
| Inveraray (Newtown).....       | Argyll.....        | 56 14      | 5 4                  | 17                             | 6'15                           | 2'71         |
| Mull (Quinish).....            | „.....             | 56 36      | 6 13                 | 35                             | 5'20                           | 2'71         |
| Dundee (Eastern Necropolis)    | Forfar.....        | 56 28      | 2 57                 | 199                            | 2'34                           | '99          |
| Braemar.....                   | Aberdeen.....      | 57 0       | 3 24                 | 1114                           | 2'73                           | '54          |
| Aberdeen (Cranford).....       | „.....             | 57 8       | 2 7                  | 120                            | 2'69                           | 1'03         |
| Cawdor.....                    | Nairn.....         | 57 31      | 3 57                 | 250                            | 2'55                           | 1'21         |
| Fort Augustus (S. Benedict's)  | E. Inverness ..    | 57 9       | 4 41                 | 68                             | 3'54                           | '82          |
| Loch Torridon (Bendamph)       | W. Ross.....       | 57 32      | 5 32                 | 20                             | 7'28                           | 2'19         |
| Dunrobin Castle.....           | Sutherland.....    | 57 59      | 3 56                 | 14                             | 2'51                           | 1'18         |
| Wick.....                      | Caithness.....     | 58 26      | 3 6                  | 77                             | 2'57                           | 1'31         |
| Killarney (District Asylum)    | Kerry.....         | 52 4       | 9 31                 | 178                            | 3'79                           | 1'15         |
| Waterford (Brook Lodge)...     | Waterford.....     | 52 15      | 7 7                  | 104                            | 3'19                           | '74          |
| Nenagh (Castle Lough).....     | Tipperary.....     | 52 54      | 8 24                 | 120                            | 3'16                           | '78          |
| Miltown Malbay.....            | Clare.....         | 52 52      | 9 26                 | 400                            | 4'18                           | 1'45         |
| Gorey (Courtown House) ..      | Wexford.....       | 52 40      | 6 13                 | 80                             | 2'78                           | '98          |
| Abbey Leix (Blandsfort)....    | Queen's County..   | 52 56      | 7 17                 | 532                            | 2'93                           | 1'30         |
| Dublin (Fitz William Square)   | Dublin.....        | 53 21      | 6 14                 | 54                             | 2'06                           | '73          |
| Mullingar (Belvedere).....     | Westmeath.....     | 53 29      | 7 22                 | 367                            | 3'01                           | 1'01         |
| Ballinasloe.....               | Galway.....        | 53 20      | 8 15                 | 160                            | 2'99                           | ...          |
| Crossmolina (Enniscoe).....    | Mayo.....          | 54 4       | 9 18                 | 74                             | 4'42                           | '80          |
| Collooney (Markree Obsy.).     | Sligo.....         | 54 11      | 8 27                 | 127                            | 3'65                           | 1'27         |
| Seaforde.....                  | Down.....          | 54 19      | 5 50                 | 180                            | 3'25                           | 1'23         |
| Bushmills (Dundarave).....     | Antrim.....        | 55 12      | 6 30                 | 162                            | 3'49                           | '89          |
| Omagh (Edenfel).....           | Tyrone.....        | 54 36      | 7 18                 | 280                            | 3'39                           | 1'20         |

## RAINFALL TABLE FOR SEPTEMBER, 1910—continued.

| RAINFALL OF MONTH (con.) |          |                   |        |             | 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. in.  | 1910. in. | Diff. from Aver. in. | % of Av. |                        |                 |
|                          |          | in.               | Date.  |             |                       |           |                      |          | in.                    |                 |
| -1.42                    | 29       | .48               | 13     | 5           | 17.92                 | 16.88     | -1.04                | 94       | 25.11                  | Camden Square   |
| -1.77                    | 21       | .22               | 13     | 10          | 18.32                 | 18.69     | + .37                | 102      | 27.64                  | Tenterden       |
| -2.61                    | 6        | .06               | 14     | 4           | 22.07                 | 26.72     | +4.65                | 121      | 33.58                  | Steyning        |
| -2.45                    | 6        | .13               | 14     | 2           | 21.18                 | 19.40     | -1.78                | 92       | 31.87                  | Cadland         |
| -1.07                    | 46       | .40               | 14     | 8           | 17.82                 | 16.55     | -1.27                | 93       | 25.16                  | Hitchin         |
| -1.53                    | 23       | .31               | 14     | 6           | 17.45                 | 14.84     | -2.61                | 85       | 24.58                  | Oxford          |
| - .91                    | 58       | .72               | 13     | 11          | 18.14                 | 20.01     | +1.87                | 110      | 25.40                  | Westley         |
| - .07                    | 97       | 1.48              | 13     | 16          | 16.33                 | 21.81     | +5.48                | 133      | 23.73                  | Geldeston       |
| -2.90                    | 7        | .13               | 14     | 6           | 24.90                 | 28.92     | +4.02                | 116      | 38.27                  | Polapit Tamar   |
| -2.40                    | 11       | .09               | 25     | 4           | 22.54                 | 21.75     | - .79                | 97       | 33.54                  | Rousdon         |
| -1.60                    | 33       | .44               | 14     | 7           | 21.12                 | 22.16     | +1.04                | 105      | 29.81                  | Stroud          |
| -1.42                    | 41       | .73               | 14     | 7           | 22.71                 | 20.92     | -1.79                | 92       | 32.41                  | Wolstaston      |
| -1.63                    | 31       | .70               | 14     | 2           | 20.51                 | 18.45     | -2.06                | 90       | 28.98                  | Coventry        |
| - .84                    | 63       | 1.21              | 14     | 11          | 19.12                 | 19.73     | + .61                | 103      | 27.10                  | Market Overton  |
| - .98                    | 53       | .89               | 14     | 9           | 16.67                 | 17.29     | + .62                | 104      | 23.35                  | Boston          |
| -1.68                    | 9        | .05               | 19     | 7           | 17.54                 | 16.17     | -1.37                | 92       | 24.46                  | Hodsock Priory  |
| -2.56                    | 12       | .19               | 1      | 7           | 24.85                 | 27.30     | +2.45                | 110      | 34.73                  | Macclesfield    |
| -2.55                    | 17       | .14               | 29     | 9           | 22.70                 | 24.18     | +1.48                | 107      | 32.70                  | Southport       |
| -1.83                    | 13       | .09               | 26     | 10          | 19.08                 | 22.00     | +2.92                | 115      | 26.87                  | Ribston Hall    |
| -4.09                    | 10       | .31               | 26     | 8           | 42.14                 | 48.54     | +6.40                | 115      | 61.49                  | Arneliffe       |
| -1.81                    | 12       | .11               | 10     | 7           | 18.57                 | 17.84     | - .73                | 96       | 26.42                  | Hull            |
| -1.26                    | 37       | .30               | 2      | 9           | 19.65                 | 18.55     | -1.10                | 94       | 27.94                  | Newcastle       |
| -9.90                    | 12       | .43               | 2      | 9           | 88.04                 | 96.14     | +8.10                | 109      | 129.48                 | Seathwaite      |
| -3.46                    | 4        | .13               | 14     | 2           | 28.63                 | 32.78     | +4.15                | 115      | 42.28                  | Cardiff         |
| -3.68                    | 6        | .18               | 14     | 5           | 30.96                 | 28.79     | -2.17                | 93       | 46.82                  | Haverfordwest   |
| -3.28                    | 16       | .18               | 2      | 8           | 30.92                 | 37.31     | +6.39                | 121      | 45.46                  | Gogerddan       |
| -1.98                    | 21       | .20               | 10     | 8           | 20.55                 | 23.60     | +3.05                | 115      | 30.36                  | Llandudno       |
| ...                      | ...      | ...               | ...    | ...         | 29.83                 | ...       | ...                  | ...      | 43.47                  | Cargen          |
| -1.58                    | 41       | .42               | 10     | 8           | 23.89                 | 19.86     | -4.03                | 83       | 33.76                  | Marchmont       |
| -2.30                    | 47       | .71               | 28     | 14          | 33.67                 | 40.21     | +6.54                | 119      | 49.77                  | Girvan          |
| -1.30                    | 57       | .37               | 29     | 10          | 25.03                 | 30.05     | +5.02                | 120      | 35.97                  | Glasgow         |
| -3.44                    | 44       | .50               | 10, 28 | 15          | 46.21                 | 51.41     | +5.20                | 111      | 68.67                  | Inveraray       |
| -2.49                    | 52       | 1.45              | 1      | 13          | 37.87                 | 39.74     | +1.87                | 105      | 56.57                  | Quinish         |
| -1.35                    | 42       | .26               | 1      | 10          | 20.54                 | 21.61     | +1.07                | 105      | 28.64                  | Dundee          |
| -2.19                    | 20       | ...               | ...    | ...         | 24.16                 | 28.17     | +4.01                | 117      | 34.93                  | Braemar         |
| -1.66                    | 38       | .43               | 1      | 9           | 22.78                 | 19.95     | -2.83                | 87       | 32.73                  | Aberdeen        |
| -1.34                    | 47       | .40               | 1      | 7           | 21.25                 | 23.48     | +2.23                | 111      | 29.33                  | Cawdor          |
| -2.72                    | 23       | .38               | 1      | 10          | 30.26                 | 32.43     | +2.17                | 107      | 44.53                  | Fort Augustus   |
| -5.09                    | 30       | .62               | 10     | 15          | 56.63                 | 63.18     | +6.55                | 112      | 83.61                  | Bendamp         |
| -1.33                    | 47       | .66               | 1      | 8           | 22.41                 | 22.10     | - .31                | 99       | 31.90                  | Dunrobin Castle |
| -1.26                    | 51       | .40               | 2      | 19          | 20.68                 | 20.52     | - .16                | 99       | 29.88                  | Wick            |
| -2.64                    | 30       | .36               | 25     | 9           | 36.76                 | 44.32     | +7.56                | 121      | 54.81                  | Killarney       |
| -2.45                    | 23       | .36               | 27     | 5           | 27.45                 | 26.94     | - .51                | 98       | 39.57                  | Waterford       |
| -2.38                    | 25       | .40               | 27     | 7           | 27.73                 | 32.09     | +4.36                | 116      | 39.43                  | Castle Lough    |
| -2.73                    | 35       | .39               | 27     | 12          | 31.46                 | 33.42     | +1.96                | 106      | 45.11                  | Miltown Malbay  |
| -1.80                    | 35       | .47               | 5      | 9           | 24.41                 | 25.38     | + .97                | 104      | 34.99                  | Courtown Ho.    |
| -1.63                    | 44       | .63               | 27     | 8           | 25.70                 | 32.49     | +6.81                | 126      | 35.92                  | Abbey Leix      |
| -1.33                    | 35       | .18               | 10     | 16          | 19.89                 | 25.11     | +5.22                | 126      | 27.68                  | Dublin          |
| -2.00                    | 33       | .60               | 27     | 7           | 26.18                 | 32.10     | +5.92                | 123      | 36.14                  | Mullingar.      |
| ...                      | ...      | ...               | ...    | ...         | 26.17                 | ...       | ...                  | ...      | 36.64                  | Ballinasloe     |
| -3.62                    | 18       | .23               | 27     | 13          | 35.74                 | 41.16     | +5.50                | 115      | 52.87                  | Ennisceoe       |
| -2.38                    | 35       | .54               | 27     | 10          | 30.14                 | 42.38     | +12.24               | 140      | 42.71                  | Markree         |
| -2.02                    | 38       | .53               | 28     | 9           | 27.63                 | 27.73     | + .10                | 100      | 38.91                  | Seaforde        |
| -2.60                    | 26       | .32               | 10     | 9           | 26.32                 | 30.25     | +3.93                | 115      | 37.56                  | Dundarave       |
| -2.19                    | 35       | .50               | 28     | 10          | 28.05                 | 34.39     | +6.34                | 122      | 39.38                  | Omagh           |

## SUPPLEMENTARY RAINFALL, SEPTEMBER, 1910.

| Div.  | STATION.                     | Rain<br>inches | Div.   | STATION.                     | Rain<br>inches |
|-------|------------------------------|----------------|--------|------------------------------|----------------|
| II.   | Warlingham, Redvers Road     | 1.41           | XI.    | Llangyhanfal, Plás Draw....  | .49            |
| "     | Ramsgate .....               | 1.45           | "      | Dolgelly, Bryntirion .....   | .56            |
| "     | Hailsham .....               | .29            | "      | Bettws-y-Coed, Tyn-y-bryn    | .36            |
| "     | Totland Bay, Aston House.    | .12            | "      | Lligwy .....                 | .44            |
| "     | Stockbridge, Ashley .....    | .16            | "      | Douglas, Woodville .....     | ...            |
| "     | Grayshott .....              | .45            | XII.   | Stoneykirk, Ardwell House    | 1.21           |
| "     | Reading, Calcot Place.....   | .27            | "      | Dalry, The Old Garroch ...   | 2.15           |
| III.  | Harrow Weald, Hill House.    | .52            | "      | Langholm, Drove Road.....    | .93            |
| "     | Pitsford, Sedgebrook .....   | .69            | "      | Moniaive, Maxwellton House   | 1.45           |
| "     | Huntingdon, Brampton.....    | .99            | XIII.  | St Mary's Loch, Cramilt Ldge | .82            |
| "     | Woburn, Milton Bryant.....   | .71            | "      | Edinburgh, Royal Observty.   | .69            |
| "     | Wisbech, Monica Road.....    | .73            | XIV.   | Maybole, Knockdon Farm...    | 2.15           |
| IV.   | Southend Water Works.....    | .89            | XV.    | Campbeltown, Witchburn...    | 1.13           |
| "     | Colchester, Lexden.....      | .90            | "      | Glenreadell Mains.....       | 1.64           |
| "     | Newport .....                | 1.17           | "      | Ballachulish House.....      | 2.11           |
| "     | Rendlesham .....             | 1.20           | "      | Islay, Fallabus .....        | 1.35           |
| "     | Swaffham .....               | .89            | XVI.   | Dollar Academy .....         | 1.02           |
| "     | Blakeney .....               | 1.41           | "      | Balquhiddy, Stronvar .....   | 1.65           |
| V.    | Bishops Cannings .....       | .24            | "      | Coupar Angus .....           | .81            |
| "     | Winterbourne Steepleton ..   | .33            | "      | Blair Atholl.....            | .92            |
| "     | Ashburton, Druid House ..    | .55            | "      | Montrose, Sunnyside Asylum   | 1.15           |
| "     | Honiton, Combe Raleigh ...   | .34            | XVII.  | Alford, Lynturk Manse ...    | 1.02           |
| "     | Okehampton, Oaklands.....    | .26            | "      | Keith Station .....          | 1.55           |
| "     | Hartland Abbey .....         | .19            | XVIII. | Glenquoich, Loan .....       | 7.20           |
| "     | Lynmouth, Rock House ...     | .29            | "      | Skye, Dunvegan.....          | 2.53           |
| "     | Probus, Lamellyn .....       | .19            | "      | N. Uist, Lochmaddy .....     | 2.05           |
| "     | North Cadbury Rectory ..     | .19            | "      | Alvey Manse .....            | .87            |
| VI.   | Clifton, Pembroke Road ...   | .28            | "      | Loch Ness, Drumnadrochit.    | .82            |
| "     | Ross, The Graig .....        | .40            | "      | Glencarron Lodge .....       | 3.38           |
| "     | Shifnal, Hatton Grange.....  | .80            | "      | Fearn, Lower Pitkerrie.....  | 1.55           |
| "     | Blockley, Upton Wold .....   | .76            | XIX.   | Invershin .....              | 1.38           |
| "     | Worcester, Boughton Park.    | .71            | "      | Altnaharra .....             | ...            |
| VII.  | Market Rasen .....           | .40            | "      | Bettyhill .....              | .77            |
| "     | Bawtry, Hesley Hall.....     | .19            | XX.    | Dunmanway, The Rectory..     | 1.80           |
| "     | Derby, Midland Railway ...   | .54            | "      | Cork .....                   | 1.28           |
| "     | Buxton.....                  | .44            | "      | Mitchelstown Castle .....    | 1.40           |
| VIII. | Nantwich, Dorfold Hall.....  | .40            | "      | Darrynane Abbey .....        | 1.23           |
| "     | Liscard .....                | .50            | "      | Glenam [Clonmel] .....       | .96            |
| "     | Chatburn, Middlewood .....   | .38            | "      | Nenagh, Traverston .....     | 1.07           |
| "     | Cartmel, Flookburgh .....    | .62            | "      | Newmarket-on-Fergus, Fenloe  | ...            |
| IX.   | Langsett Moor, Up. Midhope   | .26            | XXI.   | Laragh, Glendalough .....    | 1.24           |
| "     | Scarborough, Scalby .....    | .91            | "      | Moynalty, Westland .....     | .82            |
| "     | Ingleby Greenhow .....       | 1.01           | "      | Athlone, Twyford .....       | .86            |
| "     | Mickleton.....               | .37            | XXII.  | Woodlawn .....               | 1.05           |
| X.    | Bardon Mill, Beltingham ...  | .31            | "      | Westport, St. Helens .....   | .83            |
| "     | Ilderton, Lilburn Cottage... | .99            | "      | Achill Island, Dugort .....  | 1.67           |
| "     | Keswick, The Bank .....      | .73            | "      | Mohill .....                 | 2.04           |
| XI.   | Llanfrechfa Grange.....      | .36            | XXIII. | Enniskillen, Portora .....   | 1.57           |
| "     | Treherbert, Tyn-y-waun ...   | .32            | "      | Dartrey [Cootehill].....     | .98            |
| "     | Carmarthen, The Friary.....  | .27            | "      | Warrenpoint, Manor House     | .86            |
| "     | Castle Malgwyn [Llechryd].   | .40            | "      | Banbridge, Milltown .....    | 1.16           |
| "     | Plynlimon.....               | 1.50           | "      | Belfast, Springfield .....   | 1.35           |
| "     | Crickhowell, Ffordlas .....  | 1.00           | "      | Glenarm Castle.....          | 1.27           |
| "     | New Radnor, Ednol .....      | .64            | "      | Londonderry, Creggan. Res.   | 1.20           |
| "     | Rhayader, Tyrmynydd .....    | .52            | "      | Killybegs .....              | 1.10           |
| "     | Lake Vyrnwy .....            | .45            | "      | Horn Head .....              | .89            |

## METEOROLOGICAL NOTES ON SEPTEMBER, 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 outstanding features of the month were the unusual dryness and brilliant sunshine records. The R was the lowest September amount in the 53 years' record, excepting only 1865 and 1898, when the amounts were .55 in. and .33 in. respectively. Of the total fall, .48 in. or 83 per cent. fell in 4 hours on 13th. Duration of sunshine, 124.8\* hours, and of R 6.7 hours. Mean temp. 57°.1, or 0°.7 below the average. Shade max. 76°.3 on 28th; min. 40°0 on 21st. F 0, f 0.

TEXTERDEN.—Nearly as dry as 1907 but not so warm, temp. only reaching 70° on 2 days. Duration of sunshine, 155.0† hours. Shade max. 72°0 on 28th; min. 38°5 on 21st. F 0, f 0.

TOTLAND BAY.—The driest September since 1895, when only .11 in. fell. Duration of sunshine 182.0\* hours, or 29.0 hours above the average. Shade max. 69°0 on 2nd; min. 40°9 on 21st. F 0, f 3.

PITSFORD.—R 1.91 in. below the average. Mean temp. 54°7. Shade max. 73°6 on 28th; min. 34°6 on 22nd. F 0.

NORTH CADBURY.—The lowest R in any month since observations began in 1896. Severe ground frost on 21st, killing dahlias on low ground. Flowers bloomed well, especially at end. Shade max. 76°5 on 28th; min. 34°5 on 21st. F 0, f 2.

ROSS.—After one of the wettest Augusts in 50 years, September was just the reverse, being much the same as in 1898 and 1900, when only .46 in. and .40 in. of R fell, respectively. Shade max. 71°8 on 2nd. F 0, f 1.

HODSOCK PRIORY.—The R was less than one-third of the fall of any of the previous 35 Septembers. Shade max. 72°1 on 28th; min. 35°3 on 22nd. F 0, f 1.

SOUTHPORT.—The driest September in the 40 years' record, and bar. pressure the highest in the same period. Duration of sunshine 134.0\* hours, and of R 15.5 hours. Mean temp. 54°6. Shade max. 66°2 on 28th; min. 38°7 on 17th. F 0, f 2.

HULL.—Fine throughout, with moderate amount of cloud, light winds and very little R. Shade max. 71°0 on 28th; min. 39°0 on 13th. F 0, f 0.

HAVERFORDWEST.—Fine, dry and warm; no gales and no sunless days. Crops, except potatoes, were good. Duration of sunshine, 150.5\* hours. Shade max. 66°8 on 1st.

LLANDUDNO.—Shade max. 69°5 on 28th; min. 43°5 on 21st. F 0, f 0.

MARCHMONT HOUSE.—Duration of sunshine, 122.6\* hours on 25 days. Shade max. 66°0 on 24th; min. 37°0 on 16th and 20th. F 0, f 1.

EDINBURGH.—Shade max. 64°1 on 24th and 27th; min. 37°8 on 20th. F 0, f 0.

COUPAR ANGUS.—An ideal month, with no frosts and no storms. Shade max. 69°5 on 9th; min. 35°0 on 20th. F 0, f 0.

FORT AUGUSTUS.—Shade max. 68°0 on 17th; min. 34°1 on 20th. F 0.

WATERFORD.—The driest September since 1865. Shade max. 70°0 on 1st; min. 39°0 on 24th and 30th. F 0.

DUBLIN.—The outstanding features were the high atmospheric pressure, the prevalence of N. winds to 25th, infrequent and moderate R, and an undue amount of cloud. Mean temp. 55°8. Shade max. 68°1 on 27th; min. 41°8 on 20th. F 0, f 0.

MARKREE.—Shade max. 67°3 on 9th; min. 33°9 on 30th. F 0, f 6.

WARRENPOINT.—Shade max. 70°0 on 5th; min. 45°0 on 19th and 21st. F 0, f 0.

*Erratum.*—In notes on August, 1910, at London, Camden Square, *read*, Mean temp. 61°8 or 0°5 below the average.

\* Campbell-Stokes.

† Jordan.

## Climatological Table for the British Empire, April, 1910.

| STATIONS.<br><br>(Those in italics are<br>South of the Equator.) | Absolute. |       |          |       | Average. |      |               |           | Absolute.       |                   | Total Rain     |       | Aver.<br>Cloud. |
|------------------------------------------------------------------|-----------|-------|----------|-------|----------|------|---------------|-----------|-----------------|-------------------|----------------|-------|-----------------|
|                                                                  | Maximum.  |       | Minimum. |       | Max.     | Min. | Dew<br>Point. | Humidity. | Max. in<br>Sun. | Min. on<br>Grass. | Depth.         | Days. |                 |
|                                                                  | Temp.     | Date. | Temp.    | Date. |          |      |               |           |                 |                   |                |       |                 |
| London, Camden Square                                            | 65·7      | 21    | 25·9     | 3     | 56·1     | 39·8 | 40·7          | 79        | 107·5           | 20·2              | inches<br>2·24 | 18    | 7·2             |
| Malta ... ..                                                     | 73·4      | 25    | 47·3     | 19    | 64·1     | 54·5 | 53·8          | 85        | 141·5           | ...               | ·84            | 5     | 4·9             |
| Lagos ... ..                                                     | 92·0      | 5     | 70·0     | 25    | 88·9     | 75·1 | 82·3          | 73        | 156·0           | 68·0              | 4·48           | 8     | 8·2             |
| Cape Town ... ..                                                 | 98·8      | 12    | 42·8     | 22    | 75·1     | 54·1 | 54·2          | 71        | ...             | ...               | 1·15           | 7     | 3·6             |
| Durban, Natal                                                    | ...       | ...   | ...      | ...   | ...      | ...  | ...           | ...       | ...             | ...               | ...            | ...   | ...             |
| Johannesburg ... ..                                              | 78·2      | 9     | 34·0     | 26    | 70·8     | 48·6 | 47·3          | 70        | 132·3           | 30·4              | ·42            | 5     | 1·4             |
| Mauritius ... ..                                                 | 85·3      | 11    | 65·1     | 8     | 81·6     | 70·6 | 68·6          | 80        | 154·9           | 57·9              | 3·70           | 23    | 6·1             |
| Calcutta... ..                                                   | 104·8     | 10    | 69·2     | 16    | 96·6     | 75·7 | 72·2          | 68        | ...             | 65·5              | 1·22           | 3     | 2·4             |
| Bombay... ..                                                     | 92·6      | 22    | 74·9     | 12    | 90·2     | 77·2 | 72·9          | 73        | 135·0           | 69·2              | ·00            | 0     | 1·2             |
| Madras ... ..                                                    | 101·7     | 24    | 71·1     | 7     | 94·8     | 78·2 | 75·0          | 76        | 143·4           | 68·0              | ·04            | 1     | 2·6             |
| Kodaikanal ... ..                                                | 75·4      | 1     | 52·2     | 6     | 69·5     | 54·6 | 45·6          | 57        | 135·6           | 40·9              | 4·10           | 10    | 3·3             |
| Colombo, Ceylon                                                  | 90·4      | 14    | 69·4     | 2     | 88·5     | 76·3 | 74·6          | 79        | 156·8           | 69·0              | 4·71           | 13    | 5·5             |
| Hongkong ... ..                                                  | 84·4      | 18    | 59·0     | 12    | 73·9     | 66·1 | 64·4          | 82        | 132·9           | ...               | 3·73           | 8     | 8·0             |
| Melbourne ... ..                                                 | 84·8      | 25    | 43·2     | 17    | 69·8     | 51·5 | 47·7          | 63        | 137·0           | 39·1              | ·93            | 14    | 4·9             |
| Adelaide ... ..                                                  | 88·0      | 6     | 44·0     | 27    | 75·3     | 53·2 | 48·9          | 57        | 152·6           | 34·3              | ·06            | 3     | 2·8             |
| Coolgardie ... ..                                                | 95·0      | 7     | 40·9     | 29    | 80·8     | 54·3 | 46·4          | 47        | 154·0           | 33·4              | ·07            | 1     | 2·1             |
| Perth ... ..                                                     | 99·7      | 9     | 46·9     | 29    | 78·9     | 59·7 | 53·3          | 57        | 146·1           | 38·5              | ·90            | 8     | 4·4             |
| Sydney ... ..                                                    | 79·7      | 26    | 50·9     | 28    | 71·9     | 58·0 | 56·7          | 78        | 133·8           | 41·2              | 2·91           | 24    | 4·7             |
| Wellington ... ..                                                | 66·9      | 9     | 44·8     | 18    | 61·3     | 50·8 | 46·4          | 70        | 118·0           | 35·0              | 1·88           | 11    | 4·5             |
| Auckland ... ..                                                  | 72·5      | 18    | 43·5     | 28    | 65·7     | 53·3 | 55·2          | 88        | 142·0           | 38·0              | 2·02           | 17    | 5·1             |
| Jamaica, Kingston                                                | 91·0      | 28    | 64·0     | 1     | 87·0     | 68·8 | 66·0          | 70        | ...             | ...               | 1·53           | 2     | 3·5             |
| Grenada ... ..                                                   | 86·6      | 24*   | 69·0     | 1, 9  | 83·3     | 72·8 | 68·9          | 73        | 140·0           | ...               | 2·90           | 15    | 5·0             |
| Toronto ... ..                                                   | 74·0      | 14    | 27·0     | 12    | 55·3     | 38·4 | ...           | ...       | 89·8            | 19·6              | 5·01           | 15    | ...             |
| Fredericton ... ..                                               | 44·0      | 28    | -25·0    | 25    | 27·2     | 6·3  | ...           | 87        | ...             | ...               | 3·50           | 8     | 6·0             |
| St. John's, N.B.                                                 | 66·5      | 25    | 25·7     | 29    | 49·9     | 37·7 | ...           | 78        | ...             | ...               | 7·36           | 17    | 6·6             |
| Victoria, B.C. ...                                               | 68·7      | 23    | 32·2     | 14†   | 55·0     | 40·2 | ...           | 72        | ...             | ...               | 1·69           | 12    | 7·0             |
| Dawson ... ..                                                    | 52·0      | 30    | -12·0    | 10    | 38·9     | 12·5 | ...           | ...       | ...             | ...               | 1·68           | 9     | 5·9             |

\* and 25, 26, 27. † and 17.

MALTA.—Mean temp. of air 58°·9. Average bright sunshine 8·4 hours per day.

Johannesburg.—Bright sunshine 277 hours.

Mauritius.—Mean temp. of air 0°·1, of dew point 0°·2, and R 2·44 in., below averages. Mean hourly velocity of wind 9·4 miles, or 1·1 below average.

KODAIKANAL.—Bright sunshine 233 hours. TSS on 14 days.

COLOMBO.—Mean temp. of air 80°·5, or 2°·1 below, of dew point 0°·1 above, and R 5·42 in. below, averages. Mean hourly velocity of wind 5·5 miles. TS on the 1st.

HONGKONG.—Mean temp. of air 69°·6. Bright sunshine 135·2 hours, or 31 hours above, and R 2·10 in. below, averages. Mean hourly velocity of wind 14·1 miles.

Melbourne.—Mean temp. of air 1°·1 above, and R 1·44 in. below, averages.

Adelaide.—Mean temp. normal. The driest April on record.

Coolgardie.—Rainfall ·61 in. below average.

Perth.—Rainfall ·46 in. below average. The max. temp. on 9th was a record one.

Sydney.—Mean temp. of air 0°·4 above, and R 2·36 in. below, averages.

Wellington.—Mean temp. of air 4°·2 below, and R 2·23 in. below, averages. Bright sunshine 200 hours.

# Symons's Meteorological Magazine.

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No. 538.

NOVEMBER, 1910.

VOL. XLV.

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## METEOROLOGY AT THE INTERNATIONAL AMERICAN SCIENTIFIC CONGRESS, BUENOS AIRES, JULY, 1910.

By R. C. MOSSMAN, F.R.S.E.

A HIGHLY successful scientific Congress was held at Buenos Aires, from the 10th to the 25th of July, under the auspices of the Argentine Scientific Society. A large number of foreign delegates were present, from Europe, the United States, and South American republics. Great Britain was officially represented by Admiral Field, F.R.S., who delivered an interesting and much appreciated address on recent advances in Hydrography, before the section devoted to Naval Science, over the meetings of which he several times presided. Several papers of Meteorological interest were read, of which the following is a short resumé.

Mr. W. G. Davis, Director of the Argentine Meteorological Office, gave a description of the work carried on under his superintendence. The meteorological service in the Argentine Republic was established in the year 1872, under the direction of Dr. B. A. Gould, the American astronomer, who came to this country in 1870, to establish the National Astronomical Observatory. After two years residence Dr. Gould was impressed with the necessity of obtaining meteorological data from as many points as possible throughout the Republic, as up to that time the climatology of the southern part, or, in fact, of the whole of South America, was very little known. During the the first years of the organization of this office, observations were made of the temperature, barometric pressure, direction and velocity of the wind, and the rainfall at a limited number of stations; the work being conducted on these lines up to the time of Dr. Gould's retirement in the year 1884. The results of these observations were published in four volumes, giving data from some 20 stations, so distributed as to give a general knowledge of the climatology throughout the Republic.

On the retirement of Dr. Gould the direction of the office passed to the present Director. Up the end of the year 1900 the service was carried on in the same conditions as when under Dr. Gould's direction. The number of stations at that time, that is up to the year 1900, was 40 stations of the first class where the principal



atmospheric elements were observed, and 165 rain stations. In the year 1901 the Government decreed the organization of the daily weather map, and on the 1st January of the year 1902 the first weather map was published, compiled from the 2 p.m. observations. In the month of September of the same year the hour was changed to 7 a.m., and on the 1st January, 1904, to 8 a.m. Since September, 1904, two maps are made, one from the 8 a.m. observations, and the other from those taken at 8 p.m., but until July 1st, 1910, only the former was published. From the evening observations a synopsis of the weather is made, which is given to the papers to be published in their morning editions. The forecasts are made from the morning observations for the 36 hours following, and any changes resulting from the variations during the day from the morning forecasts are noted in the evening synopsis.

At the present time the meteorological service consists of 32 first class stations, equipped with automatically registering instruments; 148 second class stations, where observations are made at 8 a.m., 2 p.m., and 8 p.m.; 10 third class stations; and 862 fourth class stations. All of these are within the limits of this Republic and of Paraguay. From Brazil observations at 12 stations are received, from Chile 10, and from Uruguay 6. Thus the daily weather map shows the meteorological conditions reigning from Para (Brazil) situated on the equator, to the southernmost limits of this Republic, extending over a region of 55° latitude, data being now received by wireless telegraphy from New Year's Island and Ushuaia in 55° S. latitude. The number of maps printed daily exceeds 1900 and is rapidly increasing. The two central offices where comparisons of instruments are made, and where special meteorological observations are carried on, are at Córdoba and at Chacarita, the latter on the outskirts of Buenos Aires. At the South Orkney station in latitude 61° south, there is a fully equipped meteorological and magnetic station, occupied by a special commission sent every year during the month of January or February, the only season when a vessel can reach the station, as during the remaining months of the year it is icebound.

In the year 1903 the Hydrometric service of the office was started with the object of installing river-gauges on all the principal streams and lake outlets throughout the Republic, to aid the special studies for determining the practicability of irrigation of the contiguous lands, as well as for the determination of the hydraulic power that can be developed from the water supply. At the present time there are 111 river-gauges installed at which daily observations are made. The depths of the water at the principal ports and shallow passes of the navigable rivers are published in the daily weather map, and timely warning is given of the approach of freshets in the rivers where damage is liable to be caused.

In the year 1904 the Magnetic Service was founded, with the central office at Pilar, Province of Córdoba, the office being also

equipped with the necessary instruments for the observation of sun spots and sprectoscopic observations of the corona, as well as for other studies of a like nature. Determinations of the three principal magnetic elements have been made throughout the country, and in the year 1908 the results of these observations were made known in the publication of an Isogonic Chart. At the present time there is a trained staff of assistants employed in making still further detailed studies of the magnetic variations in the remotest confines of the Republic.

The Office has under its charge the printing for all the departments of the Ministry of Agriculture, employing from 60 to 120 hands. A large number of these are skilled workmen employed in the lithographic department, for the establishment does the typographical and lithographic work connected with the entire publications of the Ministry. The total number of employees, as shown by the pay-sheet, is 350. Of these, 101 compose the Staff of the Central and Sub-Offices. The Rain Observers are all unpaid.

From the foregoing it will be seen that the Meteorological Office embraces not only the meteorological work of the country, but also the Magnetic and Hydrometric Services, to which must be added a Seismological Service, which, at the present time, is confined to the stations of Pilar and Chacarita, but will shortly embrace a line of stations from Salta to Santa Cruz, along what is practically the whole extent—from north to south—of the Argentine Republic.

Mr. Davis also read papers on "Temperatures of the Argentine Republic compared with those of the other countries of the world," and "The Climate of the Argentine Republic and the basin of the River Plate." In the former paper he divided the Argentine Republic into seven zones, according to their mean annual temperature, and showed the areas covered by similar zones around the globe. Between isotherms drawn around the globe he shaded regions having the same annual rainfall, and discussed the general climatic features of these regions in their bearing on agricultural subjects. In the second paper he gave a resumé of the principal results of his recently published work on the "Climate of the Argentine Republic."

Mr. Henry Helm Clayton read a paper on "A New Method of Forecasting the Weather," in which he showed that the ordinary oscillations of temperature may be separated by harmonic analysis into waves of different lengths, that is with different intervals of time between maxima and minima. When this is done it is found that the short waves, that is those with a short interval between maxima, progress rapidly from the pole to the equator, while longer waves progress more slowly. He showed that oscillations of temperature with a wave length of about two days progressed from Punta Arenas to Rio de Janeiro in about three days, while waves of five days took twice as long, and waves of nine days three times as long. In other words the rate of progress of the different waves was in proportion to their wave length. Short waves travel rapidly, and long waves

slowly. Further analysis showed that waves with an interval of thirty days or more between the maxima progressed in an opposite direction to the shorter waves. That is, they moved from the equator toward the polar regions. Since these waves move slowly, it is possible to anticipate their coming for the southern stations of Argentina by two or three weeks, and it is possible that forecasts of the prolonged periods, or spells of similar weather which these waves cause, may be of greater service to commerce, to agriculture and to ordinary intercourse than the more rapid weather changes.

Mr. Clayton also read a paper on the "Exploration of the Air with Kites and Balloons," in which he briefly described the recent knowledge obtained by means of researches in the upper air. He said that so far all, or nearly all of the observations had been made in the northern hemisphere, but that research work of this kind was about to be established in the Argentine Republic by Mr. Davis.

A paper on the "Cyclones and Anticyclones of South America," was communicated by Mr. Herbert Solyam, Chief of the Weather Forecast Division of the Argentine Meteorological Office, in the course of which he remarked that the paths followed by cyclones and anticyclones in southern South America are determined, primarily by the positions and variations of six permanent barometric "centres of action," *i.e.*, the Atlantic and Pacific highs, central in latitude  $30^{\circ}$  in their respective oceans; the Weddell and Bellingshausen lows, in about latitude  $55^{\circ}$  in the seas of corresponding name; the Brazilian low over central Brazil and the Graham's Land high, probably a lobe of the Antarctic high. The three northern centres are much more pronounced than the three southern ones. Another controlling factor is the Andean mountain chain which, between the equator and latitude  $55^{\circ}$  S. presents only one gap of dimensions sufficient to facilitate the transit of atmospheric disturbances. This gap lies about latitude  $40^{\circ}$  S.

The cyclones which reach the continent from the Pacific travel mostly in high latitudes. A few cross directly over the mountains, others move north-east to the gap above mentioned, traverse central Argentina, turn to the south-east and move with the winds of the Atlantic high toward South Georgia. The majority, however, travel over, or to the south of Terra del Fuego, moving slightly north of east till in the neighbourhood of the Falklands, then turn south-east toward the Weddell sea low. Other cyclones are formed apparently by the detachment of portions of the southern lobe of the Brazilian low. They travel south or south-east. Still others develop in central Argentina during the passage of a high latitude cyclone. They travel north-east to the valley of the Paraná and then turn south-east toward the Weddell sea.

Most of the anticyclones are offshoots of the Pacific high, and travel almost due east across the continent, uniting later with the Atlantic high. Other highs, of brief duration and uncertain path, originate over the Argentine provinces. Still others, suspected of

being only extensions of the Atlantic high, appear on the Brazilian or Uruguayan coast, remain almost stationary for a while and then disappear. Lastly highs appear, not infrequently in the extreme south, being probably offshoots of the Antarctic anticyclone. They travel north or north-east over Patagonia, and finally either blend with the Atlantic high or turn south-east in about latitude  $35^{\circ}$  S., and move toward South Georgia.

The west coast rains occur mostly in the east, or south-east, quadrant of a low pressure area; those of the east coast in the southern or south-western quadrant of a low or, quite frequently, as a fringe along the advancing edge of a high moving north-east. The north of Chile and the central west of Argentina are thus left almost rainless.

Mr. R. C. Mossman read a paper on the Meteorology of South America in relation to Antarctic conditions. In this paper the interrelations between Antarctic conditions and the temperature and rainfall over South America, south of the tropic of Capricorn, are discussed by seasons for the eight years 1902-1909.

Data for the Antarctic were obtained from various expeditions that have explored the region during the last ten years, and especially from the observations taken at the Argentine Meteorological Station on the South Orkneys, since March, 1903. It is shown that, as regards temperature, the influence of Antarctic conditions extends along the Atlantic coast of South America as far as latitude  $35^{\circ}$  S. This relation was most marked in winter and summer, was also present in autumn, but was hardly noticeable in the spring months.

Generally speaking, when there is little ice in the south, the winter rainfall over the greater part of the Argentine Republic is below the average; when there is much ice it is above the average. The cause of this is that the track of cyclonic storms, in their movements from west to east, varies with the position of the ice-belt. When the ice is far north the track of the storms is also far north, and when the ice is south then the storm track is also south.

In cold winters at the South Orkneys, which are always associated with a northern extension of the pack, the weather map of the Oficina Meteorologica Argentina shows that the storm centres, instead of following the usual route to the south of Cape Horn, are deflected northward, reaching the coast of Chile between the parallels of  $38^{\circ}$  and  $45^{\circ}$  S. These storms produce heavy rains on the Chilean littoral, and to a less degree on the adjoining Argentine provinces on the eastern slope of the Andes, extending even as far as to the Atlantic coast.

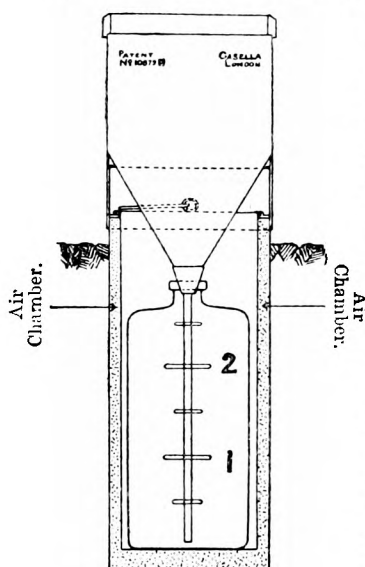
In open seasons, as in 1903, 1908 and 1909, when there was little ice in the south, the tracks of the storms were also far to the south, and a drought prevailed very generally on the coast of Chile, between  $35^{\circ}$  and  $40^{\circ}$  S., and also over the Argentine Republic. It is shown that the height of the Rio Negro reflects the southern conditions, because the depth of water of the Paso de Pizarro, and the tempera-

ture at the South Orkneys vary inversely, the probability amounting to 86 per cent.

Other intimate correlations are also shown to exist between South American weather and Antarctic conditions, depending on the position of two atmospheric "Centres of Action" situated in the South Atlantic and South Pacific, about the latitude of the Antarctic circle.

### CASELLA'S INSULATED RAIN GAUGE.

For all ordinary rainfall observations the Snowdon pattern rain gauge is the most accurate, convenient and economical form of instrument to employ. When showers fall in very hot weather there is, as in all other rain gauges, a slight tendency to loss by evaporation, and in very cold weather there is a tendency to allow the contents to freeze, which is an inconvenience, even if the bottle or containing vessel is not damaged. We have always felt, and have urged upon instrument makers, the importance of having a rain gauge so constructed as to resist change of temperature. We have suggested the use of a section of a large bamboo, or a papier-maché cylinder, or some other light and water-tight material for the outer casing of a gauge, the funnel of which must, of course, be metal; but instrument makers are very conservative, and do not care to handle unfamiliar materials. Messrs. Casella & Co. have, however, succeeded in showing that the ordinary metal rain gauge may be effectively insulated so as to resist evaporation and greatly retard freezing. The arrangement is absurdly simple. A narrow ledge projects round the mouth of the outer cylinder on the inside, and the inner can is



CASELLA'S INSULATED  
RAIN GAUGE.

made a little shorter and narrower than the outer with a flange round the top, which rests upon the ledge of the outer cylinder. The inner can thus hangs free, and is separated by an air space from all other contact with the outer walls. The ordinary bottle placed in the inner can interposes an additional non-conducting layer between the atmosphere and the collected rain.

At our suggestion Messrs. Casella & Co. carried out a series of experiments with the following results, using a felt-insulated gauge as well as the air-insulated and ordinary pattern both in copper and galvanised iron. The four experimental gauges were charged with water at the temperature of the air, about  $49^{\circ}$  F., and were then immersed in a bath containing a freezing mixture at about  $-3^{\circ}$  F.

The temperature of the water in the gauges after the lapse of various intervals of time is given in the following table, which shows that after 54 minutes the water in the ordinary rain gauges had fallen to the freezing point ; after the lapse of 115 minutes the temperature in the felt-protected gauge was still 42°, having lost only 6° in nearly two hours, while that in the air-insulated gauge was 38°, a total loss of 11°, and still 41° above the outside temperature.

TABLE I.—*Experiment with Freezing Mixture.*

Temperature of Water in Gauge at beginning about 49° F. ;  
of Freezing Mixture —3° F.

|                     | After<br>2<br>mins. | After<br>5<br>mins. | After<br>12<br>mins. | After<br>22<br>mins. | After<br>35<br>mins. | After<br>30<br>mins. | After<br>54<br>mins. | After<br>75<br>mins. | After<br>115<br>mins. |
|---------------------|---------------------|---------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|-----------------------|
| Insulated Copper    |                     |                     |                      |                      |                      |                      |                      |                      |                       |
| (felt)              | 48°                 | 48°                 | 47°                  | 45°                  | 45°                  | 45°                  | 43°                  | 42°                  | 42°                   |
| „ Iron (air).       | 47°                 | 46°                 | 45°                  | 44°                  | 43°                  | 43°                  | 41°                  | 39°                  | 38°                   |
| Ordinary Copper ... | 43°                 | 40°                 | 37°                  | 34°                  | 33°                  | 33°                  | 32°                  | —                    | —                     |
| „ Iron .....        | 44°                 | 41°                 | 38°                  | 35°                  | 34°                  | 34°                  | 32°                  | —                    | —                     |

A second experiment with 1 lb. of hot water in the rain gauges and the temperature of the external air about 50° F. gave the following differences in the rate of cooling between the two gauges.

| After<br>hrs. | mins. |       | Galvanized<br>Iron,<br>F. |       | Galvanized Iron,<br>Air-Insulated,<br>F. |
|---------------|-------|-------|---------------------------|-------|------------------------------------------|
| 0             | 0     | ..... | 141°                      | ..... | 141°                                     |
| 0             | 20    | ..... | 125°                      | ..... | 138°                                     |
| 0             | 38    | ..... | 104°                      | ..... | 124°                                     |
| 1             | 46    | ..... | 75°                       | ..... | 95°                                      |
| 2             | 16    | ..... | 68°                       | ..... | 88°                                      |
| 2             | 41    | ..... | 64°                       | ..... | 79°                                      |

Here after 38 minutes the temperature of the water in the air-insulated gauge was 20° higher than that in the ordinary pattern, and after 2 hours 41 minutes it was 15° degrees higher, showing that the insulation exercised a very substantial influence in retarding change of temperature.

We have used a copper air-insulated rain gauge for more than a year at Camden Square for taking a weekly record, which is a much more severe test than a daily record. The result was to show that when the insulated gauge was in use the individual weekly readings came considerably nearer the sum of the daily readings for the week taken by a gauge placed close by, than was the case in earlier years when an ordinary Snowdon gauge was used for the weekly record. The difference, though occasionally quite pronounced, was never so great as to cast any doubt on the substantial accuracy of the standard pattern ; though we believe for gauges read once a month the insulation would prove a distinct advantage.

## THE WEATHER OF OCTOBER.

By FRED. J. BRODIE.

ONE of the most striking features in the weather of last month was the almost entire absence, over a large portion of England, of sharp touches of cold, such as are commonly experienced at some time during the mid-autumn season. In London, where the thermometer failed to sink below  $44^{\circ}$ , and probably in many other parts of our eastern, midland and southern counties the absolute minimum screen temperature of the month was the highest recorded in October for at least 40 years past. Even on the surface of the ground the exposed thermometer in central London (at Westminster) did not once fall as low as the freezing point. At Kew and Greenwich, and in many rural districts, slight ground frosts were experienced on the mornings of the 21st and 23rd, but over England as a whole there was, throughout the month, no nocturnal cold of sufficient severity to cause any material damage to vegetation.

At the beginning of October the weather was influenced rather seriously by a "V-shaped" depression (acting as secondary to a large Icelandic disturbance) which moved rapidly north-eastward across England between the 2nd and 3rd. The winds accompanying the progress of such systems are usually of no great strength, but on this occasion a violent gale from south-west and west blew all along the south coast, and a strong gale from north-west in the Irish Sea and the north of Ireland. The southerly current in the front of the disturbance was unusually warm, the thermometer on the 2nd rising to  $70^{\circ}$  and upwards in many parts of England, and touching  $74^{\circ}$  at Cromer. As the depression passed away to northern Europe, a large anticyclone extended north-eastward from the Atlantic, and for nearly a week the weather over the United Kingdom was fine and dry. Temperature remained at a fairly high level, but the nights became rather cool, and between the 4th and 7th a slight ground frost was experienced at many northern stations, the exposed thermometer falling to  $29^{\circ}$  at West Linton and to  $30^{\circ}$  at Crathes and Newton Rigg. On the 10th and 11th, when another "V-shaped" depression advanced eastwards across the United Kingdom, a warm air again spread up from the southward, the thermometer rising above  $65^{\circ}$  in several parts of England, and touching  $69^{\circ}$  at Greenwich and at Geldeston, near Beccles. Between the 12th and 15th the weather in all the more northern districts was influenced by a large anticyclone which drifted over from the north-westward, and, with a clear sky, sharp night frosts were experienced in many places. Between the nights of the 13th and 15th the sheltered thermometer fell below  $32^{\circ}$  in several parts of northern and central Scotland, and reached  $29^{\circ}$  at Wick and Balmoral, while on the surface of the grass a slight frost was reported also in the northern parts of England and Ireland. On the 16th, however, the anticyclone passed away to the continent and in the course of the next two days, when a couple of cyclonic disturbances moved eastward



# THAMES VALLEY RAINFALL — OCTOBER, 1910.



**ALTITUDE SCALE**

|                |                 |                  |                 |
|----------------|-----------------|------------------|-----------------|
| Below 250 feet | 250 to 500 feet | 500 to 1000 feet | Above 1000 feet |
|----------------|-----------------|------------------|-----------------|

**SCALE OF MILES**





across the United Kingdom, a mild air from between south and west set in, the thermometer rising slightly above  $60^{\circ}$  in many places. In the rear of the second depression, the wind shifted to the northward, and temperature fell decidedly, a sharp ground frost being experienced on the night of the 19th in the west of Scotland and the north west of England. After the 21st the weather in all but the south-western districts was influenced by a large anticyclone whose central portion lay over Scandinavia, the wind blowing generally from east or south-east. The days were cloudy and fairly mild, but night frosts were experienced at some time or another in all but the most southern districts. In the extreme south-western parts of the country, and later on in all southern localities, the conditions were affected by a large barometrical depression which extended very gradually from the Atlantic over the Bay of Biscay and France, and caused heavy rain in Cornwall and the Channel Islands. The closing days of the month witnessed two rapid changes in pressure, caused by the successive movements from the Icelandic region of an anticyclone, followed immediately by a deep cyclonic disturbance. The brisk southerly extension of the latter system on the 31st was accompanied by a heavy fall of rain in all our more western and northern districts, and by strong gales from the westward over nearly the entire kingdom.

The mean temperature of the month was above the average in all districts, the excess being greatest (about four and a half degrees) in the east and south-east of England. Bright sunshine was generally rather deficient, but was slightly in excess of the normal in the Hebrides. At Westminster the total duration, 54 hours, was 15 below the average, and was the smallest recorded in October since 1902.

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## THE TEMPERATURE OF OCTOBER, 1910, IN LONDON.

THE mild nature which the present autumn has so far exhibited having given occasion for an examination of the conditions in previous years, we have been interested to observe that the last few years have produced in London a succession of mild Octobers, to which the half-century of observations at Camden Square can show nothing approaching a parallel. With two exceptions, in 1899 and 1905, the last fourteen Octobers all had a mean temperature in excess of the average, which for the 50 years is exactly  $50^{\circ}0$ . The average temperature for October during these 14 years amounted to  $51^{\circ}6$ , or  $1^{\circ}6$  in excess, and 6 Octobers out of the 14 had a mean temperature more than  $3^{\circ}0$  in excess, a feature all the more noteworthy from the fact that in the previous 39 years so great an excess had been observed in three years only.

October, 1910, proved no exception to the run of mild seasons, the mean temperature for the month being  $53^{\circ}8$ , or  $3^{\circ}8$  above the average, and the highest with four exceptions in the whole period. The feature of the month, which was most abnormal, was the

prevalence of high minima and the complete absence of the early autumn ground frost which October so rarely escapes. The mean shade minimum temperature for the month,  $48^{\circ}\cdot3$ , was above the average by  $4^{\circ}\cdot7$ , having been exceeded once only ( $49^{\circ}\cdot0$  in 1898), and the mean grass minimum was  $42^{\circ}\cdot8$ , or  $3^{\circ}\cdot5$  above the average; this has been six times higher in previous years. The lowest readings recorded during the month were  $41^{\circ}\cdot6$  in the shade and  $35^{\circ}\cdot3$  on the grass, being respectively  $9^{\circ}\cdot6$  and  $8^{\circ}\cdot2$  above the average. Both these figures stand without precedent in our long record as the highest absolute minimum temperatures recorded during the month of October. The maximum temperatures, although less noteworthy than the minimum, were worthy of remark, the mean,  $60^{\circ}\cdot6$ , being  $3^{\circ}\cdot0$  above the average, and ranking fourth in order of magnitude since 1858. The lowest maximum recorded was  $52^{\circ}\cdot2$ , or  $4^{\circ}\cdot4$  above the average lowest, and this has been excelled on only four occasions.

## INTERNATIONAL BALLOON ASCENTS, IN MAY, 1908.

By W. H. DINES, F.R.S.

*May 7th, 1908.*

| Starting Point.          | Country.     | A<br>miles. | B<br>° F. | C<br>miles. | D<br>° F. | E<br>miles. | F        |
|--------------------------|--------------|-------------|-----------|-------------|-----------|-------------|----------|
| Uccle .....              | Belgium .... | 6·4         | —65       | 11·9        | —62       | 51          | E.S.E.   |
| Lindenberg....           | Germany .... | 6·4         | —71       | 9·1         | —60       | 34          | N.N.E.   |
| Trappes .....            | France ..... | 6·4         | —62       | 10·2        | —66       | 62          | E.S.E.   |
| Munich.....              | Germany....  | ?           | —67       | 11·5        | ?         | 94          | S. by E. |
| Pavia.....               | Italy.....   | 6·4         | —58       | 7·0         | —60       | 41          | S.E.     |
| Pavlovsk.....            | Russia ..... | 5·6         | —63       | 7·5         | —51       | 72          | S.E.     |
| Nigin Oltschedaëff ..... |              | 6·0         | —60       | ?           | ?         | 30          | N.E.     |

A=Height in miles of commencement of isothermal column.

B=Temperature, F°, at bottom of column.

C=Greatest height of reliable record in miles.

D=Temperature, F°, at greatest height.

E=Distance in miles of point where balloon fell.

F=Bearing of falling point from starting point.

None of the English balloons were found, a somewhat unusual occurrence. The temperatures are very uniform, and a little below the average, but the height of the isothermal column is well below the average. The general drift of the atmosphere was towards the east and south-east.

A region of low pressure stretched from the North to the Black Sea, with higher pressures both to the north and south.

## HEAVY RAINFALL IN BARBADOS.

THE following details are taken from an interesting note on the exceptional rainfall of May, 1910, in Barbados. The total rainfall in St. Peters, St. Josephs and St. James, was nearly 20 inches, and in Christ Church and St. Philip, St. John, St. George and St. Michael varied from 10 to 12 inches. St. Nicholas is in the north of Barbados, and is about 600 feet above sea level; Ebworth is two or three miles to the east and is 200 to 300 feet lower down.

*Rainfall, May, 1910.*

| <i>St. Nicholas.</i> |      |        |        | <i>Ebworth.</i> |      |        |        |
|----------------------|------|--------|--------|-----------------|------|--------|--------|
|                      | in.  |        | in.    |                 | in.  |        | in.    |
| May 1                | ·07  | May 20 | ·18    | May 2           | ·13  | May 22 | 2·84   |
| „ 3                  | ·67  | „ 21   | ·10    | „ 3             | 1·12 | „ 23   | 5·13   |
| „ 5                  | ·04  | „ 22   | 5·48   | „ 6             | ·14  | „ 24   | 4·51   |
| „ 6                  | ·13  | „ 23   | 1·86   | „ 7             | ·12  | „ 25   | 3·02   |
| „ 7                  | ·10  | „ 24   | 3·40   | „ 8             | ·05  | „ 26   | ·16    |
| „ 8                  | ·03  | „ 25   | ·89    | „ 10            | ·16  | „ 27   | ·80    |
| „ 11                 | ·10  | „ 26   | ·10    | „ 12            | 1·17 | „ 28   | ·38    |
| „ 12                 | ·54  | „ 27   | 1·00   | „ 14            | 2·82 | „ 29   | ·83    |
| „ 13                 | ·10  | „ 28   | ·28    | „ 17            | 1·02 | „ 30   | } 1·83 |
| „ 14                 | 2·99 | „ 29   | ·81    | „ 20            | ·50  | „ 31   |        |
| „ 15                 | ·30  | „ 30   | } 1·46 | „ 21            | ·18  |        |        |
| „ 17                 | ·53  | „ 31   |        |                 |      |        |        |
| „ 18                 | ·18  |        |        |                 |      | Total  | 26·91  |
| „ 19                 | ·12  | Total  | 21·46  |                 |      |        |        |

**WATERSHEDS WITH AN EXAMPLE.**

EVERY now and then one reads in the newspapers of a house which lies in two counties, or two wards, giving rise to some trouble in settling the district in which the inhabitant should vote or pay rates; and such references are useful in impressing on the mind the sharpness of the dividing line between large areas, the “imaginary line” of bye-gone schooldays when the diagrams of the book rather than the definitions of the mathematicians gave the schoolmaster the crude materialistic conception from which he tried to escape by an appeal to imagination. Maps as a rule show the artificial boundaries, counties, parishes and the like, according to scale, with greater clearness than the fundamental natural dividing lines which separate the slopes dipping to different valleys, and it may be to different seas. It is unfortunate that the term *watershed* is used in two senses; the geographer rightly employs it as meaning the line which sheds the water to one side and the other, as a Scots lassie “sheds her hair” with a comb; but engineers usually mean by watershed the whole area of land draining to a particular point. It is not uncommon to use the neutral phrase *water-parting* or *divide*, in which there is no ambiguity; but we must confess to a liking for the old word in its true meaning, the English *watershed* exactly equivalent to the German *Wasserscheide*.

When seeking for the most appropriate divisions of a country for the purpose of grouping the rain gauges we have been confronted with the choice between the natural division into drainage areas or river basins bounded by watersheds, and the artificial but familiar division into counties. County boundaries are marked clearly on all maps; but few people realize how greatly the representation of these lines varies on maps of different date and scale, nor how difficult it is in some cases to arrive at a really authoritative settlement. We know several rainfall observers who give the name of their county as that in which they believe they ought to be included, though they

know that the best maps place them in another county, and they reluctantly confess, on pressure being applied, that they pay rates to the county of the map not to that of their choice. But when it comes to watersheds it is surprising how few people know or care where the stream by the side of the road on a rainy day is running to when it vanishes through a grating in the gutter ; and when one turns to the map, though the towns and villages of the riverside and the lower slopes can be allocated at a glance, there is no guide as to how the solitary farmhouses on the Downs or the moorlands are to be placed. Even with an Ordnance Survey map on the scale of 6 inches to a mile it is often extremely difficult to draw the line which separates the waters. It is never a straight line, it is not always the

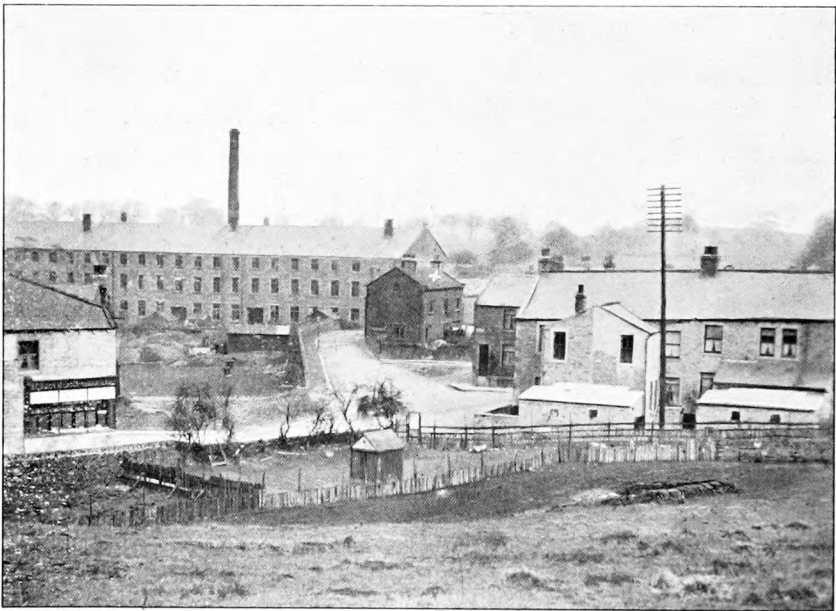


FIG. 1.—GENERAL VIEW FROM SOUTH. MR. J. WIDDUP'S HOUSE MARKED WITH A CROSS.

line following the highest ground, and the larger the scale of the map the more difficult is it to say in which direction a given plot of land near the watershed really drains. It cannot always be determined precisely even by an inspection of the ground.

Our attention has been specially called to watersheds lately by making an attempt to divide counties for rainfall purposes into drainage areas, so that each division would apply to one river only, and the parts of the same river basin in various counties could be easily picked out. Whether we succeed in this scheme or not the investigation has been full of interest, and in the course of it we have come across some instances of houses standing astride of watersheds so that the ridge of the roof is itself a true watershed, the rain



FIG. 2.—MR. J. WIDDUP'S HOUSE AT BARNOLDSWICK.  
SOUTH-WEST GABLE END.

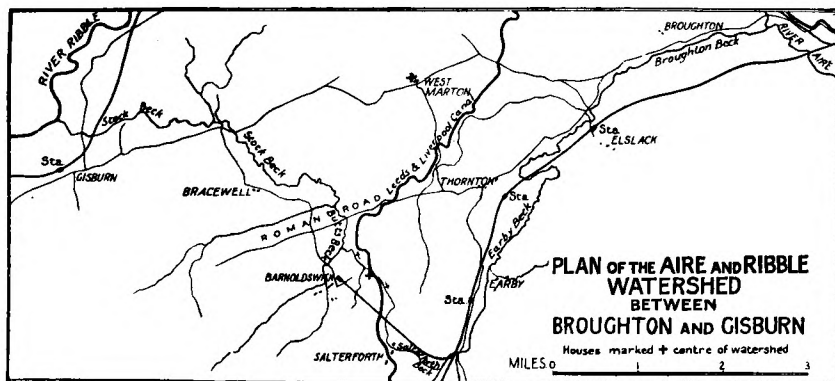


FIG. 3.

falling on one side of the roof running off to one river and that falling on the other side to another. A raindrop alighting on the actual ridge and broken up by the shock may send one half of its substance to the Irish Sea and the other half to what used to be called the German Ocean.

For full particulars of the most interesting of these cases I am indebted to the kindness of the Rev. Arthur Shipham, lately of Barnoldswick, and of his son, Mr. Shipham, who took the photographs which we reproduce. The house in Barnoldswick occupied by Mr. John Widdup is shown in the middle of the photograph (fig. 1) which is taken looking north, the gable of the house is seen, and the slope of the roof on the right which faces the east is marked with a white cross. It will be seen from the picture that the ground, though



FIG. 4.—CONTOUR MAP OF THE BARNOLDSWICK DISTRICT. THE DARKEST TINTING INDICATES THE LOWEST ALTITUDE. THE WHITE LINES DENOTE ROADS AND RIVERS.

nearly level, slopes from the house both to the east and to the west, so that the ridge on the roof is a true watershed, and the water which falls on the eastern slope would naturally flow to the Aire and the North Sea, while that which falls on the western slope would naturally flow to the Ribble and the Irish Sea. The larger scale photograph of the gable (fig. 2) shows that the water from the western side is conducted by the pipe on the left-hand side to the drain which carries it to the Ribble; but that the pipe on the right-hand side, receiving the water which falls on the eastern slope of the roof, is bent sharply to the left and diverts the water to the Ribble also. Only when the down-pipes are choked and the gutters overflow can the natural action of the ridge watershed assert itself; but this

does not affect the interesting position of the roof. The sketch-map shows the streams which rise nearest the house we have been describing, and the shaded map, which is a photograph of a contoured model of the district built up of cardboard layers by Mr. A. G. Petty, B.Sc., of Skipton, gives a graphic representation of the country side.

Mr. Shipham discovered a second case of a roof watershed between the Aire and Ribble at West Marton, about five miles from Barnoldswick. A joiner's shop stands on the height of land between the two slopes, the water from one side of the roof flowing to Earby and the Aire, that on the other side to Gisburn and the Ribble. Of this he has also supplied photographs, but the first example is sufficient for our purpose.

It sometimes happens, though rarely, that a stream flows along a watershed and bifurcates, part flowing down one slope, part down another. Something similar occurs at Barnoldswick (a name which the inhabitants economise into "Barlick" in familiar speech) in the case of the Leeds and Liverpool Canal, the top lock of which is on this ridge, and when this lock is opened at one end the water flows out to the west; when opened at the other end it flows out to the east.

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## Correspondence.

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

### RAINFALL VAGARIES.

YOUR mention of the exceptional rainfall here on September 7th prompts me to make a few observations on the subject, my excuse for which must be that so little is known of the causes which determine the localities of these small "cloud-bursts," that any contribution in the shape of facts bearing on the subject may be of some value.

During the period from September 6th to 13th these islands were under the influence of an immense anticyclone extending from the south of France almost to Iceland, and causing northerly and north-easterly winds to prevail. These would probably have been dry had there not been a south-westerly current between the north of Scotland and Iceland, which may have supplied it with moisture; and the northerly current on reaching the north of Kent discharged itself as shown below. The three stations given stand almost in a straight line from north-east to south-west; they are (1) Sharsted Court, on the north slope of the North Downs, and 278 ft. above sea level; (2) Harrietsham Rectory, at the foot of the steep southerly slope of the same range, and (3) Ulcombe Place, on the southerly slope, half way up from the foot of the next or Lower Greensand range. The height of the North Downs is about 600 ft., and that of the Lower Greensand about 500 ft. Harrietsham is about 7 miles from Sharsted Court and 3 from Ulcombe. The rainfall on September 7th was as follows:—



|           |              |          |
|-----------|--------------|----------|
| Sharsted. | Harrietsham. | Ulcombe. |
| ·26 in.   | ·42 in.      | ·74 in.  |

This is precisely in the reverse order of what would be expected in the case of a warm, moist current striking a colder range of hills ; but in this case the current was probably as cold as the hills.

On September 12th and 13th the following falls occurred at the same places :—

| Sharsted.    | Harrietsham.   | Ulcombe.     |
|--------------|----------------|--------------|
| in.          | in.            | in.          |
| 12th ... ·09 | 12th } ... ·71 | 12th ... ·10 |
| 13th ... ·38 | 13th }         | 13th ... ·40 |
| —            | —              | —            |
| ·47          | ·71            | ·50          |

The bulk at Harrietsham was on the 12th, as I was caught in it near there on the way to Ulcombe. The difference in the amount of water on the road between the north and south side of the Greensand ridge was very marked. Both this fall and that on the 7th at Ulcombe were of the torrential character generally associated with thunderstorms, but no thunder or lightning was observed in either case.

These “bursts” did not reach far to the south. At Tenterden the total fall for the month was only ·48 in., and at Hastings there was no rain either on the 7th or 12th. On the other hand, Ramsgate, with a rainfall for the month of 1·45 in., probably experienced something of the same kind.

I have to thank the Rev. C. B. Marsham, Rector of Harrietsham, and Mr. T. C. Court, Sharsted Court, for information as shown above.

ALFRED O. WALKER.

*Ulcombe, Kent, October 28th, 1910.*

In the October number of *Symons's Meteorological Magazine* mention is made of a curious local storm at Ulcombe in Kent, so I thought perhaps a rather heavy fall which took place here on the night of 11th October might be of interest to you and other readers of the Magazine. Between 5.30 p.m. on 11th and about 6.30 or 7 a.m. on 12th, I registered 1·40 in. I see that there was rather under half an inch in London, and rather over half an inch was recorded at Berkhamstead, the other side of us beyond Watford.

JOHN DURST.

*Grove End, Bushey Hall Road, Watford, November 5th, 1910.*

[The feature of the Ulcombe storm lay rather in its isolation in time than in space, occurring as it did during the prevalence of a remarkable drought, which was unbroken at many neighbouring stations. On October 11th falls of rain exceeding 1·00 in. were recorded over a large area in the east of England, and the patchiness to which our correspondent calls attention is a perfectly normal circumstance in connection with this well known type of rain-storm.

EDITOR, *S.M.M.*]

I THINK the rainfall of the 11th, 12th and 13th inst. is worth notifying, although it seems to have been pretty general throughout the south of England.

|                          |      |
|--------------------------|------|
| On the 11th I registered | in.  |
| „ 12th                   | 1.84 |
| „ 13th                   | 1.54 |
|                          | 1.85 |

Total for the 3 days ... 3.23

GEORGE SHEDDEN.

*Spring Hill, East Cowes, I.W., October 15th, 1910.*

### OCTOBER, 1910.

PROBABLY your correspondents will refer freely to the unusual warmth of the nights during October. Here, at 360 feet above sea level, the lowest record was 41° on the 21st, the highest minimum being 54° on the 8th, and the maximum 71° on the 2nd.

Associated naturally with this, was unusual air clearness in London, exceeded only in 1899 and 1903 since I began records in 1897 of the quarter hours in daytime when I required artificial light at my desk in a City office between 9 a.m. and 5 p.m.

The following Table may be of interest:—

| Year.      | Darkness<br>before 2 p.m.<br>Days. | Hours.           |                  | Earliest Date. |
|------------|------------------------------------|------------------|------------------|----------------|
|            |                                    | 9 a.m. to 2 p.m. | 2 p.m. to 5 p.m. |                |
| 1897 ..... | 3                                  | 3                | $\frac{1}{2}$    | Oct. 1         |
| 1898 ..... | 1                                  | $\frac{1}{2}$    | $\frac{2}{2}$    | „ 13           |
| 1899 ..... | 0                                  | 0                | 6                | Nov. 17        |
| 1900 ..... | 2                                  | 2                | 6                | Oct. 16        |
| 1901 ..... | 4                                  | 6                | 9                | Sept. 25       |
| 1902 ..... | 5                                  | 4                | 7                | „ 19           |
| 1903 ..... | 0                                  | 0                | 2                | Nov. 9         |
| 1904 ..... | 3                                  | 8 $\frac{1}{2}$  | 5                | Oct. 11        |
| 1905 ..... | ...                                | ...              | ...              | ...            |
| 1906 ..... | 2                                  | 2 $\frac{1}{4}$  | 9 $\frac{1}{4}$  | Oct. 30        |
| 1907 ..... | 8                                  | 6 $\frac{3}{4}$  | 16               | Aug. 26        |
| 1908 ..... | 6                                  | 11 $\frac{1}{4}$ | 12               | Sept. 22       |
| 1909 ..... | 6                                  | 9 $\frac{1}{2}$  | 2 $\frac{1}{4}$  | „ 20           |
| 1910 ..... | 0                                  | 0                | 11 $\frac{3}{4}$ | Nov. 4         |

The large number of hours this year after 2 p.m. (really from about 3.30 p.m.) was undoubtedly due to the unusual cloudiness without real fog, of which the evenings have been as free as the mornings.

J. EDMUND CLARK.

*Asgarth, Riddlesdown Road, Purley, Surrey, November 4th, 1910.*

### LIGHTNING STORM ON NOVEMBER 1st.

FROM 9 p.m. to 10 p.m. on November 1st a very bright display of sheet lightning was visible in S.E., S., and S.W., the flashes averaging three per minute, a cloudless sky prevailing at the time. A count of the flashes between 9.18 and 9.31 p.m. gave a total number of 41. Three distinct centres of activity were present, but the discharge was

most frequent from a point almost due S. At the S.E. point of disturbance the flashes were of a markedly blue colour. The barometer at 9 p.m. stood at 29.13 (cor. and red.) with a tendency for pressure to increase, the shade temperature being 42°.

For so late a date in the season, the frequency and brightness of the display were exceptional.

SPENCER C. RUSSELL.

*Epsom, November 5th, 1910.*

### THE ANGLE AT WHICH RAIN FALLS.

I VENTURE to write again to you and air my views on a rainfall problem. My views are, of course, those of an amateur and may be of little value, but I give them for what they are worth.

It is well-known that if two gauges be placed one on each slope of a ridge roof, the one on the leeward slope collects most rain—in some cases very much the most rain. Similarly it is, I think, generally found that a gauge on the lee side of a range of hills of moderate elevation collects more rain than one on the windward side, though here the difference is much less marked. The reasons for this are well explained in an article and diagram which appeared in *British Rainfall*, 1871, p. 21. I have, however, long had reason to suspect that the horizontal rain gauges do not tell a true story as regards the amount of rain deposited on the sloping surface. I have, in my yard, an arrangement of water butts, a 50 gallon water butt which receives the rain from a roof surface sloping south-west, and two 40 gallon water butts, the water passing from one, when full, into the other, which receive the rain from about an equal surface of roof facing north-east. If rain falls vertically an equal quantity of water, roughly speaking, is stored in each place, but if there is any wind the differences are very great, and exactly the opposite to what would be indicated by rain gauges as mentioned above. A notable instance recently occurred. With a strong wind from south-west .34 in. fell in large driving drops. The 50 gallon butt was filled to overflowing, while barely fifteen gallons reached the others. I have no doubt that most of the drops which passed over the ridge shot clear of the roof facing north-east, but of course a horizontal gauge would have intercepted them. This looks as though a gauge, to measure correctly the rain actually falling on a district, should have its surface not horizontal, but parallel, if possible, to the general plane of the surface of the district immediately round it. This, of course, would be in most cases impracticable; but it seems to me that records of extraordinary rainfall at places like the Styne, for example, must be received with some hesitation as representing the actual fall at those spots. Probably the water actually deposited is really greater on the Wasdale slope of the Styne Head Pass than on the Borrowdale slope, exactly contrary to what is measured.

Twenty-five years ago I remember noticing the large amount of water which appeared to flow out of Mosedale, near Wasdale Head,

in proportion to the dimensions of that little valley, and I wrote to Mr. Symons asking whether there was a gauge there. He sent me back a map showing that there was one, and I examined its records in *British Rainfall* and found them not very remarkable. I have little doubt, however, that more water actually falls there than the other side of Great Gable, where so much more is measured.

F. J. WARDALE.

*Shrewton, Wilts.*

## TRANSVAAL METEOROLOGICAL OBSERVATIONS.

YOUR "Contributor" in his letter on the Meteorological Outlook in South Africa, remarks that

"the barometric observations made at Johannesburg are printed in millimetres, whereas those for the Transvaal out-stations are printed in inches."

He continues :

"every meteorologist is capable of converting the one into the other, but it is hardly fair to expect him to do such a work of supererogation. Is it impossible to have the conversion into inches done at headquarters before publication?"

May I state that it is so done and the figures published alongside those for the out-stations, so that an immediate comparison is available. If your "Contributor" will refer to any of the annual reports he will see this at once ; in particular, in the last report published (1908-09), he will find the figures he suggests printed on page 100.

R. T. A. INNES,

*Johannesburg, 14th October, 1910.*

*Director Transvaal Observatory.*

## METEOROLOGICAL NEWS AND NOTES.

THE METEOROLOGICAL OFFICE has now completed the transference of its staff and property to their new quarters situated over the recently erected post office buildings in Exhibition Road. The address in future will be, "Meteorological Office, South Kensington, S.W." We expect in the next number of this Magazine to be able to give an illustrated account of the new premises, touching on the enlarged scope which it is hoped the increased facilities will bring to the work of the Office.

LECTURES on "Modern Meteorology, Dynamical and Statistical," will be given by Dr. W. N. Shaw, F.R.S., at the Meteorological Office, Exhibition Road, S.W., on November 21st and 28th. No tickets will be required for admission.

THE COST OF SNOWSTORMS forms one of the items in the Manchester Corporation accounts for the year 1909-10, where it is stated that to clear away falls aggregating 15 inches in depth during that one winter, cost the sum of £5,941, and gave employment to no fewer than 15,640 men.

## RAINFALL TABLE FOR OCTOBER, 1910.

| STATION.                       | COUNTY.            | Lat.<br>N. | Long.<br>W.<br>[*E.] | Height<br>above<br>Sea.<br>ft. | RAINFALL<br>OF MONTH.          |              |
|--------------------------------|--------------------|------------|----------------------|--------------------------------|--------------------------------|--------------|
|                                |                    |            |                      |                                | Aver.<br>1875—<br>1909.<br>in. | 1910.<br>in. |
| Camden Square.....             | London.....        | 51 32      | 0 8                  | 111                            | 2·72                           | 2·00         |
| Tenterden.....                 | Kent.....          | 51 4       | *0 41                | 190                            | 3·48                           | 2·77         |
| Steyning.....                  | Sussex.....        | 50 53      | 0 20                 | 80                             | 4·15                           | 3·30?        |
| Southampton (Cadland) ...      | Hampshire.....     | 50 50      | 1 22                 | 52                             | 4·07                           | 5·27         |
| Hitchin.....                   | Hertfordshire..... | 51 57      | 0 17                 | 238                            | 2·77                           | 2·72         |
| Oxford (Magdalen College).     | Oxfordshire.....   | 51 45      | 1 15                 | 186                            | 2·82                           | 3·87         |
| Bury St. Edmunds (Westley)     | Suffolk.....       | 52 15      | *0 40                | 226                            | 2·72                           | 1·95         |
| Geldeston [Beccles].....       | Norfolk.....       | 52 27      | *1 31                | 38                             | 2·84                           | ·92          |
| Polapit Tamar [Launceston]     | Devon.....         | 50 40      | 4 22                 | 315                            | 4·84                           | 5·73         |
| Rousdon [Lyme Regis].....      | „.....             | 50 41      | 3 0                  | 516                            | 3·81                           | 4·86         |
| Stroud (Upfield).....          | Gloucestershire..  | 51 44      | 2 13                 | 226                            | 3·21                           | 3·70         |
| Church Stretton (Wolstaston).. | Shropshire.....    | 52 35      | 2 48                 | 800                            | 3·77                           | 4·46         |
| Coventry (Kingswood).....      | Warwickshire...    | 52 24      | 1 30                 | 340                            | 3·20                           | 2·28         |
| Market Overton.....            | Rutland.....       | 52 44      | 0 41                 | 475                            | 3·10                           | 1·77         |
| Boston.....                    | Lincolnshire.....  | 52 58      | 0 1                  | 25                             | 2·75                           | 2·14         |
| Worksop (Hodsock Priory).      | Nottinghamshire    | 53 22      | 1 5                  | 56                             | 2·77                           | 2·17         |
| Macclesfield.....              | Cheshire.....      | 53 15      | 2 7                  | 501                            | 3·53                           | 2·60         |
| Southport (Hesketh Park)..     | Lancashire.....    | 53 38      | 2 59                 | 38                             | 3·74                           | 3·23         |
| Wetherby (Ribston Hall)...     | Yorkshire, W.R.    | 53 59      | 1 24                 | 130                            | 3·18                           | 2·79         |
| Arneliffe Vicarage.....        | „.....             | 54 8       | 2 6                  | 732                            | 6·48                           | 6·32         |
| Hull (Pearson Park).....       | „ E.R.             | 53 45      | 0 20                 | 6                              | 3·19                           | 1·89         |
| Newcastle (Town Moor)...       | Northumberland     | 54 59      | 1 38                 | 201                            | 3·20                           | 3·69         |
| Borrowdale (Seathwaite)...     | Cumberland.....    | 54 30      | 3 10                 | 423                            | 12·71                          | 6·71         |
| Cardiff (Ely).....             | Glamorgan.....     | 51 29      | 3 13                 | 53                             | 4·87                           | 5·01         |
| Haverfordwest.....             | Pembroke.....      | 51 48      | 4 58                 | 95                             | 5·52                           | 4·28         |
| Aberystwyth (Gogerddan)..      | Cardigan.....      | 52 26      | 4 1                  | 83                             | 5·38                           | 4·69         |
| Llandudno.....                 | Carnarvon.....     | 53 20      | 3 50                 | 72                             | 3·78                           | 3·57         |
| Cargen [Dumfries].....         | Kirkcudbright...   | 55 2       | 3 37                 | 80                             | 4·45                           | 2·53         |
| Marchmont House.....           | Berwick.....       | 55 44      | 2 24                 | 498                            | 3·83                           | 3·44         |
| Girvan (Pinmore).....          | Ayr.....           | 55 10      | 4 49                 | 207                            | 5·38                           | 2·01         |
| Glasgow (Queen's Park)...      | Renfrew.....       | 55 53      | 4 18                 | 144                            | 3·36                           | 2·01         |
| Inveraray (Newtown).....       | Argyll.....        | 56 14      | 5 4                  | 17                             | 6·50                           | 3·44         |
| Mull (Quinish).....            | „.....             | 56 36      | 6 13                 | 35                             | 5·87                           | 3·13         |
| Dundee (Eastern Necropolis)    | Forfar.....        | 56 28      | 2 57                 | 199                            | 2·81                           | 1·77         |
| Braemar.....                   | Aberdeen.....      | 57 0       | 3 24                 | 1114                           | 3·88                           | 4·75         |
| Aberdeen (Cranford).....       | „.....             | 57 8       | 2 7                  | 120                            | 3·23                           | 2·21         |
| Cawdor.....                    | Nairn.....         | 57 31      | 3 57                 | 250                            | 2·95                           | 1·08         |
| Fort Augustus (S. Benedict's)  | E. Inverness...    | 57 9       | 4 41                 | 68                             | 4·14                           | 1·76         |
| Loch Torridon (Bendamph)       | W. Ross.....       | 57 32      | 5 32                 | 20                             | 8·38                           | 3·36         |
| Dunrobin Castle.....           | Sutherland.....    | 57 59      | 3 56                 | 14                             | 3·15                           | 1·39         |
| Wick.....                      | Caitness.....      | 58 26      | 3 6                  | 77                             | 3·14                           | 1·70         |
| Killarney (District Asylum)    | Kerry.....         | 52 4       | 9 31                 | 178                            | 5·59                           | 2·93         |
| Waterford (Brook Lodge)...     | Waterford.....     | 52 15      | 7 7                  | 104                            | 4·00                           | 4·28         |
| Nenagh (Castle Lough)...       | Tipperary.....     | 52 54      | 8 24                 | 120                            | 3·48                           | 2·17         |
| Miltown Malbay.....            | Clare.....         | 52 52      | 9 26                 | 400                            | 4·31                           | 1·72         |
| Gorey (Courtown House)...      | Wexford.....       | 52 40      | 6 13                 | 80                             | 3·75                           | 3·24         |
| Abbey Leix (Blandsfort)...     | Queen's County..   | 52 56      | 7 17                 | 532                            | 3·53                           | 2·38         |
| Dublin (Fitz William Square)   | Dublin.....        | 53 21      | 6 14                 | 54                             | 2·88                           | 2·22         |
| Mullingar (Belvedere).....     | Westmeath.....     | 53 29      | 7 22                 | 367                            | 3·19                           | 1·65         |
| Ballinasloe.....               | Galway.....        | 53 20      | 8 15                 | 160                            | 3·19                           | 1·51         |
| Crossmolina (Enniscoe).....    | Mayo.....          | 54 4       | 9 18                 | 74                             | 5·27                           | 2·29         |
| Collooney (Markree Obsy.).     | Sligo.....         | 54 11      | 8 27                 | 127                            | 4·21                           | 3·10         |
| Seaforde.....                  | Down.....          | 54 19      | 5 50                 | 180                            | 3·65                           | 1·47         |
| Bushmills (Dundarave).....     | Antrim.....        | 55 12      | 6 30                 | 162                            | 3·60                           | 1·92         |
| Omagh (Edenfel).....           | Tyrone.....        | 54 36      | 7 18                 | 280                            | 3·76                           | 2·13         |
| Aug. ... Cargen [Dumfries]     | Kirkcudbright...   | 55 2       | 3 37                 | 80                             | 4·23                           | 9·11         |
| Sept. ... „ [ „ ]              | „ ..               | „          | „                    | „                              | 3·34                           | 1·06         |

## RAINFALL TABLE FOR OCTOBER, 1910—continued.

| RAINFALL OF MONTH (con.) |          |                   |             |       | RAINFALL FROM JAN. 1. |        |                      |          | Mean Annual 1875-1909. | STATION.        |
|--------------------------|----------|-------------------|-------------|-------|-----------------------|--------|----------------------|----------|------------------------|-----------------|
| Diff. from Av. in.       | % of Av. | Max. in 24 hours. | No. of Days | Date. | Aver. 1875-1909.      | 1910.  | Diff. from Aver. in. | % of Av. |                        |                 |
|                          |          | in.               |             |       | in.                   | in.    |                      |          | in.                    |                 |
| — .72                    | 74       | .36               | 11, 31      | 13    | 20.64                 | 18.88  | — 1.76               | 91       | 25.11                  | Camden Square   |
| — .71                    | 79       | .44               | 31          | 17    | 21.80                 | 21.46  | — .34                | 98       | 27.64                  | Tenterden       |
| — .85                    | 80       | .60               | 13          | 14    | 26.22                 | 30.02? | + 3.80               | 114      | 33.58                  | Steyning        |
| + 1.20                   | 129      | 1.32              | 12          | 19    | 25.25                 | 24.67  | — .58                | 98       | 31.87                  | Cadland         |
| — .05                    | 98       | .93               | 11          | 14    | 20.59                 | 19.27  | — 1.32               | 94       | 25.16                  | Hitchin         |
| + 1.05                   | 137      | 1.79              | 11          | 15    | 20.27                 | 18.71  | — 1.56               | 92       | 24.58                  | Oxford          |
| — .77                    | 72       | .46               | 11          | 11    | 20.86                 | 21.96  | + 1.10               | 105      | 25.40                  | Westley         |
| — 1.92                   | 32       | .28               | 31          | 8     | 19.17                 | 22.73  | + 3.56               | 119      | 23.73                  | Geldeston       |
| + .89                    | 118      | .76               | 12          | 20    | 29.74                 | 34.65  | + 4.91               | 116      | 38.27                  | Polapit Tamar   |
| + 1.05                   | 128      | 1.03              | 27          | 16    | 26.35                 | 26.61  | + .26                | 101      | 33.54                  | Rousdon         |
| + .49                    | 115      | .75               | 11          | 14    | 24.33                 | 25.86  | + 1.53               | 106      | 29.81                  | Stroud          |
| + .69                    | 118      | 1.06              | 2           | 15    | 26.48                 | 25.38  | — 1.10               | 96       | 32.41                  | Wolstaston      |
| — .92                    | 71       | .43               | 1           | 12    | 23.71                 | 20.73  | — 2.98               | 87       | 28.98                  | Coventry        |
| — 1.33                   | 57       | .42               | 11          | 18    | 22.22                 | 21.50  | — .72                | 97       | 27.10                  | Market Overton  |
| — .61                    | 78       | .88               | 1           | 12    | 19.42                 | 19.43  | + .01                | 100      | 23.35                  | Boston          |
| — .60                    | 78       | .95               | 11          | 15    | 20.31                 | 18.34  | — 1.97               | 90       | 24.46                  | Hodsock Priory  |
| — .93                    | 74       | .90               | 31          | 12    | 28.38                 | 29.90  | + 1.52               | 105      | 34.73                  | Macclesfield    |
| — .51                    | 86       | .98               | 18          | 13    | 26.44                 | 27.41  | + .97                | 104      | 32.70                  | Southport       |
| — .39                    | 88       | .52               | 17          | 17    | 22.26                 | 24.79  | + 2.53               | 111      | 26.87                  | Ribston Hall    |
| — .16                    | 98       | 2.19              | 31          | 15    | 48.62                 | 54.86  | + 6.24               | 113      | 61.49                  | Arneliffe       |
| — 1.30                   | 59       | .46               | 11          | 16    | 21.76                 | 19.73  | — 2.03               | 91       | 26.42                  | Hull            |
| + .49                    | 115      | .64               | 1           | 17    | 22.85                 | 22.24  | — .61                | 97       | 27.94                  | Newcastle       |
| — 6.00                   | 53       | 3.91              | 31          | 11    | 100.75                | 102.85 | + 2.10               | 102      | 129.48                 | Seathwaite      |
| + .14                    | 103      | .80               | 31          | 17    | 33.50                 | 37.79  | + 4.29               | 113      | 42.28                  | Cardiff         |
| — 1.24                   | 78       | .61               | 27          | 17    | 36.48                 | 33.07  | — 3.41               | 91       | 46.82                  | Haverfordwest   |
| — .69                    | 87       | 1.08              | 31          | 14    | 36.30                 | 42.00  | + 5.70               | 116      | 45.46                  | Gogerddan       |
| — .21                    | 94       | .83               | 18          | 11    | 24.33                 | 27.17  | + 2.84               | 112      | 30.36                  | Llandudno       |
| — 1.92                   | 57       | 1.36              | 2           | 6     | 34.28                 | 43.08  | + 8.80               | 126      | 43.47                  | Cargen          |
| — .39                    | 90       | 1.07              | 18          | 17    | 27.72                 | 23.30  | — 4.42               | 84       | 33.76                  | Marchmont       |
| — 3.37                   | 37       | 1.13              | 2           | 13    | 39.05                 | 42.22  | + 3.17               | 108      | 49.77                  | Girvan          |
| — 1.35                   | 60       | .85               | 31          | 9     | 28.39                 | 32.06  | + 3.67               | 113      | 35.97                  | Glasgow         |
| — 3.06                   | 53       | 1.98              | 31          | 14    | 52.71                 | 54.85  | + 2.14               | 104      | 68.67                  | Inveraray       |
| — 2.74                   | 53       | .94               | 31          | 16    | 43.74                 | 42.87  | — .87                | 98       | 56.57                  | Quinish         |
| — 1.04                   | 63       | .77               | 18          | 13    | 23.35                 | 23.38  | + .03                | 100      | 28.64                  | Dundee          |
| + .87                    | 122      | ...               | ...         | ...   | 28.04                 | 32.92  | + 4.88               | 117      | 34.93                  | Braemar         |
| — 1.02                   | 68       | .42               | 20          | 16    | 26.01                 | 22.16  | — 3.85               | 85       | 32.73                  | Aberdeen        |
| — 1.87                   | 37       | .62               | 20          | 5     | 24.20                 | 24.56  | + .36                | 101      | 29.33                  | Cawdor          |
| — 2.38                   | 43       | .91               | 31          | 15    | 34.40                 | 34.19  | — .21                | 99       | 44.53                  | Fort Augustus   |
| — 5.02                   | 40       | 1.06              | 19          | 16    | 65.01                 | 66.54  | + 1.53               | 102      | 83.61                  | Bendampf        |
| — 1.76                   | 44       | .78               | 31          | 9     | 25.56                 | 23.49  | — 2.07               | 92       | 31.90                  | Dunrobin Castle |
| — 1.44                   | 54       | .55               | 31          | 21    | 23.82                 | 22.22  | — 1.60               | 93       | 29.88                  | Wick            |
| — 2.66                   | 52       | .72               | 3           | 22    | 42.35                 | 47.25  | + 4.90               | 112      | 54.81                  | Killarney       |
| + .28                    | 107      | .95               | 29          | 18    | 31.45                 | 31.22  | — .23                | 99       | 39.57                  | Waterford       |
| — 1.31                   | 62       | .60               | 31          | 18    | 31.21                 | 34.26  | + 3.05               | 110      | 39.43                  | Castle Lough    |
| — 2.59                   | 40       | .40               | 2           | 16    | 35.77                 | 35.14  | — .63                | 98       | 45.11                  | Miltown Malbay  |
| — .51                    | 86       | 1.77              | 2           | 17    | 28.16                 | 28.62  | + .46                | 102      | 34.99                  | Courtown Ho.    |
| — 1.15                   | 68       | .75               | 2           | 16    | 29.23                 | 34.87  | + 5.66               | 119      | 35.92                  | Abbey Leix      |
| — .66                    | 77       | 1.08              | 2           | 18    | 22.77                 | 27.33  | + 4.56               | 120      | 27.68                  | Dublin          |
| — 1.54                   | 52       | .45               | 2           | 14    | 29.37                 | 33.75  | + 4.38               | 115      | 36.14                  | Mullingar       |
| — 1.68                   | 47       | .41               | 2           | 14    | 29.36                 | 28.95  | — .41                | 99       | 36.64                  | Ballinasloe     |
| — 2.98                   | 44       | .49               | 31          | 18    | 41.01                 | 43.45  | + 2.52               | 106      | 52.87                  | Enniscoe        |
| — 1.11                   | 74       | .87               | 2           | 15    | 34.35                 | 45.48  | + 11.13              | 132      | 42.71                  | Markree         |
| — 2.18                   | 40       | .38               | 2           | 11    | 31.28                 | 29.20  | — 2.08               | 93       | 38.91                  | Seaforde        |
| — 1.68                   | 53       | .62               | 31          | 10    | 29.92                 | 32.17  | + 2.25               | 108      | 37.56                  | Dundarave       |
| — 1.63                   | 57       | .40               | 19, 31      | 11    | 31.81                 | 36.52  | + 4.71               | 115      | 39.38                  | Omagh           |
| + 4.88                   | 215      | 1.94              | 28          | 21    | 26.49                 | 39.49  | + 13.00              | 149      | 43.47                  | Cargen          |
| — 2.28                   | 32       | .46               | 26          | 5     | 29.83                 | 40.55  | + 10.72              | 136      | „                      | „               |

## SUPPLEMENTARY RAINFALL, OCTOBER, 1910.

| Div.  | STATION.                      | Rain<br>inches | Div.   | STATION.                     | Rain<br>inches |
|-------|-------------------------------|----------------|--------|------------------------------|----------------|
| II.   | Warlingham, Redvers Road      | 3.21           | XI.    | Llangyhanfal, Plás Draw....  | 4.30           |
| "     | Ramsgate .....                | 1.43           | "      | Dolgelly, Bryntirion .....   | 5.13           |
| "     | Hailsham .....                | 4.36           | "      | Bettws-y-Coed, Tyn-y-bryn    | 5.93           |
| "     | Totland Bay, Aston House.     | 5.05           | "      | Lligwy .....                 | 3.64           |
| "     | Stockbridge, Ashley .....     | 4.13           | "      | Douglas .....                | 3.39           |
| "     | Grayshott .....               | 4.43           | XII.   | Stoneykirk, Ardwell House    | 1.74           |
| "     | Reading, Calcot Place.....    | 4.15           | "      | Dalry, The Old Garroch ...   | 3.99           |
| III.  | Harrow Weald, Hill House.     | 2.32           | "      | Langholm, Drove Road.....    | 3.29           |
| "     | Pitsford, Sedgebrook .....    | 2.31           | "      | Moniaive, Maxwelton House    | 2.90           |
| "     | Huntingdon, Brampton.....     | 1.48           | XIII.  | St Mary's Loch, Cramilt Ldge | 4.53           |
| "     | Woburn, Milton Bryant.....    | 2.88           | "      | Edinburgh, Royal Observty.   | 2.16           |
| "     | Wisbech, Monica Road.....     | 1.58           | XIV.   | Maybole, Knockdon Farm..     | 2.16           |
| IV.   | Southend Water Works.....     | 1.71           | XV.    | Campbeltown, Witchburn...    | 2.05           |
| "     | Colchester, Lexden.....       | 1.39           | "      | Glenreaddell Mains.....      | 2.40           |
| "     | Newport .....                 | 1.86           | "      | Ballachulish House.....      | 4.98           |
| "     | Rendlesham .....              | 1.28           | "      | Islay, Eallabus .....        | 2.33           |
| "     | Swaffham .....                | 1.40           | XVI.   | Dollar Academy .....         | ...            |
| "     | Blakeney .....                | 1.56           | "      | Balquhidder, Stronvar .....  | 3.92           |
| V.    | Bishops Cannings .....        | 4.31           | "      | Coupar Angus .....           | 1.96           |
| "     | Winterbourne Steepleton ..    | 5.08           | "      | Blair Atholl.....            | 1.92           |
| "     | Ashburton, Druid House ...    | 7.97           | "      | Montrose, Sunnyside Asylum   | 1.45           |
| "     | Honiton, Combe Raleigh ...    | 4.75           | XVII.  | Alford, Lynturk Manse ...    | 3.14           |
| "     | Okehampton, Oaklands.....     | 6.42           | "      | Keith Station .....          | 3.39           |
| "     | Hartland Abbey .....          | 6.15           | XVIII. | Glenquoich, Loan .....       | 10.90          |
| "     | Lynmouth, Rock House ...      | 5.29           | "      | Skye, Dunvegan.....          | 5.91           |
| "     | Probus, Lamellyn .....        | 5.96           | "      | N. Uist, Lochinaddy .....    | 1.37           |
| "     | North Cadbury Rectory ...     | ...            | "      | Alvey Manse .....            | 2.27           |
| VI.   | Clifton, Pembroke Road ...    | 5.23           | "      | Loch Ness, Drumnadrochit.    | 1.83           |
| "     | Ross, The Graig .....         | 3.74           | "      | Glencarron Lodge .....       | 6.79           |
| "     | Shifnal, Hatton Grange.....   | 3.25           | "      | Fearn, Lower Pitkerrie.....  | 4.00           |
| "     | Blockley, Upton Wold .....    | 4.00           | XIX.   | Invershin .....              | 2.35           |
| "     | Worcester, Boughton Park.     | 2.93           | "      | Altnaharra .....             | ...            |
| VII.  | Market Rasen .....            | 1.98           | "      | Bettyhill .....              | 3.03           |
| "     | Bawtry, Hesley Hall.....      | 1.85           | XX.    | Dunmanway, The Rectory..     | 4.61           |
| "     | Derby, Midland Railway ...    | 2.00           | "      | Cork .....                   | 4.03           |
| "     | Buxton.....                   | 3.07           | "      | Mitchelstown Castle .....    | 3.94           |
| VIII. | Nantwich, Dorfold Hall.....   | 2.70           | "      | Darrynane Abbey .....        | 4.29           |
| "     | Liscard .....                 | 3.33           | "      | Glenam [Clonmel] .....       | 3.50           |
| "     | Chatburn, Middlewood .....    | 3.66           | "      | Nenagh, Traverston .....     | 2.40           |
| "     | Cartmel, Flookburgh .....     | 2.60           | "      | Newmarket-on-Fergus, Fenloe  | ...            |
| IX.   | Langsett Moor, Up. Midhope    | 3.02           | XXI.   | Laragh, Glendalough .....    | 4.20           |
| "     | Scarborough, Scalby .....     | 3.76           | "      | Moynalty, Westland .....     | 2.05           |
| "     | Ingleby Greenhow .....        | 3.77           | "      | Athlone, Twyford .....       | 1.10           |
| "     | Mickleton.....                | 3.36           | XXII.  | Woodlawn .....               | 2.14           |
| X.    | Bardon Mill, Beltingham ...   | ...            | "      | Westport, St. Helens .....   | 2.13           |
| "     | Ilderton, Lilburn Cottage.... | 3.18           | "      | Achill Island, Dugort .....  | 1.62           |
| "     | Keswick, The Bank .....       | 3.67           | "      | Mohill .....                 | 2.06           |
| XI.   | Llanfrechfa Grange.....       | 4.96           | XXIII. | Enniskillen, Portora .....   | 2.16           |
| "     | Treherbert, Tyn-y-waun ...    | 6.37           | "      | Dartrey [Cootehill].....     | 2.07           |
| "     | Carmarthen, The Friary.....   | 2.91           | "      | Warrenpoint, Manor House     | 2.19           |
| "     | Castle Malgwyn [Llechryd].    | 3.87           | "      | Banbridge, Milltown .....    | 1.43           |
| "     | Plynlimon.....                | 6.50           | "      | Belfast, Springfield .....   | 2.21           |
| "     | Crickhowell, Ffordlas.....    | 4.50           | "      | Glenarm Castle.....          | 2.84           |
| "     | New Radnor, Ednol .....       | 5.30           | "      | Londonderry, Creggan. Res.   | 2.60           |
| "     | Rhayader, Tyrmynydd .....     | 5.81           | "      | Killybegs .....              | 3.93           |
| "     | Lake Vyrnwy .....             | 5.31           | "      | Horn Head ... ..             | 2.28           |

## METEOROLOGICAL NOTES ON OCTOBER, 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 entire absence of ground frost and the persistent high minima were the most striking features in a fair to cloudy month. (See p. 185). Duration of sunshine, 56·7\* hours, and of R 37·9 hours. Mean temp. 53°·8, or 3°·8 above the average. Shade max. 72°·8 on 2nd; min. 41°·6 on 21st. F 0, f 0.

TENTERDEN.—Fine and dry until 11th, afterwards a good many days with R, but no heavy falls. Duration of sunshine, 94·5† hours. Shade max. 69°·0 on 2nd; min. 43°·0 on 4th, 21st and 24th. F 0, f 0.

TOTLAND BAY.—Duration of sunshine 76·3\* hours, or 32·8 hours below the average, and the smallest amount recorded in October. Shade max. 66°·3 on 5th; min. 42°·9 on 21st. F 0, f 1.

PITSFORD.—R 77 in. below the average. Mean temp. 50°·5. Shade max. 69°·2 on 2nd; min. 40°·6 on 16th. F 0.

ROUSDON.—The first ten days were mild and genial, seven consecutive days having temp. above 60°. There was a great change on 10th, and during a local TS on 11th 40 in. of R fell in 15 minutes. The least sunshine in any October in the last 27 years. Shade max. 64°·8 on 4th. F 0, f 0.

ROSS.—Shade max. 69°·7 on 1st; min. 40°·0 on 20th. F 0, f 0.

HODSOCK PRIORY.—A mild month, with an unusual absence of frost, the min. being the highest ever recorded in October. Shade max. 70°·7 on 5th; min. 37°·5 on 15th. F 0, f 2.

SOUTHPORT.—Notable for having more E. wind than any October in the 40 years' record. Duration of sunshine 83·5\* hours, or 12·6 hours below the average. Duration of R 49·9 hours. Mean temp. 51°·4, or 2°·8 above the average. Shade max. 70°·2 on 1st; min. 37°·9 on 30th. F 0, f 4.

HULL.—Shade max. 70°·0 on 2nd; min. 41°·0 on 1st and 30th. F 0, f 0.

HAVERFORDWEST.—Very mild and somewhat stormy. Duration of sunshine, 79·1\* hours. Shade max. 66°·4 on 6th.

LLANDUDNO.—Shade max. 72°·5 on 1st; min. 41°·5 on 20th. F 0, f 0.

MARCHMONT HOUSE.—Duration of sunshine, 69·6\* hours on 20 days. Shade max. 68°·0 on 1st; min. 36°·0 on 9th and 18th. F 0, f 1.

EDINBURGH.—Shade max. 66°·5 on 1st; min. 37°·8 on 20th. F 0, f 0.

COUPAR ANGUS.—A fairly good and dry month until the last day, when there was a sudden R storm. Shade max. 69°·0 on 6th; min. 31°·0 on 30th.

FORT AUGUSTUS.—Shade max. 66°·0 on 2nd; min. 30°·0 on 15th. F 3.

CORK.—Shade max. 62°·0 on 4th; min. 34°·0 on 31st. F 0, f 1.

DUBLIN.—A mild, cloudy month of N.W. and E. winds. Save for a fall of 1·08 in. during a TS on 2nd, the R, though frequent, was small. Gales on 13th and 31st. Mean temp. 51°·7. Shade max. 63°·4 on 1st; min. 37°·9 on 12th. F 0, f 0.

MARKREE.—Shade max. 65°·7 on 5th; min. 27°·9 on 31st. F 2, f 5.

WARRENPOINT.—On the whole a fine month, with a prevalence of E. winds. Shade max. 64°·0 on 4th; min. 42°·0 on 30th. F 0, f 0.

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\* Campbell-Stokes.

† Jordan.



## Climatological Table for the British Empire, May, 1910.

| STATIONS.<br><br>(Those in italics are<br>South of the Equator.) | Absolute. |       |          |       | Average. |      |               |           | Absolute.       |                   | Total Rain     |       | Aver. |        |
|------------------------------------------------------------------|-----------|-------|----------|-------|----------|------|---------------|-----------|-----------------|-------------------|----------------|-------|-------|--------|
|                                                                  | Maximum.  |       | Minimum. |       | Max.     | Min. | Dew<br>Point. | Humidity. | Max. in<br>Sun. | Min. on<br>Grass. | Depth.         | Days. |       | Cloud. |
|                                                                  | Temp.     | Date. | Temp.    | Date. |          |      |               |           |                 |                   |                |       |       |        |
| London, Camden Square                                            | 80°0      | 22    | 29°8     | 10    | 65°0     | 46°3 | 46°8          | 77        | 123°1           | 22°9              | inches<br>2·22 | 19    | 6·5   |        |
| Malta ... ..                                                     | 75°2      | 27    | 53°2     | 14    | 67°2     | 53°2 | 55°6          | 81        | 139°6           | ...               | 14             | 1     | 5·0   |        |
| Lagos ... ..                                                     | 91°0      | 6     | 70°0     | 15*   | 88°7     | 74°0 | 74°9          | 74        | 159°0           | 67°0              | 8°79           | 8     | 8·3   |        |
| Cape Town ... ..                                                 | 80°8      | 3     | 39°2     | 6     | 68°3     | 51°6 | 53°3          | 81        | ...             | ...               | 4°39           | 11    | 4·6   |        |
| Durban, Natal                                                    | ...       | ...   | ...      | ...   | ...      | ...  | ...           | ...       | ...             | ...               | ...            | ...   | ...   |        |
| Johannesburg ... ..                                              | 73°7      | 21    | 31°6     | 25    | 65°3     | 46°0 | 40°3          | 63        | 128°3           | 31°6              | °04            | 1     | 1·0   |        |
| Mauritius ... ..                                                 | 82°1      | 5     | 58°0     | 27    | 78°8     | 63°9 | 63°1          | 77        | 147°4           | 56°5              | °94            | 10    | 5·1   |        |
| Calcutta .. ...                                                  | 101°7     | 2     | 71°2     | 9     | 96°8     | 77°9 | 75°6          | 73        | ...             | 69°8              | 4°80           | 7     | 4·1   |        |
| Bombay .. ...                                                    | 92°7      | 17    | 77°4     | 5     | 91°3     | 80°2 | 75°6          | 74        | 137°5           | 72°1              | °03            | 2     | 2·7   |        |
| Madras ... ..                                                    | 112°9     | 20    | 77°6     | 2     | 100°7    | 81°6 | 72°8          | 61        | 143°4           | 75°2              | °01            | 1     | 3·2   |        |
| Kodaikanal ... ..                                                | 74°1      | 28    | 51°9     | 21    | 69°0     | 51°9 | 51°5          | 72        | 135°6           | 41°1              | 6°29           | 20    | 4·8   |        |
| Colombo, Ceylon                                                  | 90°7      | 5     | 73°8     | 7     | 87°8     | 78°0 | 75°7          | 80        | 153°9           | 71°2              | 2°32           | 17    | 6·1   |        |
| Hongkong ... ..                                                  | 90°1      | 13    | 70°3     | 21    | 84°1     | 75°1 | 71°0          | 77        | 133°8           | ...               | 1°96           | 5     | 5·5   |        |
| Melbourne ... ..                                                 | 70°9      | 1     | 38°2     | 6     | 53°1     | 49°5 | 46°2          | 69        | 119°6           | 33°9              | 2°47           | 20    | 6·5   |        |
| Adelaide ... ..                                                  | 77°8      | 8     | 44°7     | 3     | 66°9     | 52°6 | 50°4          | 73        | 145°9           | 33°6              | 4°41           | 17    | 6·9   |        |
| Coolgardie ... ..                                                | 77°0      | 1     | 36°9     | 26    | 66°3     | 47°7 | 46°6          | 69        | 139°0           | 32°0              | 2°28           | 12    | 5·1   |        |
| Perth ... ..                                                     | 78°6      | 3     | 42°0     | 25    | 67°1     | 53°3 | 51°7          | 73        | 129°5           | 35°7              | 7°31           | 19    | 6·7   |        |
| Sydney ... ..                                                    | 79°5      | 2     | 46°3     | 31    | 67°0     | 53°0 | 49°0          | 76        | 121°7           | 38°2              | 3°19           | 18    | 5·0   |        |
| Wellington ... ..                                                | 65°2      | 5     | 37°8     | 18    | 59°1     | 49°8 | 45°6          | 72        | 109°0           | 29°0              | 3°35           | 15    | 7·2   |        |
| Auckland ... ..                                                  | 70°0      | 5     | 41°5     | 19    | 63°0     | 52°3 | 51°3          | 88        | 138°0           | 37°0              | 5°03           | 18    | 6·3   |        |
| Jamaica, Kingston                                                | 92°4      | 29    | 66°0     | 1     | 88°1     | 71°1 | 68°6          | 72        | ...             | ...               | 1°32           | 3     | 4·2   |        |
| Grenada ... ..                                                   | 85°6      | sevl. | 70°0     | 27    | 83°2     | 73°6 | 71°0          | 77        | 139°0           | ...               | 8°36           | 24    | 6·5   |        |
| Toronto ... ..                                                   | 79°6      | 28    | 32°2     | 15    | 61°2     | 43°7 | ...           | ...       | 99°2            | 27°8              | 2°73           | 17    | 5·5   |        |
| Fredericton ... ..                                               | 76°0      | 25    | 28°0     | 6     | 62°0     | 39°1 | ...           | 71        | ...             | ...               | 2°51           | 9     | 6·4   |        |
| St. John's, N.B.                                                 | 70°0      | 28    | 29°5     | 6     | 55°9     | 42°2 | ...           | ...       | ...             | ...               | 3°49           | 13    | 6·3   |        |
| Victoria, B.C. ... ..                                            | 74°4      | 21    | 38°7     | 1     | 64°4     | 45°2 | ...           | 70        | ...             | ...               | °77            | 9     | 4·0   |        |
| Dawson ... ..                                                    | 75°0      | 30    | 22°0     | 8     | 59°7     | 31°5 | ...           | ...       | ...             | ...               | °19            | 2     | ...   |        |

\* and 20, 25, 29.

MALTA.—Mean temp. of air 62°·3. Average bright sunshine 9·9 hours per day.

Johannesburg.—Bright sunshine 287·8 hours.

Mauritius.—Mean temp. of air 1°·2, of dew point 2°·2, and R 2·80 in., below averages. Mean hourly velocity of wind 8·3 miles, or 2·0 below average.

KODAIKANAL.—Bright sunshine 204 hours. TSS on 28 days.

COLOMBO.—Mean temp. of air 80°·7 or 1°·6 below, of dew point 0°·3 above, and R 8·72 in. below, averages. Mean hourly velocity of wind 7·2 miles. TSS on 4 days.

HONGKONG.—Mean temp. of air 78°·9. Bright sunshine 261·3 hours, or 107·5 hours above, and R 10·33 in. below, averages. Mean hourly velocity of wind 9·4 miles, or 3·6 miles below average.

Melbourne.—Mean temp. of air 2°·3 above, and R ·34 in. above, averages.

Adelaide.—Rainfall 1·62 in. above average.

Coolgardie.—R 1°00 in. above the average.

Perth.—Mean temp. of air normal, and R 2·25 in. above average.

Sydney.—Mean temp. of air 1°·5 above, and R 1·83 in. below, averages.

Wellington.—Mean temp. of air 1°·6 above, and R 1·53 in. below, averages. Bright sunshine 122·1 hours.

# Symons's Meteorological Magazine.

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No. 539.

DECEMBER, 1910.

VOL. XLV.

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## THE METEOROLOGICAL OFFICE.

By W. N. SHAW, SC.D., F.R.S.,

*Director of the Meteorological Office.*

IN moving its quarters from 63, Victoria Street, to the new building in Exhibition Road, South Kensington, the Meteorological Office enters on a new era. It may be interesting to note the successive steps by which its present position has been attained.

In 1854 Admiral FitzRoy was appointed Superintendent of a new department of the Board of Trade, formed for the collection and discussion of meteorological data supplied by observations made at sea.

In 1860, following the precedent of Leverrier in France, FitzRoy introduced the system of weather telegraphy which rendered possible the issue of storm warnings and the publication of forecasts in the daily newspapers.

In 1865, on the death of FitzRoy, Mr. T. H. Babington took over the management of the department. At the same time a Departmental Committee was appointed to consider the work and position of the Meteorological Department of the Board of Trade. The result of the inquiry was that in 1867 the control of the Parliamentary Grant for Meteorology was transferred to a Committee of the Royal Society, with Sir E. Sabine, President of the Society, as Chairman of the Committee. The work was extended to include with the marine meteorology and weather telegraphy, land meteorology, as represented by six fully equipped meteorological observatories, Falmouth, Stonyhurst, Aberdeen, Glasgow, Armagh, and Valencia, in addition to Kew, which became the central observatory of the system. Mr. R. H. Scott was appointed Director of the re-organized Office, with Captain H. Toynbee as Superintendent of the marine branch.

In 1869 the Department was dispossessed of its quarters in 1, Parliament Street, belonging to the Board of Trade, and hired for itself the residential flat then known as 116, Victoria Street.

In 1876 a second Government inquiry was held, and in the following year the Office passed under the control of a Council appointed by the Royal Society, with Mr. Scott as Secretary.

In 1903 a third inquiry into the work and status of the Office was held and the present system was then adopted, under which the Office is managed by a Director with an Advisory Committee appointed by the Treasury.

From 1869 to the present time the Office has occupied the premises at 116 (which was renumbered 63), Victoria Street.

The work of the Office has extended, and the Staff now includes, besides the Marine Superintendent (Commander Campbell Hepworth, R.N.R., C.B., R.D.), a Superintendent of Forecasts (Mr. R. G. K. Lempfert, M.A.), a Superintendent of Statistics (Mr. E. Gold, M.A.), and a Superintendent of Instruments (Mr. Richard Curtis).

The fully-equipped Meteorological Observatory at Eskdalemuir (under the superintendence of Mr. G. W. Walker) has been added to the list of Observatories already associated with the Office.

In 1903, Sir H. Maxwell's Committee pronounced the premises at 63, Victoria Street unsuitable for the work that had to be done in them, and in view of the importance to the working of the Office of the near proximity of a Post Office, a proposition was made to erect a building for the Meteorological Office and a new District Post Office in Exhibition Road, South Kensington.

The transfer of the Office Staff to the new premises was completed on November 15th, 1910, and the Committee invited a large party to an "At Home" in the new building on December 1st.

The Office premises are for the most part on the first and second floors of the new building at the corner of Exhibition Road and Imperial Institute Road; these two floors provide, besides the Library and its anteroom, a room for the Director and four rooms for the Superintendents and Director's Secretary; a large room for the Clerical Staff and another for the Forecast Staff; two rooms for the Marine Staff and two for the Instrument Staff. The ground floor and the greater part of the basement are assigned to the Post Office, but in the basement space has been reserved for a Printing Office and for a Workshop in connection with the Meteorological Office. A small Physical Laboratory and Photographic Room are provided on the third floor, the remainder of which is temporarily occupied by the Staff of the Science Museum. Access is gained on the third floor to a large flat roof, with space for the exposure of instruments for purposes of trial and investigation.

The Staircase, Library and anteroom, are finished with ornamental woodwork in Austrian oak. The Library is divided into six compartments by bookcases extending from the side walls; two of these recesses are furnished with tables for students, and on the book cabinets near them the latest additions to the Library are placed.

The Forecast Room on the second floor is in direct connection, by means of a pneumatic tube, with the instrument room of the Post Office.

Until quite recently education in the science of Meteorology has been neglected; the subject has been allowed to fall out of the

school curricula, and its place has been taken by sciences with which the teachers are more familiar. In moving their home from 63, Victoria Street to South Kensington, the Meteorological Committee hope to change that state of things. They have sought to secure space in which to display, for the information of the public, a series of exhibits which show what the work of the Office has been during the last 50 years, what its work is now, how it does it, and what its purpose is in doing it. The manner in which the Committee have utilised the space at their disposal, and have kept in view the educational purpose of the Office, will be seen from the subjoined abstract of the list of exhibits prepared for the party of December 1st.

*Outer Vestibule.*—Barograph, and the recording parts of instruments showing the Temperature on the roof of the Office and the Wind Velocity experienced at the top of the flag-pole.

*Ground Floor Hall.*—Weekly Report. Diagram showing the comparison of the weekly statistics of temperature, rainfall and sunshine of the present year with the average for 25 years.

*Staircase.*—Photographs of clouds. Diagrams representing the Temperature in the Upper Air as obtained from registering balloons in 1907-8. The Average Variation of temperature, rainfall and sunshine, week by week throughout the year in the 12 districts of the British Isles, and Local Variations of Weather.

*Hall. First Floor.*—Three cases of historical instruments, &c. :—illustrating (a) the period of Admiral FitzRoy, (b) that of Lieut-General Sir E. Sabine and Dr. R. H. Scott, (c) that of Professor H. J. S. Smith and Sir R. Strachey.

Record obtained by the Callendar electric sunshine recorder on the roof. Record of Rainfall on the roof.

*Ante-room.*—Relief map of the British Isles and neighbouring countries within a circle of 1,000 miles diameter, on the horizontal scale of 1/1,000,000, vertical scale 15/1,000,000.

Harmonic Analyser constructed by Mr. R. W. Munro from Lord Kelvin's designs.

The ordinary Outdoor Equipment of a Meteorological Station of the Second Order on the scheme approved by the Meteorological Office, the Royal Meteorological Society and the Scottish Meteorological Society.

Wall cases showing :—

Barograms from ships and from stations in the British Isles.

Illustrations of the use of isopleths : the average distribution of relative humidity and of the distribution of rainfall throughout the day at different times in the year.

Selection of Pressure-Tube Anemograms, to illustrate wind structure, &c.

Illustrations of line squalls.

Distribution of mean January and July temperature and rainfall along sections round the globe at latitudes  $50^{\circ}$  N. and  $50^{\circ}$  S., at  $23^{\circ}$  N. and  $23^{\circ}$  S., and at the Equator.

Sunshine and fog in London in the past 36 years.

Diagrams for comparing (a) the yield of Barley with the accumulated temperature of the summer and spring ; (b) the yield of Wheat with the rainfall of the previous autumn.

*Museum and Library.*—Normal Instruments adopted by the Meteorological Office for use at meteorological stations, and corresponding Instruments adopted by other countries.

Meteorological Logs and other documents illustrating the work in Marine Meteorology.

Charts, diagrams, &c., illustrating the history of the Daily Telegraphic Service for forecasts and storm warnings, and the results obtained from the observations at Climatological and Rainfall Stations.

Instruments designed and constructed by Mr. W. H. Dines, F.R.S., for the registration of temperature, &c., in the upper air, with specimens of the kite and balloons used in the investigation.

Glass models representing the distribution of temperature in the atmosphere up to a height of 15 miles over the British Isles on July 27th and 29th, 1908.

Wind vanes showing the velocity and direction of wind in the upper air, deduced from observations of pilot balloons at Ditcham Park, by Mr. C. J. P. Cave.

Apparatus, &c., designed and constructed for the Advisory Committee for Aeronautics.

Four cases illustrating the use of developable globes to represent mean values over the globe, viz. :—

i. Synoptic Chart of the distribution of pressure over the globe on 27th January, 1907, during the occurrence of exceptionally high pressure.

ii. "Réseau Mondial," showing the relation of the British Empire to the Meteorology of the globe.

iii. Averages of sea surface temperature and of air temperature over the land for February.

iv. Pressure and air temperature over the globe for January, 1905, on the smaller scale of  $1/80,000,000$ .

Kew and Eskdalemuir Observatories. Magnetic and Seismological results.

Stereo-photographs of clouds with extended base. (Presented by J. Tennant, Esq.)

Examples of lantern slides prepared in the Office.

Zoetrope showing the motion of air in travelling storms.

Rare Meteorological Books.

Relief Model of the Winter Quarters of the Antarctic S.S. "Discovery."

Two Kiosks exhibiting the Meteorological Records of the past week for Kew, Falmouth and Aberdeen. Sunshine records for a summer

day at 92 stations included in the Weekly Weather Report, and for the winter, December, 1909—January, 1910, in London (Bunhill Row), Westminster, Kew, Cambridge and Eastbourne.

Three Cabinets containing the Daily Weather Reports of all countries, the latest Climatological Reports for the British Dominions, and the unfolded maps for developable globes on the scale of 1/20,000,000.

Two Tables on which are set out Meteorological Atlases and New Books.

*Physical Laboratory and Photographic Room.*—Experimental illustrations of the formation of clouds and of halos and coronæ.

*Marine Rooms.*—Collection of 13,500 meteorological logs, from 1854 to the present time, with some logs of a still earlier date.

*Instrument Rooms.*—Pantagraphs and other drawing apparatus. Stock of instruments for the supply of the Navy, the Mercantile Marine, and Office Stations.

*Forecast Room.*—Collection of working charts and reports prepared in the Office, 1860–1910, and of Daily Weather Reports, with daily synoptic charts of the Atlantic Ocean and of the Northern Hemisphere.

*Statistical Room.*—Collection of manuscript registers of observations from British stations.

With the permission of the Director the Museum and Library are open to anyone who wishes to consult the books or documents or to examine the results exhibited; opportunity is thus afforded for school classes, and others interested in Meteorology as a subject of education, to make themselves acquainted with the most recent developments of Meteorological work.

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## ROYAL METEOROLOGICAL SOCIETY.

THE opening meeting of the session, which was held on Wednesday evening, November 16th, was devoted to the consideration of four papers dealing with the investigation of the upper atmosphere.

The first was by Miss Margaret White, in which she described the second series of hourly balloon ascents made from Manchester with the object of obtaining information on the diurnal variation in the temperature at high altitudes. These experiments, which have been carried out at the suggestion of Prof. A. Schuster, F.R.S., were made on March 18th–19th, 1910. Twenty-eight small rubber balloons, carrying Dines' meteorographs, were liberated hourly from the Physical Laboratories of the University, and of these 20 have been recovered. The balloons left Manchester going at first in a southerly and later south-easterly direction, and were found in the Worcester, Hereford and Monmouth district—one reaching North Devon. Although the maximum height varied from 9 to 20 km., the direction of the places of fall was constant within less than 2°, showing that the direction of the upper wind was unchanged during the period over

which the ascents extended. The general character of the variation with height of the temperature of the earth's atmosphere, as obtained from the results of registering balloon and kite ascents, is clearly shown by the results of this series. A large gradient for the first kilometer is followed by a small gradient from 1 to 3 km., which gradually increases up to about 10 km., when it suddenly decreases rapidly and changes sign between 10 and 12 km. at the lower limit of the stratosphere. This small negative gradient in general persists up to above 15 km., beyond which a very small gradient, either positive or negative, is recorded. Such an inversion of temperature has been shown in every ascent at the lower limit of the stratosphere, and its existence is confirmed by the records of the hourly balloon series, both in June, 1909, and in March, 1910. The average height of the stratosphere was 10·7 km.

The second paper was read by Mr. W. H. Dines, F.R.S., in which he gave a brief summary of the results obtained from the registering balloon ascents, which were carried out in the British Isles during the two international weeks, December 6th–11th, 1909, and August 8th–13th, 1910. Balloons were sent up on each occasion from Ditcham Park, near Petersfield; Pyrton Hill, Oxon; Manchester; Crinan in Argyllshire, and also in the west of Ireland. Seventeen records were secured in the December ascents, and these show that the values for the height of the stratosphere are some of the lowest ever observed, and the temperatures are, perhaps, the lowest ever recorded at a height of 5 miles. Of the balloons sent up in the August week, seventeen were found. The average height attained was about 10 miles. The inversion of temperature at the commencement of the isothermal layer was larger than usual.

In the third paper Mr. C. J. P. Cave gave an account of the Pilot Balloon Observations which were made in Barbados during the International week, December 6th–11th, 1909. These observations, which were undertaken at the request of the Royal Meteorological Society, were carried out by Mr. Radcliffe Hall and others. Eighteen balloons were sent up. They were not followed by the theodolites long enough for the westerly current above the trade wind to be observed. The greatest height reached was 5 km. on December 10th, and the wind was east at this height and apparently slightly increasing in strength. In general the wind behaves like an east wind in this country, increasing to a maximum and then falling off above. The prevalence of clouds during the day-time interfered with the ascents, many of the balloons being lost to sight after a few minutes.

The fourth paper, by Mr. W. Marriott, described three registering balloon ascents carried out at the Royal Agricultural Society's Show at Liverpool, June 21st–23rd, 1910. All three records were recovered. On the 21st the lowest temperature recorded was  $-52^{\circ}6$  F. at 6·2 miles, and the balloon fell at Kirkby Stephen, 77 miles north-north-east. On the 22nd the balloon, which reached an altitude of only 5 miles where the temperature was  $-29^{\circ}2$  F., fell at Kirkham,

26 miles north. On the 23rd the lowest temperature recorded was  $-59^{\circ} \cdot 8$  F. at a height of 6·5 miles, and the balloon fell near Buxton, 43 miles east-south-east.

Dr. W. N. Shaw congratulated both the authors of the various papers and all those who had helped them in the ascents. He pointed out that the sending up of balloons carrying recording instruments for 24 hours in succession was a piece of enterprise which, with the exception of the previous Manchester ascents, was unique.

Dr. R. Glazebrook thought that much of the success of the investigations was due to the remarkable simplicity of the instruments used, and their extreme adaptability to the purposes necessary; and that meteorology owed a large debt of gratitude to Mr. Dines for the designs of the instruments used, and also for the way in which he had placed his services at the disposal of meteorologists, and showed how the results obtained from the instruments should be interpreted.

Mr. E. Gold drew attention to the fact that the results shown both by Miss White and by Mr. Marriott indicated that the general direction of the wind, at the surface and up above, was in agreement with the theoretical wind shown by the isobars. It was generally the case that where there was a well defined gradient having the same general direction over a considerable area, the direction of the place of fall of the balloon was roughly the same as that of the gradient wind.

Mr. W. W. Bryant and Prof. C. V. Boys considered it desirable that steps should be taken to ensure a thoroughly efficient calibration of the instruments.

Capt. C. H. Ley, Mr. A. Mallock, Colonel H. E. Rawson, Mr. J. E. Clark and Mr. E. S. Bruce, also took part in the discussion.

Mr. Dines, in reply, said that the upper northerly current was a hindrance to his work, as it carried the balloons sent up at Pyrton Hill into the Channel. It did not seem possible to know from the surface conditions where it would prevail; were it possible to know he should certainly abstain from starting balloons on such occasions. Mr. Dines explained how the instruments were calibrated, and referred to letters on the subject that had appeared in *Nature*.

Miss White and Mr. Cave also replied.

The following new Fellows were elected:—Dr. H. S. Anders, Mr. A. Barnes, Mr. J. Busfield, Mr. H. G. Busk, Mr. R. Chambers, Mr. A. F. Collins, Mr. D. J. Devlin, Mr. F. W. Dyson, F.R.S., Mr. G. M. S. Farmer, Mr. G. G. Kennedy, Dr. P. Olsson-Seffer, Mr. Abdus-Salam Rafiqi, Mr. H. P. Raikes, M.Inst.C.E., Mr. A. S. M. Smith, Lieut. C. E. Stuart, R.N.R., Mr. J. A. Turnbull, Capt. W. G. Walker-Gilchrist, Rev. S. B. Warde, and Mr. O. J. Wilkinson, Assoc. M.Inst.C.E.

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## THE WEATHER OF NOVEMBER.

By FRED. J. BRODIE.

THE absence of cold weather which formed so striking a feature in the meteorological history of October was amply compensated for in the succeeding month, which was undoubtedly one of the coldest, and in many parts of the country, one of the wettest Novembers on record. In London the one month is normally about six degrees colder than the other; this year, owing to the unusual warmth of October and the coolness of November, the difference in mean temperature amounted to more than fifteen degrees—a decline altogether without precedent in the record of the past 40 years.

The general inclemency of last month appears to have been due, in the first place, to the abnormal prevalence of cyclonic systems, which passed in quick succession across the United Kingdom. The absence of warmth may, however, be attributed in a larger measure to the almost constant presence of high barometrical pressures over and to the northward of Iceland, a feature which has been in evidence for some months past, and accounted in a degree for the unseasonable weather of the summer. Over and over again, in the rear of the various depressions which appeared last month over our own islands, a stream of air descended from the cold northern anticyclone, the normal prevalence of south-westerly winds being thus replaced by harsh breezes from north-west and north. When the southerly and south-westerly current had fair play, which occurred only once or twice, and chiefly between the 13th and 15th of the month, the thermometer rose to a tolerably high level, the shade readings mounting to between  $50^{\circ}$  and  $55^{\circ}$  in many parts of England and Ireland, and touching  $58^{\circ}$  on the 15th at Geldeston. Equally high values were recorded over Ireland on the 22nd and 23rd, but at other times the daily maxima were nearly all below  $50^{\circ}$ , and in many parts of north Britain that very moderate level was not reached in the course of the whole month. At the London observing station of the Meteorological Office the absolute maximum,  $54^{\circ}$  on the 1st, 4th and 6th, was the lowest recorded in November since 1878, when the thermometer failed to rise above  $53^{\circ}$ . At Leith, and a similar remark applies doubtless to many other northern stations, the absolute maximum of  $48^{\circ}$  was the lowest in November for at least 39 years past.

The sharpest frosts of last month occurred respectively on the 5th, between the 9th and 11th, the 17th to 19th, the 22nd and 23rd and the 29th and 30th. Those of the 17th to 19th and 22nd to 23rd were especially severe, the sheltered thermometer falling below  $20^{\circ}$  in many parts of the United Kingdom, and below  $15^{\circ}$  in some of the Scottish districts; at Balmoral early on the 23rd a minimum as low as  $10^{\circ}$  was registered. On the surface of the grass the readings on the 22nd and 23rd were in many places at least  $20^{\circ}$  below the freezing point, a minimum as low as  $7^{\circ}$  being recorded at West

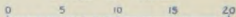
THAMES VALLEY RAINFALL NOVEMBER, 1910.



ALTITUDE  
SCALE

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

SCALE OF MILES





Linton, in Peebleshire, and a reading of  $8^{\circ}$  at Balmoral and Llangam-march Wells. At a large number of stations frosty nights were more numerous than in any recent November. In London the thermometer in the screen sank below the freezing point on as many as 17 nights, the number of such occasions being nearly three times the average, and larger than in any November since that of 1871. The mean minimum temperature in the metropolis,  $32^{\circ}5$ , was nearly  $6^{\circ}$  below the average, and was lower than in any November of the past forty years.

In spite of the generally unsettled state of the weather, the total duration of bright sunshine last month was nearly everywhere above the normal. Up to the close of the third week the aggregate in London bid fair to eclipse the record, but owing to a complete absence of sunshine during the last nine days the total at Westminster for the month, 36 hours, was only 9 hours in excess of the average.

### Correspondence.

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

#### HEAVY RAINFALL IN GUERNSEY.

OCTOBER and November, but November especially, have been two such very wet months in Guernsey that a few particulars may be interesting. Seventeen years ago I commenced measuring the rainfall at this place and had never, until last month, reached 8 inches as a monthly total. Including November, 1910, 7 inches, in fact, has only been topped on six occasions in the entire period. The dates and the total rainfall for these very wet months are given below, and it will be seen that November, 1910, beat the previous record (October, 1896, with 7.65 in.) by as much as 3.48 in. The table also shows that, together, October and November have given the enormous amount, for the Channel Islands, of 18.72 in. This is 55 per cent. of the year's average total, which, at this station, is 33.95 in.

|      |      |      |      |      |       |
|------|------|------|------|------|-------|
| 1896 | 1905 | 1907 | 1909 | 1910 | 1910  |
| Oct. | Nov. | Oct. | Oct. | Oct. | Nov.  |
| in.  | in.  | in.  | in.  | in.  | in.   |
| 7.65 | 7.45 | 7.46 | 7.18 | 7.59 | 11.13 |

October and November, 1910, 18.72 in.

The island possesses, in addition to my own and other shorter records of rainfall, a valuable record (Hoskins-Collinette) extending back, intact, from to-day to the year 1843. From this I gather that twice only during the long interval of nearly seven decades has 11 inches of rain fallen in Guernsey in one month. These exceptional instances were October, 1872, with 11.04 in., and December, 1876, with 11.47 in.

In 1908 Guernsey suffered from an unusual deficiency of rainfall, a deficiency which 1909 in no way helped to make up. The wiping

out of the great shortage has apparently been reserved for 1910 to accomplish, and to all appearances it will be done, or very nearly so. At any rate from an accumulated deficit of 12·05 in., as late as last September, the figures have fallen rapidly and to-day stand at 0·90 in. It only requires that December be rather more wet than usual and the rainfall at this station will once more be at par.

BASIL T. ROWSWELL.

*"Les Blanchés," Guernsey, December 3rd, 1910.*

THE rainfall here for the month of November may be of interest. The total was 9·80 in. on 26 days, the greatest fall in 24 hours was 1·57 in. on 29th. In November, 1907, the total fall was 1·70 in., and in November, 1909, 2·13 in. For November, 1908, I have no record. Much of the country is under water. We have registered practically no frost as yet.

PERCY A. GORE.

*Les Combournaises, Dinan, Côtes-du-Nord, December 1st, 1910.*

### EXCEPTIONAL NOVEMBER COLD.

ON November 16th the thermometer fell below 32° at 5.30 p.m., and during the night registered a minimum of 20°·5. At 9 a.m. on the 17th it was 23°, and during the day reached a maximum of only 31°·2, a very low reading for the time of year. At 6 p.m. it was 26°·7, and did not rise above 32° until 7.30 a.m. on the 18th.

The temperature was therefore continuously below the freezing point from 5.30 p.m. on the 16th until 7.30 a.m. on the 18th, or 38 hours consecutively. This, I think, is very unusual for the middle of November in the south of England.

The above readings were taken in the Stevenson screen with Kew certified thermometer.

H. K. G. ROGERS.

*"Glenart," Weybridge, 20th November, 1910.*

### UNUSUAL DARKNESS.

ON November 15th, from 2 to 3 p.m., dense slow-moving clouds from N.N.W. involved us in a gloom which, as far as my recollection serves, is without a parallel in my experience. It was impossible to read without artificial light, in fact people here found it necessary to employ gas or oil lamps in proceeding with their business or domestic occupations. Showers of rain fell, but the amount was light, and nothing like the torrential descent which accompanies a thunderstorm. There was also a little hail, but no fog or mist, the barometer was very low, and had shown great fluctuations on few preceding days. At night there was a brilliantly coloured lunar halo and corona.

W. F. DENNING.

*Bristol, November 17th 1910.*



## REMARKABLE WEATHER IN SEPTEMBER AND OCTOBER, 1910, IN THE LAKE DISTRICT.

As the rainfall for the two months, September and October, when taken together, and the long continuance of most beautiful weather during the same period, constitutes an absolute record in this neighbourhood, I send you some figures relating thereto, which perhaps may not be uninteresting.

The records of myself and my predecessor go back for 39 years, and the average rainfall in the two months, September and October, for the whole series of years is 11.55 in. For this year the full amount was 3.30 in.; the nearest approach to this was in 1902 when there was just 6.00 in. of rain in the two months. Of this amount, (3.30 in.), 1.55 in. fell in the first two days of September and the last day of October; of the intervening 58 days 41 were absolutely fine and mostly sunny; of the remaining 17 days, ten had an average fall of .025 in. per day, and the other seven had an average fall of .214 in. per day. From September 2nd to 24th there was no rain, except for some slight showers which fell on four nights, and which were not noticeable except by a regular observer. In October there was no rain from the 4th to the 16th, except for a slight shower on the 11th, and it was again rainless from the 21st to 30th inclusive, except that .01 in. was measured on the 28th, which was due to a thick mist one evening.

CHAS. P. CHAMBERS.

*Orchard Head, Broughton-in-Furness, November 9th, 1910.*

## LUNAR ECLIPSE: FIREBALL.

THE eclipse of the moon was witnessed here under the best atmospheric conditions on November 16th. Not a cloud marred the picturesque spectacle. There was sharp hoar frost and a little fog, but during totality the stars apparently shone with the same brilliancy as on an ordinary moonless night. The moon is very rarely altogether obscured during a so-called total eclipse, and on this occasion she could be seen as a pretty bright copper coloured ball near the Pleiades. The ring of the Earth's atmosphere, through which the solar rays were refracted to the eclipsed moon, must have been fairly transparent on this occasion. It is remarkable that nearly all the lunar eclipses which have occurred during the last 40 years have been witnessed at Bristol. This gives weight to the opinion held by Sir J. Herschel and others that the full moon possesses the faculty of clearing away clouds.

A splendid meteoric fireball belonging to the shower of Leonids appeared during the total phase at 12.26 a.m., and passed from over a point between Edinburgh and Glasgow to above the sea north of Portrush, Ireland. Its height was from 80 to 41 miles, length of luminous course 133 miles, traversed at a velocity of 35 miles per second. The fireball left a drifting streak for 20 minutes as observed at Penicuik, near Edinburgh.

W. F. DENNING.

*Bristol, November 25th, 1910.*

## ROOF WATERSHEDS.

I WAS much interested in the account in *Symons's Meteorological Magazine* for November, of the house at Barnoldswick which acts as a water parting, and no doubt you will receive many communications as to similar cases. At the risk of calling your attention to one of which you already know, I may mention that there stands, or used to stand some years ago, a house by the side of the road from Dolgelly to Bala exactly on the dividing line between the gathering ground of the river Dee and that of the Wnion, which enters the sea at Barmouth, after junction with the Mawddach. The fact is mentioned in some guide books to North Wales.

M. J. SALTER.

*Mickleton, Glos., 22nd November, 1910.*

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## THE COLD NOVEMBER IN LONDON.

IN contrast to the very mild October of this year November proved extremely cold, and the temperature observations at Camden Square afford some interesting comparisons with past years. The return to mild conditions during the early part of December, has put out of the minds of most the long persistence of early frost which took place during the month just closed, and it comes almost as a shock to find that we have experienced a November the mean temperature of which, as recorded at Camden Square, was only  $38^{\circ}6$ , or  $4^{\circ}7$  below the average, and the lowest with one single exception in 53 years. As in October, although the conditions were reversed, the minimum temperature was the special feature, and in the case of both the screen and grass temperatures the means for the month were well below the previously lowest recorded, the former being  $32^{\circ}3$ , or  $5^{\circ}8$  below the average, and the latter  $27^{\circ}3$ , or  $6^{\circ}6$  below the average; the previous lowest mean grass minimum was  $29^{\circ}2$  in 1896. The number of frosts in the screen, 15, or 9 above the average, has been equalled twice, in 1871 and 1879, but never exceeded; and the number on grass, 25, or 13 above the average, has never been approached nearer than by 22 in 1861 and 1879; in 1871, which was the only November with a lower mean temperature, the number of grass frosts was 21. The mean maximum in 1910 was  $45^{\circ}4$ , or  $3^{\circ}6$  below the average; this has been lower on four previous occasions. The actual extremes of minimum temperature, viz.,  $24^{\circ}0$  in the screen and  $19^{\circ}7$  on the grass, have been exceeded fairly frequently, bearing witness to the fact that the low temperature recorded on this occasion was not the result of a few very cold days, but of a continuous cold spell.

It is not without interest to observe that the fall of mean temperature from October to November during the present year was as much as  $15^{\circ}2$  compared with a normal fall of  $6^{\circ}7$ . No larger fall has ever been recorded here. The fall of the mean minimum was

still more remarkable, amounting to  $16^{\circ}\cdot 0$ , or  $11^{\circ}\cdot 5$  above the average in the screen, and to  $16^{\circ}\cdot 5$ , or  $11^{\circ}\cdot 1$  above the average, on the grass.

The usual accompaniment of a cold winter month is anticyclonic weather and lack of rainfall; but although the total rainfall in London was not greatly above the average, the conditions were, except for a brief period, of an unsettled type, with frequent prolonged rain showers. The duration of rainfall was 81·9 hours, or 36·4 hours above the average of 24 years, and the greatest in November in 30 years' observations, the nearest approach being 81·8 hours in November, 1888. On four days the duration measured more than 10 hours, a figure not previously reached during 1910. A period of sunlessness set in on the 22nd, and at the time of writing (December 12th) the total duration of bright sunshine recorded since and including that date has amounted to less than one hour.



### SCOTTISH METEOROLOGICAL SOCIETY.

THE Annual Business Meeting of the Society was held at 5, St. Andrew's Square, Edinburgh, on 6th December, 1910, Sir Archibald Buchan-Hepburn, Bart., in the chair.

The report from the Council expressed satisfaction at the fact that the publication, by the Royal Society of Edinburgh, of the observations made on Ben Nevis and at Fort William had been completed by the issue of Vol. 44 of the *Transactions* of that Society. It was to be noted that not only had the observations themselves been printed in great detail, but that the four volumes in which they appeared (*Trans. Roy. Soc. Edin.*, Vols. 36, 42, 43 and 44) contained also numerous papers in which various theoretical and practical aspects of the observations were discussed. The Council desired to place on record their sense of the deep obligation they were under to the Royal Society of Edinburgh for publishing the work in such a complete and handsome manner. It was a matter of further satisfaction that almost simultaneously with the completion of the publication of the Ben Nevis observations and results, the Society had, through the generosity of its friends, been entirely relieved from the burden of debt which it had to assume when the Observatories were closed in 1904.

The following were appointed Office-bearers and Council for the ensuing twelve months:—*President*: Professor A. Crum Brown, M.D., LL.D., F.R.S. *Vice-Presidents*: J. Mackay Bernard and Ralph Richardson, W.S. *Council*: James Macdonald, C. G. Knott, D.Sc., Sir David Paulin, Gilbert Thomson, H. M. Cadell, Captain H. G. Lyons, D.Sc., F.R.S., Sir A. Buchan-Hepburn, Bart., G. G. Chisholm and M. McCallum Fairgrieve. *Hon. Secretaries*: R. T. Omond and E. M. Wedderburn, W.S. *Hon. Treasurer*: W. B. Wilson, W.S.

Thereafter Mr. A. Watt, Secretary, read a paper on "The Early Days of the Society." The foundation of the Society in 1855 was due mainly to the exertions of Sir John Stuart Forbes, Bart., brother



of the famous Professor of Natural Philosophy, and of David Milne Home, of Wedderburn, who was well known as a geologist. And from the beginning the society was supported in the most strenuous manner by the Eighth Marquis of Tweeddale, by Alexander Keith Johnston, by Thomas Stevenson and by Sir Arthur (then Dr) Mitchell. That early band of remarkable men never wavered in their allegiance to the society, and of them Stevenson and Milne Home lived to see the establishment of the Observatory on Ben Nevis, which may be regarded as the crowning point of Milne Home's long scientific career, for the suggestion of the observatory was due to him; whilst Sir Arthur Mitchell rendered devoted service to the society for fully half a century. A sketch was given of the scientific outlook in the middle of last century. The founders of the society had, of course, in view the double aim of encouraging special researches and of organising observations in the various districts of Scotland, and though from the first generous support was received from people of all classes, the actual commencement of work might have been considerably delayed but for the independent action of Dr. James Stark, who had just been appointed Superintendent of Statistics in the newly-established Department of the Registrar-General for Scotland. In 1856 Dr. Stark was appointed secretary to the society, but resigned two years later when the growing interests of the society demanded the attention of a man who could give his whole time to the work. Dr. Buchan became secretary in 1860. The paper went on to relate the various researches in which the society had engaged, the state of the membership at various times, and the present outlook.

## INTERNATIONAL BALLOON ASCENTS, IN JUNE, 1908.

By W. H. DINES, F.R.S.

*June 11th, 1908.*

| Starting Point.         | Country.     | A<br>miles. | B<br>° F. | C<br>miles. | D<br>° F. | E<br>miles. | F         |
|-------------------------|--------------|-------------|-----------|-------------|-----------|-------------|-----------|
| Brussels .....          | Belgium .... | 7·5         | —85       | 9·1         | —67       | 16          | S.S.E.    |
| Hamburg.....            | Germany .... | 7·5         | —81       | 10·6        | —58       | 37          | S. by E.  |
| Lindenberg....          | " ....       | 7·5         | —71       | 8·7         | —58       | 88          | S. by E.  |
| Strassburg ....         | " ....       | 7·7         | —83       | 11·2        | —62       | 21          | S. by E.  |
| Munich.....             | " ....       | 7·9         | —73       | 11·6        | —44       | 27          | S.S.E.    |
| Pavia.....              | Italy.....   | 7·2         | —87       | 8·0         | ?         | 26          | S.W. by S |
| Nigin Oltchidaeff ..... | .....        | 6·7         | —53       | 10·0        | —58       | 70          | N.E.      |

A=Height in miles of commencement of isothermal column.

B=Temperature, F°, at bottom of column.

C=Greatest height of reliable record in miles.

D=Temperature, F°, at greatest height.

E=Distance in miles of point where balloon fell.

F=Bearing of falling point from starting point.

Again all the English balloons were lost. Over the Continent an extensive high-pressure area prevailed, with small gradients.

## METEOROLOGICAL NEWS AND NOTES.

DR. W. N. SHAW, F.R.S., will give a course of eight lectures on "Climatology, with special reference to British Possessions," at the London School of Economics and Political Science, Clare Market, on Fridays at 5 p.m., beginning on January 20th, 1911.

LOCAL RAINFALL RECORDS are liable to be influenced by a multitude of disturbing influences into which we make it our duty to enquire. In the case of health resorts one of these influences may possibly be inferred from the following innocent remark which we take from the report of a council meeting printed in a local paper :—

"Alderman Jones said he was told that the rain water gauge from which the rainfall records were taken showed higher results than the one in the open. He thought this was a matter which should be seen to, as it was detrimental to the town."

A METEOROLOGICAL POST CARD has fallen into our hands, which suggests that in the King's Dominions over the Seas the authorities are less conservative in their methods of making public useful scientific information than we have grown to be in this country. The post card gives in the form of a neat diagram the average monthly rainfall at a number of important stations in Australia, and serves to illustrate in a striking manner the extraordinary diversity of type of seasonal distribution which exists in that continent.

THE "BOTANICAL JOURNAL," which entered on its career with the issue for October last, is intended to take the place of the now defunct *Quarterly Record of the Royal Botanic Society*. The number before us contains an abstract of the meteorological observations taken in the Gardens of the Society in Regent's Park during 1909, and complete daily records for the last six months of that year. We welcome the reappearance of this valuable series in its new and greatly improved setting.

ROOF AND GROUND RAIN GAUGES usually differ somewhat widely in their indications. We have been informed that Mr. H. D. Vavasour, of Ugbrooke Station, Blenheim, New Zealand, has a rain gauge funnel fixed 3 feet above the roof of his house, and the rainfall is led by a "compo." pipe into a room beneath, for a distance of about 15 feet, to a bottle. He has made comparisons between the records obtained in this way and those of a gauge set up in the garden under the usual conditions. The most remarkable fact obtained was that in registering dews the roof gauge will register ·01, and the ground gauge *nil*. If the gauge on the roof registers ·02, the gauge on the ground will register ·005, which is taken as ·01 according to the rules. In heavy rains the gauge on the ground will register from 2 to 4 per cent. more than the roof gauge.

## RAINFALL TABLE FOR NOVEMBER, 1910.

| STATION.                       | COUNTY.            | Lat.<br>N. | Long.<br>W.<br>[*E.] | Height<br>above<br>Sea.<br>ft. | RAINFALL<br>OF MONTH           |              |
|--------------------------------|--------------------|------------|----------------------|--------------------------------|--------------------------------|--------------|
|                                |                    |            |                      |                                | Aver.<br>1875—<br>1909.<br>in. | 1910.<br>in. |
| Camden Square.....             | London.....        | 51 32      | 0 8                  | 111                            | 2'34                           | 3'19         |
| Tenterden.....                 | Kent.....          | 51 4       | *0 41                | 190                            | 3'07                           | 5'19         |
| Steyning.....                  | Sussex.....        | 50 53      | 0 20                 | 80                             | 3'91                           | 6'06         |
| Southampton (Cadland) ..       | Hampshire.....     | 50 50      | 1 22                 | 52                             | 3'39                           | 3'98         |
| Hitchin.....                   | Hertfordshire..... | 51 57      | 0 17                 | 238                            | 2'46                           | 4'00         |
| Oxford (Magdalen College).     | Oxfordshire.....   | 51 45      | 1 15                 | 186                            | 2'25                           | 2'95         |
| Bury St. Edmunds (Westley)     | Suffolk.....       | 52 15      | *0 40                | 226                            | 2'40                           | 2'71         |
| Geldeston [Beccles].....       | Norfolk.....       | 52 27      | *1 31                | 38                             | 2'49                           | 3'69         |
| Polapit Tamar [Launceston]     | Devon.....         | 50 40      | 4 22                 | 315                            | 4'07                           | 6'94         |
| Rousdon [Lyme Regis].....      | ".....             | 50 41      | 3 0                  | 516                            | 3'51                           | 4'94         |
| Stroud (Upfield).....          | Gloucestershire..  | 51 44      | 2 13                 | 226                            | 2'77                           | 4'01         |
| Church Stretton (Wolstaston).. | Shropshire.....    | 52 35      | 2 48                 | 800                            | 2'94                           | 4'36         |
| Coventry (Kingswood).....      | Warwickshire...    | 52 24      | 1 30                 | 340                            | 2'61                           | 4'95         |
| Market Overton.....            | Rutland.....       | 52 44      | 0 41                 | 475                            | 2'47                           | 3'86         |
| Boston.....                    | Lincolnshire.....  | 52 58      | 0 1                  | 25                             | 2'05                           | 2'58         |
| Worksop (Hodsock Priory).      | Nottinghamshire    | 53 22      | 1 5                  | 56                             | 1'98                           | 3'00         |
| Macclesfield.....              | Cheshire.....      | 53 15      | 2 7                  | 501                            | 3'00                           | 5'12         |
| Southport (Hesketh Park)..     | Lancashire.....    | 53 38      | 2 59                 | 38                             | 3'16                           | 4'82         |
| Wetherby (Ribston Hall)...     | Yorkshire, W.R.    | 53 59      | 1 24                 | 130                            | 2'34                           | 3'13         |
| Arneliffe Vicarage.....        | ".....             | 54 8       | 2 6                  | 732                            | 6'12                           | 6'52         |
| Hull (Pearson Park).....       | "..... E.R.        | 53 45      | 0 20                 | 6                              | 2'34                           | 3'01         |
| Newcastle (Town Moor)...       | Northumberland     | 54 59      | 1 38                 | 201                            | 2'63                           | 3'10         |
| Borrowdale (Seathwaite)...     | Cumberland.....    | 54 30      | 3 10                 | 423                            | 13'59                          | 9'98         |
| Cardiff (Ely).....             | Glamorgan.....     | 51 29      | 3 13                 | 53                             | 4'08                           | 6'67         |
| Haverfordwest.....             | Pembroke.....      | 51 48      | 4 58                 | 95                             | 5'16                           | 5'49         |
| Aberystwyth (Gogerddan)..      | Cardigan.....      | 52 26      | 4 1                  | 83                             | 4'50                           | 6'78         |
| Llandudno.....                 | Carnarvon.....     | 53 20      | 3 50                 | 72                             | 3'19                           | 5'27         |
| Cargen [Dumtries].....         | Kirkcudbright...   | 55 2       | 3 37                 | 80                             | 4'35                           | 6'18         |
| Marchmont House.....           | Berwick.....       | 55 44      | 2 24                 | 498                            | 3'21                           | 3'52         |
| Girvan (Pinmore).....          | Ayr.....           | 55 10      | 4 49                 | 207                            | 5'24                           | 4'64         |
| Glasgow (Queen's Park)...      | Renfrew.....       | 55 53      | 4 18                 | 144                            | 3'63                           | 2'95         |
| Inveraray (Newtown).....       | Argyll.....        | 56 14      | 5 4                  | 17                             | 7'39                           | 4'66         |
| Mull (Quinish).....            | ".....             | 56 34      | 6 13                 | 35                             | 6'24                           | 4'31         |
| Dundee (Eastern Necropolis)    | Forfar.....        | 56 28      | 2 57                 | 199                            | 2'62                           | 2'62         |
| Braemar.....                   | Aberdeen.....      | 57 0       | 3 24                 | 1114                           | 3'76                           | 2'85         |
| Aberdeen (Cranford).....       | ".....             | 57 8       | 2 7                  | 120                            | 3'29                           | 5'98         |
| Cawdor.....                    | Nairn.....         | 57 31      | 3 57                 | 250                            | 2'60                           | 5'04         |
| Fort Augustus (S. Benedict's)  | E. Inverness.....  | 57 9       | 4 41                 | 68                             | 4'51                           | 4'07         |
| Loch Torridon (Bendamph)       | W. Ross.....       | 57 32      | 5 32                 | 20                             | 8'90                           | 8'51         |
| Dunrobin Castle.....           | Sutherland.....    | 57 59      | 3 56                 | 14                             | 3'25                           | 6'51         |
| Wick.....                      | Caitness.....      | 58 26      | 3 6                  | 77                             | 2'95                           | 6'77         |
| Killarney (District Asylum)    | Kerry.....         | 52 4       | 9 31                 | 178                            | 5'54                           | 6'11         |
| Waterford (Brook Lodge)...     | Waterford.....     | 52 15      | 7 7                  | 104                            | 3'80                           | 4'30         |
| Nenagh (Castle Lough).....     | Tipperary.....     | 52 54      | 8 24                 | 120                            | 3'88                           | 3'23         |
| Miltown Malbay.....            | Clare.....         | 52 52      | 9 26                 | 400                            | 4'50                           | 4'87         |
| Gorey (Courtown House)...      | Wexford.....       | 52 40      | 6 13                 | 80                             | 3'41                           | 4'80         |
| Abbey Leix (Blandsfort)....    | Queen's County..   | 52 56      | 7 17                 | 532                            | 3'28                           | 3'35         |
| Dublin (Fitz William Square)   | Dublin.....        | 53 21      | 6 14                 | 54                             | 2'64                           | 2'54         |
| Mullingar (Belvedere).....     | Westmeath.....     | 53 29      | 7 22                 | 367                            | 3'38                           | 3'16         |
| Ballinasloe.....               | Galway.....        | 53 20      | 8 15                 | 160                            | 3'59                           | 3'55         |
| Crossmolina (Enniscroe).....   | Mayo.....          | 54 4       | 9 18                 | 74                             | 5'75                           | 6'13         |
| Collooney (Markree Obsy.).     | Sligo.....         | 54 11      | 8 27                 | 127                            | 4'02                           | 5'22         |
| Seaforde.....                  | Down.....          | 54 19      | 5 50                 | 180                            | 3'86                           | 3'73         |
| Bushmills (Dundarave).....     | Antrim.....        | 55 12      | 6 30                 | 162                            | 3'77                           | 5'53         |
| Omagh (Edenfel).....           | Tyrone.....        | 54 36      | 7 18                 | 280                            | 3'66                           | 3'65         |

RAINFALL TABLE FOR NOVEMBER, 1910—*continued.*

| RAINFALL OF MONTH (con.) |          |                   |        |             | 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. in.  | 1910. in. | Diff. from Aver. in. | % of Av. |                        |                 |
| in.                      |          | in.               | Date.  |             | in.                   | in.       | in.                  |          | in.                    |                 |
| + .85                    | 137      | .76               | 30     | 16          | 22.08                 | 22.07     | — .91                | 96       | 25.11                  | Camden Square   |
| +2.12                    | 169      | .75               | 13     | 19          | 24.87                 | 26.65     | +1.78                | 107      | 27.64                  | Tenterden       |
| +2.15                    | 155      | 1.07              | 13     | 13          | 30.13                 | 36.08     | +5.95                | 120      | 33.58                  | Steyning        |
| + .59                    | 117      | .67               | 23     | 17          | 28.64                 | 28.65     | + .01                | 100      | 31.87                  | Cadland         |
| +1.54                    | 162      | 1.08              | 27     | 16          | 23.05                 | 23.27     | + .22                | 101      | 25.16                  | Hitchin         |
| + .70                    | 131      | .85               | 27     | 16          | 22.52                 | 21.66     | — .86                | 96       | 24.58                  | Oxford          |
| + .31                    | 113      | .68               | 27     | 14          | 23.26                 | 24.67     | +1.41                | 106      | 25.40                  | Westley         |
| +1.20                    | 148      | .58               | 27     | 22          | 21.66                 | 26.42     | +4.76                | 122      | 23.73                  | Geldeston       |
| +2.87                    | 170      | 1.00              | 13     | 27          | 33.81                 | 41.59     | +7.78                | 123      | 38.27                  | Polapit Tamar   |
| +1.43                    | 141      | .82               | 23     | 20          | 29.86                 | 31.55     | +1.69                | 106      | 33.54                  | Rousdon         |
| +1.24                    | 145      | .79               | 27     | 22          | 27.10                 | 29.87     | +2.77                | 110      | 29.81                  | Stroud          |
| +1.42                    | 148      | .94               | 27     | 23          | 29.42                 | 29.74     | + .32                | 101      | 32.41                  | Wolstaston      |
| +2.34                    | 190      | 1.12              | 27     | 18          | 26.32                 | 25.68     | — .64                | 98       | 28.98                  | Coventry        |
| +1.39                    | 156      | .88               | 27     | 18          | 24.69                 | 25.36     | + .67                | 103      | 27.10                  | Market Overton  |
| + .53                    | 126      | .83               | 27     | 15          | 21.47                 | 22.01     | + .54                | 103      | 23.35                  | Boston          |
| +1.02                    | 152      | .97               | 27     | 16          | 22.29                 | 21.34     | — .95                | 96       | 24.46                  | Hodsock Priory  |
| +2.12                    | 170      | .92               | 27     | 22          | 31.38                 | 35.02     | +3.64                | 112      | 34.73                  | Macclesfield    |
| +1.66                    | 152      | 1.01              | 10     | 22          | 29.60                 | 32.23     | +2.63                | 109      | 32.70                  | Southport       |
| + .79                    | 134      | .83               | 10     | 15          | 24.60                 | 27.92     | +3.32                | 113      | 26.87                  | Ribston Hall    |
| + .40                    | 107      | 1.12              | 10     | 18          | 54.74                 | 61.38     | +6.64                | 112      | 61.49                  | Arneliffe       |
| + .67                    | 129      | .90               | 27     | 18          | 24.10                 | 22.74     | —1.36                | 94       | 26.42                  | Hull            |
| + .47                    | 118      | .46               | 10     | 19          | 25.48                 | 25.34     | — .14                | 99       | 27.94                  | Newcastle       |
| —3.61                    | 73       | 3.00              | 6      | 18          | 114.34                | 112.83    | —1.51                | 99       | 129.48                 | Seathwaite      |
| +2.59                    | 163      | 1.02              | 13     | 22          | 37.58                 | 44.46     | +6.88                | 118      | 42.28                  | Cadiff          |
| + .33                    | 106      | .77               | 27     | 22          | 41.63                 | 38.56     | —3.07                | 93       | 46.81                  | Haverfordwest   |
| +2.28                    | 151      | 1.08              | 23     | 24          | 40.80                 | 48.78     | +7.98                | 119      | 45.46                  | Gogerddan       |
| +2.08                    | 165      | .57               | 28     | 27          | 27.52                 | 32.44     | +4.92                | 117      | 30.36                  | Llandudno       |
| +1.83                    | 142      | 1.42              | 6      | 11          | 38.63                 | 49.26     | +10.63               | 128      | 43.47                  | Cargen          |
| + .31                    | 110      | .85               | 12     | 19          | 30.93                 | 26.82     | —4.11                | 87       | 33.76                  | Marchmont       |
| — .60                    | 89       | .75               | 12     | 18          | 44.29                 | 46.86     | +2.57                | 106      | 49.77                  | Girvan          |
| — .68                    | 81       | .78               | 12     | 12          | 32.02                 | 35.01     | +2.99                | 109      | 35.97                  | Glasgow         |
| —2.73                    | 63       | 1.06              | 6      | 17          | 60.10                 | 59.51     | — .59                | 99       | 68.67                  | Inveraray       |
| —1.93                    | 69       | 1.02              | 6      | 20          | 49.98                 | 47.18     | —2.80                | 94       | 56.57                  | Quinish         |
| .00                      | 100      | .64               | 13     | 12          | 25.97                 | 26.00     | + .03                | 100      | 28.64                  | Dundee          |
| — .91                    | 76       | ...               | ...    | ...         | 31.80                 | 35.77     | +3.97                | 112      | 34.93                  | Braemar         |
| +2.69                    | 182      | .75               | 6      | 24          | 29.30                 | 28.14     | —1.16                | 96       | 32.73                  | Aberdeen        |
| +2.44                    | 194      | .76               | 13, 14 | 18          | 26.80                 | 29.60     | +2.80                | 110      | 29.33                  | Cawdor          |
| — .44                    | 90       | .63               | 14     | 22          | 38.91                 | 38.26     | — .65                | 98       | 44.53                  | Fort Augustus   |
| — .39                    | 96       | 1.42              | 1      | 20          | 73.91                 | 75.05     | +1.14                | 102      | 83.61                  | Bendamph        |
| +3.26                    | 200      | 1.62              | 6      | 24          | 28.81                 | 30.00     | +1.19                | 104      | 31.90                  | Dunrobin Castle |
| +3.82                    | 229      | .75               | 6      | 26          | 26.77                 | 28.99     | +2.22                | 108      | 29.88                  | Wick            |
| + .57                    | 110      | .73               | 4      | 27          | 47.89                 | 53.36     | +5.47                | 111      | 54.81                  | Killarney       |
| + .50                    | 113      | 1.08              | 22     | 17          | 35.25                 | 35.52     | + .27                | 101      | 39.57                  | Waterford       |
| — .65                    | 83       | .50               | 22     | 23          | 35.09                 | 37.49     | +2.40                | 107      | 39.43                  | Castle Lough    |
| + .37                    | 108      | 1.18              | 22     | 23          | 40.27                 | 40.01     | — .26                | 99       | 45.11                  | Miltown Malbay  |
| +1.39                    | 140      | 1.03              | 22     | 19          | 31.57                 | 33.42     | +1.85                | 106      | 34.99                  | Courtown Ho.    |
| + .07                    | 102      | .80               | 22     | 21          | 32.51                 | 38.22     | +5.73                | 118      | 35.92                  | Abbey Leix      |
| — .10                    | 96       | .58               | 22     | 17          | 25.41                 | 29.87     | +4.46                | 117      | 27.68                  | Dublin          |
| — .22                    | 93       | .55               | 22, 25 | 16          | 32.76                 | 36.91     | +4.15                | 113      | 36.15                  | Mullingar       |
| — .04                    | 99       | .62               | 22     | 23          | 32.95                 | 32.50     | — .45                | 99       | 36.64                  | Ballinasloe     |
| + .38                    | 107      | .72               | 14     | 27          | 46.76                 | 49.58     | +2.90                | 106      | 52.87                  | Enniscoie       |
| +1.20                    | 130      | .54               | 22     | 24          | 38.37                 | 50.70     | +12.33               | 132      | 42.71                  | Markree         |
| — .13                    | 97       | .57               | 23     | 19          | 35.14                 | 32.93     | —2.21                | 94       | 38.91                  | Seaforde        |
| +1.76                    | 147      | .54               | 23     | 25          | 33.69                 | 37.70     | +4.01                | 112      | 37.56                  | Dundarave       |
| — .01                    | 100      | .78               | 22     | 19          | 35.47                 | 40.18     | +4.71                | 113      | 39.38                  | Omagh           |

## SUPPLEMENTARY RAINFALL, NOVEMBER, 1910.

| Div.  | STATION.                     | Rain<br>inches | Div.   | STATION.                     | Rain<br>inches |
|-------|------------------------------|----------------|--------|------------------------------|----------------|
| II.   | Warlingham, Redvers Road     | 3.95           | XI.    | Llangyhanfal, Plâs Draw...   | 6.69           |
| „     | Ramsgate .....               | 3.94           | „      | Dolgelly, Bryntirion .....   | 6.02           |
| „     | Hailsham .....               | 6.66           | „      | Bettws-y-Coed, Tyn-y-bryn    | 7.30           |
| „     | Totland Bay, Aston House.    | 4.14           | „      | Lligwy .....                 | 6.79           |
| „     | Stockbridge, Ashley .....    | 3.51           | „      | Douglas .....                | 9.93           |
| „     | Grayshott .....              | 4.28           | XII.   | Stoneykirk, Ardwell House    | 7.15           |
| „     | Reading, Calcot Place .....  | 3.46           | „      | Dalry, The Old Garroch ...   | 5.82           |
| III.  | Harrow Weald, Hill House.    | 3.28           | „      | Langholm, Grove Road .....   | 5.94           |
| „     | Pitsford, Sedgebrook .....   | 3.33           | „      | Moniaive, Maxwellton House   | 4.45           |
| „     | Huntingdon, Brampton .....   | 3.74           | XIII.  | St Mary's Loch, Cramilt Ldge | 3.09           |
| „     | Woburn, Milton Bryant .....  | 3.53           | „      | Edinburgh, Royal Observty.   | 2.38           |
| „     | Wisbech, Monica Road .....   | 2.09           | XIV.   | Maybole, Knockdon Farm..     | 4.27           |
| IV.   | Southend Water Works .....   | 2.73           | XV.    | Campbeltown, Witchburn...    | 5.48           |
| „     | Colchester, Lexden .....     | 2.87           | „      | Glenreadell Mains .....      | 6.16           |
| „     | Newport .....                | 3.53           | „      | Ballachulish House .....     | 3.00           |
| „     | Rendlesham .....             | 3.41           | „      | Islay, Fallabus .....        | 6.05           |
| „     | Swaffham .....               | 3.22           | XVI.   | Dollar Academy .....         | 3.48           |
| „     | Blakeney .....               | 3.14           | „      | Balquhiddier, Stronvar ..... | 4.00           |
| V.    | Bishops Cannings .....       | 3.60           | „      | Coupar Angus .....           | 2.99           |
| „     | Winterbourne Steepleton ..   | 4.74           | „      | Blair Atholl .....           | 2.76           |
| „     | Ashburton, Druid House ..    | 7.72           | „      | Montrose, Sunnyside Asylum   | 3.04           |
| „     | Honiton, Combe Kaleigh ...   | 5.81           | XVII.  | Alford, Lynturk Manse ...    | 5.50           |
| „     | Okehampton, Oaklands .....   | 7.42           | „      | Keith Station .....          | 8.99           |
| „     | Hartland Abbey .....         | 5.64           | XVIII. | Glenquoich, Loan .....       | 8.30           |
| „     | Lynmouth, Rock House ...     | 6.13           | „      | Skye, Dunvegan .....         | 5.59           |
| „     | Probus, Lamellyn .....       | 7.57           | „      | N. Uist, Lochmaddy .....     | 5.48           |
| „     | North Cadbury Rectory ..     | 3.84           | „      | Alvey Manse .....            | 4.96           |
| VI.   | Clifton, Pembroke Road ..    | 5.17           | „      | Loch Ness, Drumnadrochit.    | 5.09           |
| „     | Ross, The Graig .....        | 3.83           | „      | Glencarron Lodge .....       | 6.70           |
| „     | Shifnal, Hatton Grange ..... | 4.11           | „      | Fearn, Lower Pitkerrie ..... | 3.34           |
| „     | Blockley, Upton Wold .....   | 4.32           | XIX.   | Invershin .....              | 6.14           |
| „     | Worcester, Boughton Park.    | 3.76           | „      | Altnaharra .....             | ...            |
| VII.  | Market Rasen .....           | 3.09           | „      | Bettyhill .....              | 4.89           |
| „     | Bawtry, Hesley Hall .....    | 2.92           | XX.    | Dunmanway, The Rectory..     | 6.27           |
| „     | Derby, Midland Railway ...   | 4.56           | „      | Cork .....                   | 3.33           |
| „     | Buxton .....                 | 6.27           | „      | Mitchelstown Castle .....    | 5.36           |
| VIII. | Nantwich, Dorfold Hall ..... | 5.69           | „      | Darrynane Abbey .....        | 8.00           |
| „     | Liscard .....                | 4.82           | „      | Glenam [Clonmel] .....       | 3.24           |
| „     | Chatburn, Middlewood .....   | 5.52           | „      | Nenagh, Traverston .....     | 3.29           |
| „     | Cartmel, Flookburgh .....    | 6.22           | „      | Newmarket-on-Fergus, Fenloe  | 4.89           |
| IX.   | Langsett Moor, Up. Midhope   | 5.12           | XXI.   | Laragh, Glendalough .....    | 6.33           |
| „     | Scarborough, Scalby .....    | 4.55           | „      | Moynalty, Westland .....     | 3.05           |
| „     | Ingleby Greenhow .....       | 3.56           | „      | Athlone, Twyford .....       | 2.65           |
| „     | Mickleton .....              | 2.65           | XXII.  | Woodlawn .....               | 3.10           |
| X.    | Bardon Mill, Beltingham ...  | 3.23           | „      | Westport, St. Helens .....   | 5.61           |
| „     | Ilderton, Lilburn Cottage .. | 3.92           | „      | Achill Island, Dugort .....  | 7.60           |
| „     | Keswick, The Bank .....      | 4.47           | „      | Mohill .....                 | 4.56           |
| XI.   | Llanfrechfa Grange .....     | 6.94           | XXIII. | Enniskillen, Portora .....   | 3.52           |
| „     | Treherbert, Tyn-y-waun ...   | 10.23          | „      | Dartrey [Cootehill] .....    | 2.85           |
| „     | Carmarthen, The Friary ..... | 6.70           | „      | Warrenpoint, Manor House     | 2.63           |
| „     | Castle Malgwyn [Llechryd].   | 6.62           | „      | Banbridge, Milltown .....    | 2.19           |
| „     | Plynlimon .....              | ...            | „      | Belfast, Springfield .....   | 4.69           |
| „     | Crickhowell, Ffordlas .....  | 5.10           | „      | Glenarm Castle .....         | ...            |
| „     | New Radnor, Ednol .....      | 6.53           | „      | Londonderry, Creggan. Res.   | 4.41           |
| „     | Rhayader, Tyrmynydd .....    | 9.11           | „      | Killybegs .....              | 7.08           |
| „     | Lake Vyrnwy .....            | 7.09           | „      | Horn Head ... ..             | 4.31           |

## METEOROLOGICAL NOTES ON NOVEMBER, 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 abnormally mild weather which prevailed through October came to an end in the first week of November, and the month throughout was extremely cold with frequent and persistent R (see p. 212). A good deal of fog occurred, but, except during the night of 22nd, it was never very thick. Duration of sunshine, 46·5\* hours, and of R 81·9 hours. Mean temp. 38°·6, or 4°·7 below the average, and with the exception of 37°·5 in 1871, the lowest for November in 53 years. Shade max. 53°·3 on 1st; min. 24°·0 on 17th. F 15, f 25.

TEXTERDEN.—The wettest November, except 1906, since 1877 and the coldest since 1890. Four inches of S fell on 17th. Duration of sunshine, 80·0† hours. Shade max. 53°·0 on 27th; min. 24°·0 on 23rd. F 14, f 19.

TOTLAND BAY.—More windy than usual, but no fog. Duration of sunshine 102·7\* hours. Mean temp. 3°·7 below the average. Shade max. 54°·1 on 6th; min. 28°·4 on 21st. F 3, f 22.

PITSFORD.—R ·91 in. above the average. Mean temp. 36°·3. Shade max. 53°·5 on 1st; min. 18°·4 on 23rd. F 20.

WINTERBOURNE STEEPLTON.—R ·88 in. above the average of 17 years, the coldest November in that period, excepting 1896. Shade max. 54°·3 on 4th; min. 22°·8 on 10th. F 18, f 21.

ROSS.—Shade max. 51°·3 on 1st; min. 22°·8 on 21st and 22nd. F 17, f 20.

HODSOCK PRIORY.—The coldest November for at least 35 years, but the first frost in the screen, on the 4th, was unusually late. Shade max. 52°·0 on 13th; min. 23°·3 on 23rd. F 19, f 27.

SOUTHPORT.—The coldest November in 40 years' record, excepting 1878. Duration of sunshine 69·6\* hours, or 18·3 hours above the average. Duration of R 97·1 hours. Mean temp. 38°·9, or 4°·4 below the average. Shade max. 53°·5 on 1st; min. 22°·2 on 22nd. F 8, f 18.

HULL.—Shade max. 50°·0 on 13th and 14th; min. 25°·0 on 23rd. F 16, f 23.

HAVERFORDWEST.—Cold, wet and stormy to 18th. Aurora on 29th. Duration of sunshine, 80·1\* hours. Shade max. 56°·0 on 1st.

LLANDUDNO.—Shade max. 54°·0 on 13th; min. 31°·0 on 21st.

CARGEN.—Cold, unpleasant month with northerly winds on 29 days. Mean temp. 36°·0. Shade max. 52°·0 on 1st; min. 19°·0 on 20th and 22nd. F 16. Splendid view of lunar eclipse.

EDINBURGH.—Shade max. 46°·3 on 1st; min. 25°·5 on 20th. F 11, f 22.

COUPAR ANGUS.—The mean temp., 35°·6, or 4°·2 below the average, was chiefly due to a cold snap on 22nd—23rd. Shade max. 49°·5 on 4th; min. 16°·0 on 23rd. F 18.

FORT AUGUSTUS.—Shade max. 47°·3 on 13th; min. 20°·7 on 22nd. F 15.

CORK.—A foggy month with R ·57 in. below the average. Shade max. 53°·0 on 23rd; min. 24°·0 on 17th. F 15, f 16.

DUBLIN.—The coldest November since 1878, when the mean temp. was only 38°·2. An unusual prevalence of N.W. winds. Mean temp. 40°·8, or 4°·5 below the average. L was seen on 6th and aurora on 5th. Shade max. 56°·3 on 1st; min. 28°·0 on 30th. F 9, f 14.

MARKREE.—Frequent H with S and frosts during the whole month. Shade max. 52°·4 on 1st and 25th; min. 19°·0 on 30th. F 16, f 20.

WARRENPOINT.—Fairly fine with W. and N.W. winds prevailing. Shade max. 49°·0 on 12th and 25th; min. 31°·0 on 20th and 29th. F 4, f 13.

\* Campbell-Stokes.

† Jordan.

## Climatological Table for the British Empire, June, 1910.

| STATIONS.<br><br>(Those in italics are<br>South of the Equator.) | Absolute. |       |          |       | Average. |      |               |           | Absolute.       |                   | Total Rain     |       | Aver. |
|------------------------------------------------------------------|-----------|-------|----------|-------|----------|------|---------------|-----------|-----------------|-------------------|----------------|-------|-------|
|                                                                  | Maximum.  |       | Minimum. |       | Max.     | Min. | Dew<br>Point. | Humidity. | Max. in<br>Sun. | Min. on<br>Grass. | Depth.         | Days. |       |
|                                                                  | Temp.     | Date. | Temp.    | Date. |          |      |               |           |                 |                   |                |       |       |
| London, Camden Square                                            | 81°3      | 20    | 45°5     | 27    | 72°3     | 53°2 | 53°4          | 77        | 125°4           | 40°0              | inches<br>2·17 | 13    | 7·5   |
| Malta ... ..                                                     | 84·9      | 28    | 61·0     | 1, 2  | 76·7     | 64·4 | ...           | ...       | 150·1           | ...               | ·00            | 0     | 1·9   |
| Lagos ... ..                                                     | 92·0      | 3     | 71·0     | 14    | 77·1     | 74·0 | 73·7          | 77        | 160·0           | 69·0              | 16·70          | 22    | 8·3   |
| Cape Town ... ..                                                 | 75·1      | 16    | 40·0     | 14    | 64·4     | 47·9 | 43·8          | 80        | ...             | ...               | 2·75           | 11    | 4·9   |
| Durban, Natal                                                    | 80·3      | 22    | 46·5     | 25    | 72·4     | 52·9 | ...           | ...       | 127·9           | ...               | ·49            | 3     | 1·0   |
| Johannesburg ... ..                                              | 68·2      | 2     | 30·1     | 27    | 57·3     | 40·7 | 35·9          | 69        | 118·2           | 27·1              | ·28            | 5     | 3·6   |
| Mauritius ... ..                                                 | 80·2      | 2     | 54·5     | 11    | 76·0     | 59·9 | 57·8          | 72        | 139·4           | 45·9              | ·53            | 16    | 4·3   |
| Calcutta... ..                                                   | 98·4      | 2     | 73·3     | 4     | 91·9     | 78·4 | 78·3          | 83        | ...             | 71·8              | 6·48           | 12    | 7·3   |
| Bombay .. ...                                                    | 95·2      | 2     | 75·4     | 23    | 87·0     | 79·3 | 77·4          | 83        | 135·3           | 73·7              | 23·92          | 25    | 7·9   |
| Madras ... ..                                                    | 104·5     | 4     | 73·1     | 23    | 97·2     | 80·5 | 71·4          | 65        | 149·5           | 73·0              | 1·75           | 9     | 7·2   |
| Kodaikanal ... ..                                                | 70·2      | 3     | 51·1     | 30    | 63·2     | 53·6 | 52·5          | 83        | 140·5           | 42·2              | 3·57           | 24    | 7·7   |
| Colombo, Ceylon                                                  | 89·5      | 3     | 71·9     | 25    | 85·8     | 76·9 | 74·6          | 80        | 155·9           | 70·3              | 4·20           | 16    | 7·1   |
| Hongkong ... ..                                                  | 90·9      | 27    | 73·2     | 2     | 86·9     | 78·8 | 75·2          | 79        | 141·4           | ...               | 18·19          | 12    | 6·3   |
| Melbourne ... ..                                                 | 67·4      | 22    | 32·1     | 16    | 58·1     | 46·0 | 43·5          | 73        | 106·9           | 30·1              | 1·33           | 12    | 6·1   |
| Adelaide ... ..                                                  | 65·9      | 19    | 41·0     | 6     | 61·2     | 48·2 | 47·5          | 79        | 124·8           | 30·3              | 3·04           | 13    | 3·3   |
| Coolgardie ... ..                                                | 67·9      | 1     | 33·0     | 22    | 60·1     | 42·3 | 41·3          | 70        | 129·0           | 27·2              | 1·90           | 12    | 4·6   |
| Perth ... ..                                                     | 74·4      | 3     | 41·2     | 10    | 62·7     | 49·3 | 48·4          | 75        | 122·3           | 32·3              | 6·34           | 23    | 6·4   |
| Sydney ... ..                                                    | 68·9      | 9     | 44·9     | 5, 28 | 61·1     | 49·3 | 47·5          | 83        | 110·4           | 36·8              | 3·51           | 25    | 6·6   |
| Wellington ... ..                                                | 63·0      | 5     | 40·0     | 22*   | 54·5     | 45·9 | 41·0          | 70        | 100·0           | 30·0              | 3·09           | 17    | 7·6   |
| Auckland ... ..                                                  | 66·0      | 5     | 39·5     | 19†   | 59·3     | 50·1 | 51·7          | 90        | 123·0           | 35·0              | 5·10           | 22    | 6·8   |
| Jamaica, Kingston                                                | 91·4      | 20    | 68·5     | 6     | 87·7     | 72·0 | 70·3          | 75        | ...             | ...               | 5·09           | 7     | 4·0   |
| Grenada ... ..                                                   | 86·6      | 3     | 72·0     | 4, 9  | 83·0     | 74·8 | 71·8          | 78        | 137·0           | ...               | 10·62          | 27    | 5·5   |
| Toronto ... ..                                                   | 93·4      | 22    | 41·2     | 4     | 75·3     | 53·9 | ...           | ...       | 111·0           | 38·0              | 1·07           | 7     | 4·0   |
| Fredericton ... ..                                               | 83·5      | 22    | 39·9     | 6     | 67·9     | 48·2 | ...           | 73        | ...             | ...               | 8·01           | 13    | 6·3   |
| St. John's, N.B.                                                 | 75·8      | 14    | 39·3     | 5     | 63·6     | 51·0 | ...           | ...       | ...             | ...               | 4·01           | 18    | 6·1   |
| Victoria, B.C. ...                                               | 76·2      | 4, 10 | 41·4     | 3     | 65·1     | 48·9 | ...           | 58        | ...             | ...               | ·93            | 7     | 6·0   |
| Dawson ... ..                                                    | 85·0      | 29    | 31·0     | 12    | 70·4     | 43·7 | ...           | ...       | ...             | ...               | 1·41           | 12    | 5·9   |

\* and 24. † and 21.

MALTA.—Mean temp. of air 70°·5. Average bright sunshine 11·8 hours per day.

Johannesburg.—Bright sunshine 225·7 hours.

Mauritius.—Mean temp. of air 1°·3, of dew point 3°·3, and R 1·53 in., below, averages. Mean hourly velocity of wind 9·1 miles, or 2·1 below average.

KODAIKANAL.—Bright sunshine 104 hours.

COLOMBO.—Mean temp. of air 78°·5 or 2°·4 below, of dew point 0°·4 above, and R 3·37 in. below, averages. Mean hourly velocity of wind 7·2 miles.

HONGKONG.—Mean temp. of air 82°·3 or 1°·6 above, bright sunshine 242·1 hours or 86 hours above, and R 1·80 in. above, the average. Mean hourly velocity of wind 11·0 miles.

Melbourne.—Mean temp. of air 1°·7 above, and R ·77 in. below, averages.

Coolgardie.—Mean temp 1°·2 below, and R about half-inch above, average.

Sydney.—Mean temp. of air 0°·8 above, and R 1·77 in. below, averages.

Wellington.—Mean temp. of air 0°·7 above, and R 3·19 in. above, averages. Bright sunshine 89·4 hours.

Auckland.—Mean temp. of air 1°·0 above average. Rainfall ·25 in. above 40 years' average.

# Symons's Meteorological Magazine.

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No. 540.

JANUARY, 1911.

VOL. XLV.

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## THE RAINFALL OF 1910.

IN our Rainfall Table this month the column of Rainfall from January 1st gives the total rainfall of the year at 55 stations, which were carefully selected so as to represent in as comprehensive a manner as possible all parts of the kingdom. The year has had one of the wettest Februaries, and one of the driest Septembers on record, and by the end of October, itself a dry month, the total for the ten months had assumed almost exactly the average value. But November was wet, and December, as shown in the earlier columns of our Table on p. 241, was very wet in the south of England, though dry in the north and in parts of Scotland and Ireland. A large part of the south of England had more than twice the average fall in December, and at Market Overton the fall was nearly three times the average amount. Our map of the Thames Valley and its surroundings shows a remarkably heavy fall in the southern portion. Looking at this map, it is easy to understand that in the first ten days, when the rain was heavy and almost incessant, the river rose rapidly and serious floods prevailed; for in December there is no check from evaporation or absorption by vegetation, and the wetness of the last days of November had saturated the ground and closed the paths for percolation, so that the surface water had all to run off over the surface into the rivers, and the rivers unable to carry off the flood, overspread their banks and poured the water back to the land. By the end of the year there was a large excess of rainfall to chronicle; and 1910 showed 8 per cent. more rain than the average for the British Isles as a whole, Wales having an excess of 17 per cent., southern England an excess of 16 per cent., Ireland an excess of 9 per cent., northern England and Scotland an excess of less than 5 per cent.

The following Table is a summary of the percentages published in our Monthly Tables.

Here it is seen that February was relatively the wettest month in England and Wales, Ireland and the British Isles as a whole, while April was by far the wettest month in Scotland. The driest month in all parts of the country was September.



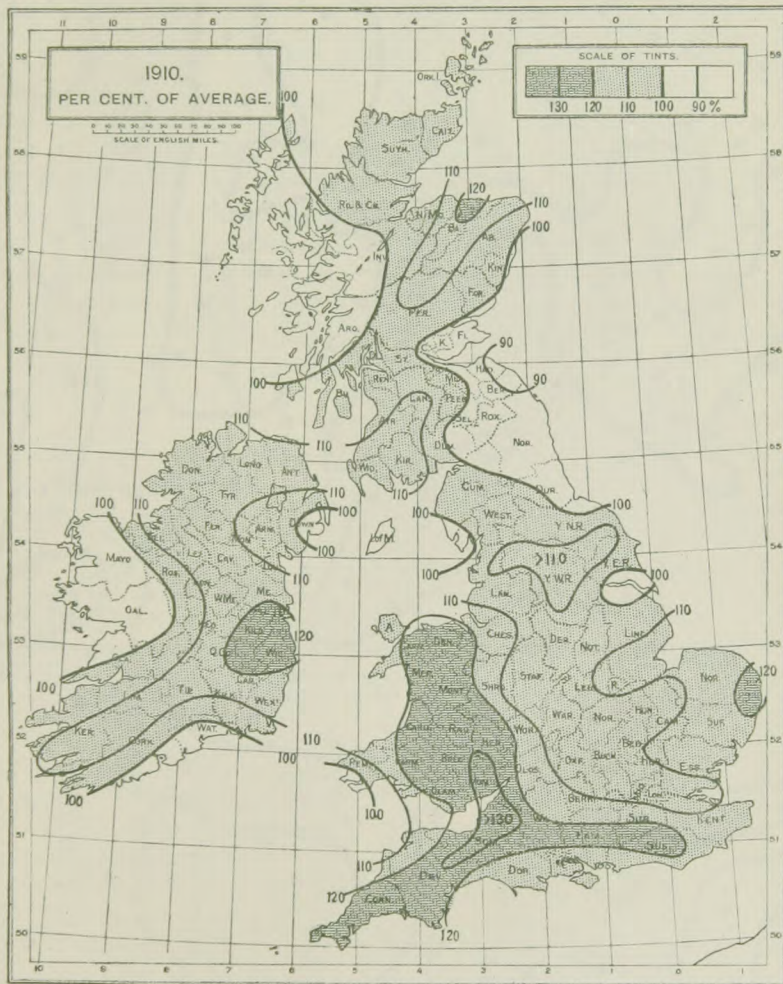
*General Rainfall of 1910 expressed as per cent. of the Average.*

| MONTH.          | England and Wales. | Scotland. | Ireland. | British Isles. |
|-----------------|--------------------|-----------|----------|----------------|
| January .....   | 122                | 109       | 115      | 117            |
| February .....  | 165                | 133       | 183      | 161            |
| March .....     | 48                 | 75        | 88       | 65             |
| April .....     | 125                | 184       | 109      | 136            |
| May .....       | 118                | 98        | 95       | 107            |
| June .....      | 110                | 68        | 161      | 113            |
| July .....      | 109                | 121       | 108      | 111            |
| August .....    | 120                | 143       | 148      | 133            |
| September ..... | 26                 | 41        | 32       | 31             |
| October .....   | 89                 | 58        | 61       | 74             |
| November .....  | 142                | 123       | 109      | 129            |
| December .....  | 159                | 101       | 113      | 132            |
| Year 1910 ..... | 111                | 102       | 109      | 108            |

The figures showing the relation of the rainfall of the year to the average when plotted on a map show that rainfall a little less than the average occurred at the south-western extremity of Wales, in a narrow strip of the south of Ireland, in part of Clare and the whole of Cos. Galway and Mayo, in Argyll, the west of Inverness and the western islands, in the south-east of Scotland (relatively the driest region, part of Berwickshire having a deficiency of more than 10 per cent.), the north-eastern counties of England and a patch on the Humber. There were also dry patches in the north-east of Ireland and the north-west of England, perhaps including the Isle of Man. A considerable part of central Ireland and Scotland had an excess of more than 10 per cent., and so had all of England except the centre. The relatively wettest area was in Somerset, where the excess exceeded 30 per cent., and this high fall probably extended into Monmouth. Practically the whole of Wales except the extreme west had more than 20 per cent., and this excess also stretched along a belt of country in Dorset, Wiltshire, Hampshire and Sussex. These and other relationships appear upon the map facing this page, which is only a preliminary sketch liable to correction.

The relation of two dry years followed by a wet year which prevailed since 1889 has now completely broken down. Two consecutive wet years for England and Wales have been recorded for the first time since 1883, and it seems possible that the swing of the pendulum is carrying us into a period of predominating wet years, corresponding to the wet period of 1874-1883. There was no more reason to suppose that the dryness of the last 27 years would continue any more than the dry spell before 1872, which was broken up in 1874. The year 1872 as a solitary year of almost unprecedented rainfall before the wet spell had its counterpart, if our suggestion holds good, in the solitary year of almost unprecedented rainfall, 1903.

# RAINFALL OF 1910 IN RELATION TO THE AVERAGE.





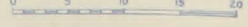
# THAMES VALLEY RAINFALL — DECEMBER, 1910.



ALTITUDE SCALE

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

SCALE OF MILES



## TEMPERATURE AND RAINFALL AT CAMDEN SQUARE IN 1910.

THE curves of shade temperature for 1910 drawn from the twelve points given by the monthly means present some features so unusual that we reproduce them together with the curve of the rainfall as a plate which appears as the frontispiece of the present volume. The smooth flow of the average curves in a dotted line is in marked contrast to the abrupt dips and rises of the curves for 1910, (continuous lines) the most marked features being the dip in July, the rises in October and December, and the dip in November, between them.

The averages employed in the following table, upon which the diagram is based, are, in the case of the mean temperature, for the 50 years 1858-1907, and, in the case of the maximum and minimum temperature, for the 40 years 1858-1897.

In the first six months of the year the persistence of moderate excesses over the average is noteworthy, April alone having a mean temperature below the average, owing, it will be observed, entirely to low maxima. In this month, however, the most noteworthy reading was the shade minimum of  $25^{\circ}9$  on the 23rd, which was, with two exceptions, the lowest daily reading in April on record here. The chief interest of the year's temperature values lies in the second half, four of the months being noteworthy for great departures from average conditions. July stands out prominently on the diagram with a deficiency of  $3^{\circ}7$  in mean temperature, the fourth greatest deficiency in 53 years, whilst its mean maximum temperature,  $68^{\circ}5$  or  $5^{\circ}6$  below the average, ranks third on the list,

### *Temperature and Rainfall at Camden Square in 1910.*

| 1910        | Mean Temperature. |                          | Mean Maximum Temperature. |                          | Mean Minimum Temperature. |                          | RAINFALL. |                                    |
|-------------|-------------------|--------------------------|---------------------------|--------------------------|---------------------------|--------------------------|-----------|------------------------------------|
|             | 1910.             | Difference from Average. | 1910.                     | Difference from Average. | 1910.                     | Difference from Average. | 1910.     | Difference from 50 years' Average. |
|             |                   |                          |                           |                          |                           |                          | in.       | in.                                |
| January ... | 39.8              | +1.2                     | 45.1                      | +2.1                     | 34.6                      | +1.3                     | 1.57      | — .41                              |
| February..  | 42.2              | +2.5                     | 48.3                      | +2.8                     | 36.3                      | +1.6                     | 2.96      | +1.34                              |
| March.....  | 43.2              | +0.9                     | 51.5                      | +1.3                     | 35.4                      | —0.1                     | .97       | — .72                              |
| April.....  | 47.6              | —0.5                     | 56.1                      | —2.0                     | 39.8                      | +0.1                     | 2.24      | + .60                              |
| May.....    | 54.9              | +1.0                     | 65.0                      | +0.3                     | 46.3                      | +1.9                     | 2.22      | + .35                              |
| June.....   | 61.8              | +1.5                     | 72.3                      | +1.0                     | 53.2                      | +2.3                     | 2.17      | — .13                              |
| July.....   | 59.9              | —3.7                     | 68.5                      | —5.6                     | 53.1                      | —0.9                     | 2.53      | + .18                              |
| August....  | 61.8              | —0.5                     | 70.9                      | —1.7                     | 54.2                      | +0.9                     | 1.64      | — .69                              |
| September   | 57.1              | —0.7                     | 66.2                      | —1.1                     | 49.6                      | —0.1                     | .58       | —1.63                              |
| October ... | 53.8              | +3.8                     | 60.6                      | +3.1                     | 48.3                      | +5.0                     | 2.00      | — .67                              |
| November    | 38.6              | —4.7                     | 45.4                      | —3.3                     | 32.3                      | —5.4                     | 3.19      | + .89                              |
| December.   | 44.5              | +4.9                     | 48.7                      | +4.7                     | 40.0                      | +5.6                     | 3.29      | +1.18                              |
| YEAR ...    | 50.4              | +0.4                     | 58.2                      | +0.1                     | 43.6                      | +1.0                     | 25.36     | + .29                              |

the extraordinary absence of hot days reflecting the unprecedentedly low duration of sunshine. November showed an even greater depression below the average than July, the mean temperature being the lowest yet recorded with a single exception, and the mean minimum the lowest ever recorded in that month. The number of frosts recorded both in the screen and on the grass was also the greatest ever observed.

October and December stand equally prominently on the other side of the account. The mean temperature in October had been exceeded four times, but the mean minimum once only, the latter being  $5^{\circ}0$  above the average. The lowest reading during the month,  $41^{\circ}6$  on the 21st, was unprecedentedly high, being as much as  $9^{\circ}6$  above the average lowest. In December the mean temperature was  $4^{\circ}9$  above the average, and  $5^{\circ}9$  above the mean temperature of the preceding month, the normal condition being a fall of  $3^{\circ}7$  from November to December. Three previous Decembers show higher mean temperature values, three higher mean maximum, and four higher mean minimum temperatures. The high mean was the result of consistent mild conditions and an abnormal absence of frost, which was registered on three days only. The combination of extremes resulted in the year as a whole reaching the average values for temperature.

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## THE WEATHER OF DECEMBER.

By FRED. J. BRODIE.

THE vagaries exhibited by the thermometer in the closing quarter of 1910 were indeed remarkable. That one of the mildest Octobers on record should have been followed by one of the coldest Novembers was regarded as a striking and unusual combination of circumstances. Soon after the commencement of December it was evident that the see-saw movement was still in progress, and as a climax to the strange sequence of events, the concluding month of the year proved one of the mildest the present generation has witnessed. Over a large portion of the country the records of the past 40 years supply in fact only two other instances of so open a December. Both in 1898 and 1900 the closing month of the year was as warm and in some places a trifle warmer than in 1910. As regards the night temperatures there were, however, many parts of England in which the past month achieved a record.


The month opened with a short spell of easterly and north-easterly winds with heavy rain in the south of England, due to the presence of a small barometrical depression, over the north of France. As the disturbance passed away to the south-westward the weather improved, and on the nights of the 3rd and 4th a slight frost was experienced in our western and northern districts. Between the 5th and 7th, when other depressions appeared over our western coasts, the wind

became southerly and the mid-day temperatures exceeded  $50^{\circ}$  in many parts of Great Britain, a reading of  $55^{\circ}$  being recorded at Dungeness on the 5th, and a reading of  $57^{\circ}$  at Cirencester on the 7th.

Between the 8th and 17th several cyclonic disturbances arrived from the Atlantic, and although very few of them passed directly across the United Kingdom, their influence was seen in a long spell of wet stormy weather, the rainfall in Wales and the southern half of England being sufficiently heavy to cause serious and widespread flooding. The prevailing winds at this time were mainly from between south-east and south-west, and temperature was continuously high both in the daytime and at night.

The warmest spells occurred between the 8th and 11th and on the 15th and 16th. On the earlier occasion the thermometer rose above  $50^{\circ}$  at many places in the west and north, and touched  $57^{\circ}$  on the 9th at Llandudno; on the 15th and 16th it reached  $55^{\circ}$  at a number of stations in the south and east of England and touched  $57^{\circ}$  at Geldeston. In the rear of a deep barometrical depression which passed eastwards across the United Kingdom and the North Sea on the 16th and 17th, an anticyclonic ridge extended temporarily from the southward, and on the night of the 19th a rather sharp frost occurred in many parts of Great Britain, the thermometer on the grass falling to  $25^{\circ}$ , or less in several places, and to  $20^{\circ}$  at Llangammarch Wells. Shortly before Christmas a south-westerly, merging into a decided westerly, type of weather was experienced, and on the 23rd or 24th the thermometer rose to  $55^{\circ}$ , or slightly above it over a large portion of the United Kingdom, a reading of  $56^{\circ}$  being recorded as far north as Gordon Castle, and a reading of  $57^{\circ}$  at Aberdeen. In the closing week the prevailing winds were north-westerly and the weather became more seasonable, night frosts occurring very commonly in nearly all parts of the country. The sharpest, and in fact the only sharp frosts of the month, occurred on the nights of the 27th and 28th, when the sheltered thermometer fell below  $25^{\circ}$  at a large number of places situated in nearly all parts of the country and below  $20^{\circ}$  at some of the central stations in Scotland and Wales. On the surface of the grass the readings were, of course, a few degrees lower; at Tunbridge Wells the thermometer sank to  $15^{\circ}$ , while at Llangammarch Wells it registered a minimum of  $8^{\circ}$ . At Leith the absolute shade minimum temperature for the month was as high as  $33^{\circ}$ , this being the first time in the course of 40 years in which the thermometer at Leith had failed, in December, to fall below the freezing point.

The duration of bright sunshine last month was below the average in most places, and considerably below it at some stations in the south of England. At Oxford the total duration, 30 hours, was little more than three fourths of the average. At Westminster the duration, 11 hours, was only 2 hours short of the normal. In the north of Scotland rather more than the average quantity was registered.





## THE NEW DAILY WEATHER REPORT.

WITH the beginning of the new year the Daily Weather Report of the Meteorological Office has assumed a new form embodying several improvements, and the increased accommodation in the new office at South Kensington has made it possible to economise time in preparation by carrying out the lithography of the Report on the premises. In the new arrangement of the Report the first page remains as before, a list of observations at about 70 stations. The second and third pages are entirely recast. The isobaric maps for 7 a.m. and 6 p.m. on the previous day are enlarged and placed side by side, and the 6 p.m. map distinguishes the area within which rain had fallen in the 24 hours from 7 a.m., thereby relieving the large map on p. 3. Below this pair of maps under the heading of "Weather Prospects" come the forecasts for the 24 hours commencing at noon on the day of issue, for twenty separate areas of the British Isles, the boundaries of which are given on a small map. It says something for the increased knowledge of geography on the part of the public that the reader can be assumed to know the position of his own home on the map, sufficiently closely to tell in which division it lies; possibly the assumption is too great. A modest heading "The Further Outlook" reserves a small space for announcing the rare types of weather of a persistent character. Page 3 contains a map of the weather of the day of issue at 7 a.m., extending to the whole breadth of the page, and presenting the greater part of the Atlantic Ocean and the whole of western Europe. This large map combines the information previously given on two smaller maps; the isobars are the more important features and are boldly drawn far over the ocean on the strength of the observations from Iceland, the Azores and Madeira. Greenland appears temptingly in the north-west, and we remember hopefully that the earliest suggested route for a Trans-Atlantic cable on the "Telegraph plateau," touching at Greenland, is again being spoken of. The extension of the isobars is occasionally helped by wireless telegrams from Atlantic liners, though it is still rare for these dispatches to arrive in time to be of use. Isotherms are shown on the same map in bold dotted lines which cannot be confused with the isobars; and winds and weather are also indicated. Below this map "Notes on the general situation" at 7 a.m., and "General inferences" drawn from the observations, are given. The last page, in addition to observations for the previous day at supplementary British and Foreign stations, and such radio-telegraphic information as may have been received from the Atlantic, has a new section headed "London Observations," giving for Greenwich Observatory, the City (Bunhill Row), Westminster (St. James's Park), and Hampstead (the new Observatory on the Heath), the humidity at "3 p.m. yesterday and 9 a.m. to-day," the maximum and minimum temperature, weather, rainfall and duration of sunshine for the preceding 24 hours. The Kew Observatory observations are given in the first page, so that the

London area is well represented, though not excessively so considering its importance.

We fear that the nature and usefulness of the Daily Weather Report are not known and appreciated as they ought to be by the public ; indeed no serious meteorological publication seems capable of exerting much popular appeal ; but for educational purposes at least the value of the Report is enormous. The knowledge that it deals with the weather of the very day on which it is studied gives a freshness to the interest that can never be aroused by less prompt publications.

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## THE BROCKEN SPECTRE ON SNOWDON.

By W. PIFFE BROWN.

MOST persons have heard of the so-called "Spectre of the Brocken," but comparatively few know that the apparition is to be seen in our own country. Given certain conditions, viz. :—(1) a mountain peak or ridge clear of opaque mist ; (2) transparent vapour, or humidity, on the peak or ridge ; (3) bright sunshine, and (4) some opaque mist in a suitable position, and the vision appears. It is often seen from the peaks and ridges of Snowdon and some adjacent mountains. A recent display was exceptionally fine, and merits some record.

In the middle of September the weather was unusually fine, there had been no rain for a fortnight, easterly winds prevailed, and on several days there was much "black haze," so much that the scenery was obscured, and no sun or sky was to be seen. These conditions ruled on the 16th when I and a companion started to ascend Snowdon. We reached the summit at 4 p.m., and, when within a few yards of it, we emerged from the obscurity of the haze into a clear atmosphere, with a cloudless blue sky and bright sunshine above.

Immediately below the summit there was a zone of humid white mist, and beyond this, as far as the eye could see, nothing was visible but black haze, not a peak or ridge, near or far, was in sight ; we stood, as it were, on a small islet in a boundless sea of mist and haze. We thought of the spectre and, placing ourselves in position, were not disappointed. A clear outline of the peak—with the buildings, ordnance cairn, stump of flag-pole, ourselves and one stranger, the only persons there—was projected on the white mist just below, and the whole was surrounded by the usual circular mist-bow, smaller and fainter than an ordinary rainbow, but showing the complete circle,

We left the summit shortly after 5 o'clock, the sun was then within an hour of setting, and becoming involved in the haze, the figures on the mist were slowly fading.

The appearances seen on the mist are not simple shadows, they are similar to dark figures thrown on a screen by means of lenses in a magic lantern. The bow is caused by the sun's rays passing through the transparent vapour on the peak, just as the ordinary rainbow results from the rays passing through a shower of rain.



## ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening December 21st, at the Institution of Civil Engineers, Great George Street, Westminster, Mr. H. Mellish, President, in the chair.

Capt. C. H. Ley gave a report on the balloon experiments which he had carried out at Blackpool during the early part of the year. It was hoped that these experiments would throw light on (a) periodic oscillations of stratum as apart from variations due to altitude, (b) vertical currents or rising winds, and (c) local eddies or other phenomena. The proposal was to employ balanced pilot balloons, which, floating in a current with no upward or downward hydrogen-velocity, would represent the motion of a particle travelling in that current. If possible, two or more flights were to be obtained on the same day, so that the variations under the same conditions at short intervals could be observed. Difficulties, however, arose which prevented the scheme being carried out as originally planned. Ultimately a hydrogen balloon or twin-system of hydrogen balloon and heavy satellite was so valved as to have a large free lift at first, but to lose gas continuously under the action of a leak until a certain point is reached at which the valve closes, when, in accordance with previous adjustment it is nearly in equilibrium.

From an analysis of the trajectories and of the method used the following general results have been deduced:—(1) Sudden variations of less than 25 feet per minute in the vertical velocity otherwise unaccounted for, may be disregarded; (2) Most trajectories are more or less sinuous; (3) The sinuosities often take the form of kinks in one direction only, the main direction being returned to; (4) Oscillations of vertical velocity nearly always accompany these sudden deflections of trajectory; (5) Oscillations of horizontal velocity often occur without deflection; (6) Depression of velocities often occurs over a river area with violent oscillation near the margin; and (7) The microbarograph often shows some peculiar correspondence of pressure changes with the trajectory oscillations.

Capt. Ley also read a paper on "The Meteorological Significance of Small Wind and Pressure Variations." This is practically a continuation of the above report. Capt. Ley compared the "yawings" of the wind at Blackpool with the small variations of atmospheric pressure as recorded by the microbarograph. Yawings occur when the variations of velocity and direction are in the same phase; but when the phases are opposite or widely divergent, the result is often dissimilar, variations usually forming irregular closed or half-closed figures on the vector diagrams. Such figures possibly represent irregular vortex systems. After analysing several instances Capt. Ley said "if the time between the commencement of marked wave-motion and that of the general change of wind at Blackpool is noted, and the distance to the extreme north-west coast of Ireland via the North Channel measured, and an allowance made for transmission of

oscillations at the velocity of sound, we are able to form a rough estimate of the speed of approach of the depression. Thus that of July 23rd would be between 50 and 60 miles per hour, and that of July 26th about 40 miles per hour. Thus these wavelinear oscillations occurring in the freer winds, appear to have a distinct meteorological significance. An instrument placed at Blackpool is very well situated for recording them before they suffer much interference. Indeed it seems to me that the orographic features, which Dr. Shaw called attention to, resemble a gigantic receiver, or ear, whose helix is on the Cumberland coast and lobe at Snowdon or Anglesey, whilst the sensitive membrane is in the central region on the coast-line. An instrument placed at Blackpool or Southport is near the drum of this ear, and actually hears the low voice of a depression as it beats in to the Irish coast from the Atlantic."

Mr. C. J. P. Cave, Mr. E. Gold, Mr. J. S. Dines, Mr. W. W. Bryant, Mr. R. Corless, and Mr. R. Inwards, took part in the discussion, and Capt. Ley replied.

A paper by Dr. Wilhelm Schmidt, of Vienna, on "Atmospheric Waves of Short Period," was also read. The author described the Variograph, an apparatus which he had designed for recording the rate of small variations of atmospheric pressure. This gives records somewhat similar to the microbarograph. Dr. Schmidt analysed the records obtained from two of these instruments at Innsbruck during the occurrence of some Föhn winds.

The following new fellows were elected, Mr. E. T. Adams, Mr. A. D. Barron, Mr. M. C. Carr-Gomm, Assoc.M.Inst.C.E., Mr. L. P. Causton, Dr. C. Chree, F.R.S., Mr. G. R. G. Conway, M.Inst.C.E., Mr. J. B. Espiner, Mr. F. S. Harvey, Assoc. M.Inst. C.E., Mr. J. H. Johnson, M.Inst.C.E., Mr. E. A. Lees, Assoc.M.Inst.C.E., Mr. J. E. Middleton, Capt. G. A. Millington, Mr. F. M. Preston, Assoc.M.Inst. C.E., Mr. W. D. L. Raw, Mr. T. R. Saunders, Assoc.M.Inst.C.E., Mr. W. Simpson, M.Inst.C.E., Mr. D. E. Smith, Mr. M. J. Stephan, and Mr. E. Timothy.

## Correspondence.

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

### TRANSVAAL METEOROLOGICAL OBSERVATIONS.

I MUST express some regret for unavoidable delay in this comment upon Mr. Innes's letter in your November number.

Pages 16—21 of the last annual report of the Transvaal Observatory contain barometric pressures for Johannesburg, at 7 a.m., 2 p.m., and 9 p.m., for each day of the year. The readings are expressed in millimetres, reduced to 30°F. Pages 22—27 contain the pressures expressed in inches, reduced to 30°F., at 8 a.m., 1.30 p.m., and 7 p.m., for each day for Pretoria. Page 97 gives

mean hourly pressures for Johannesburg for each month, expressed in millimetres, reduced to 0°C. Pages 99 and 100 give annual means, expressed in inches, reduced to 32°F., for a number of barometer stations (including the Johannesburg Observatory), with a set of plus and minus numbers showing by how much the monthly means differed from the annual means. Thus four different systems of reduction are employed, *i.e.*, (1.) millimetres and 30°F.; (2.) inches and 30°F.; (3.) millimetres and 0°C.; (4.) inches and 32°F. What help the last can possibly be in the interpretation of the first and third is not easy to see. No doubt it is sometimes difficult for an astronomical observatory to cope adequately with its meteorological "side shows"; but if one system or the other were used, preferably inches and 32°F., since there is no reason why the Transvaal should be out of step with all the rest of British South Africa, it would be much easier for future generations of investigators.

CONTRIBUTOR.

[Mr. Innes, the Director of the Transvaal Observatory, informs us that the site was selected not for astronomical purposes, for which he considers it in some respects ill-suited, but with a special view to kite-flying and other researches on the upper atmosphere, for which it is well adapted. Our recollection of a visit paid to the Observatory in 1905, is that at that time there were no astronomical instruments, and if astronomy is now being studied there, surely it, and not meteorology, is entitled to the quaint simile of a "side show." We are in entire agreement with CONTRIBUTOR as to the importance of using one uniform system of recording barometric heights, and hope that before long the Union of South Africa will have a united and accordant meteorological system.—ED. S.M.M.].

### RAIN SPELLS.

FROM 30th November to 18th December (19 days) rain was registered daily aggregating 5.44 inches. The following, by way of comparison, may be interesting records.

| Years.     | Periods.              | Days.    | in.  |
|------------|-----------------------|----------|------|
| 1900 ..... | 13—28 Feb. ....       | 16 ..... | 3.58 |
| 1903 ..... | 21 Feb.—7 Mar. ....   | 15 ..... | 2.87 |
| 1903 ..... | 20 Sept.—14 Oct. .... | 25 ..... | 4.32 |
| 1904 ..... | 25 June—21 Feb. ....  | 28 ..... | 5.90 |
| 1906 ..... | 26 Oct.—9 Nov. ....   | 15 ..... | 4.15 |
| 1907 ..... | 5—25 Oct. ....        | 21 ..... | 4.02 |
| 1908 ..... | 20 Aug.—5 Sept. ....  | 17 ..... | 4.10 |
| 1908 ..... | 4—21 Dec. ....        | 18 ..... | 1.89 |
| 1909 ..... | 27 Sept.—18 Oct. .... | 22 ..... | 3.15 |
| 1910 ..... | 4 Feb.—1 Mar. ....    | 26 ..... | 3.70 |
| 1910 ..... | 30 Nov.—18 Dec. ....  | 19 ..... | 5.44 |

C. C. HAVILAND.

*Ridgemount, Frimley Green, Surrey, 21st December, 1910.*

## RAINFALL AND WIND DIRECTION.

A SHORT time ago I had a discussion with a friend here on the direction of the wind, the amount of rainfall with each direction, and the number of fine and rain days. To satisfy myself on these points I compiled a table taken from the records I have kept for the last ten years, and this table I append as it may be of interest.

*Annual rainfall and number of rain days with the direction of the wind. Average of ten years.*

|                         | N.   | N.E. | E.   | S.E. | S.   | S.W. | W.   | N.W. | Calm. |
|-------------------------|------|------|------|------|------|------|------|------|-------|
| Rainless Days           | 17   | 20   | 12   | 13   | 3    | 25   | 13   | 36   | 14    |
| Rain Days ....          | 12   | 14   | 9    | 24   | 15   | 66   | 20   | 36   | 16    |
| Total.....              | 29   | 34   | 21   | 37   | 18   | 91   | 33   | 72   | 30    |
| Rain ..... in.          | 1·30 | 1·57 | 1·51 | 4·95 | 3·18 | 9·55 | 2·51 | 3·28 | 2·21  |
| Average per<br>Rain Day | ·108 | ·112 | ·168 | ·206 | ·212 | ·145 | ·125 | ·091 | ·138  |

MORRIS BIRKBECK.

*Shortheath, Farnham, Surrey, 12th November, 1910.*

## LOW RADIATION TEMPERATURES.

AN instance of remarkably strong radiation occurred at the Hampstead Scientific Society's Observatory, on the highest point of the Heath, on Friday, December 30th, 1910; at 4.20 p.m. the dry-bulb in the screen read 38°·9 and the wet-bulb 38°·2, while the grass minimum was as low as 26°·7, showing a depression of 12°·2. There was a faint breeze from the north at the time, and about two-fifths of the sky was cloudy, although it was clear immediately overhead. During the ensuing night the screen minimum was 32°·2 and that on the grass 21°·9. Depressions of ten degrees seem to be quite common, but I have not previously noted a difference of twelve degrees at so early an hour in the evening.

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

*2, Akenside Road, Fitzjohn's Avenue, Hampstead, N.W., January 1st, 1910.*

## CYCLONES AND THE SUN'S ROTATION PERIOD.

By F. W. HENKEL, B.A., F.R.A.S.

It has long been known that there is an intimate connection between the variations in magnetic intensity, declination and magnetic storms and solar activity. The eleven year sun-spot period corresponds with that of the larger variations of magnetic declination, as was shown by Sabine, Gautier and Wolf, soon after the detection of the former by Schwabe. Balfour Stewart and others from the Kew Observations brought out this correspondence very clearly ; but there seems to be a slight lag in point of time, the magnetic changes following the sunspot changes of about 5 months previously, whilst Mr. Ellis, from the long series of Greenwich Observations, has shown the association to be undoubted, though not extending to absolute parallelism in every detail. The curves of auroral frequency and sunspots are also intimately connected, whilst the irregular variations known as magnetic storms are synchronous with unusual solar disturbances, development of sun-spots, large faculæ, &c. The "magnetic storm" of September, 1909, was thus characterised.

As it seems natural to suppose that the amount of heat received by the Earth from the Sun should vary with the state of the latter's surface, there have not been wanting attempts to show a connection between the greater or less spotted condition of the Sun and terrestrial variations of temperature. Nevertheless, such attempts have hitherto met with but little success, and contradictory results have been arrived at by different authorities. In the first place, though the spots themselves radiate less heat than the general surface of the Sun, and thus their direct tendency is to make the Earth cooler ; on the other hand, since they are probably due to, or accompanied by, eruptive action, the hotter gases from below bursting upwards with extra abundance during seasons of maxima, this latter will increase the emission of heat from the Sun, perhaps to an even greater extent. Observations made by German observers discussed by Jelinek, showed no difference that could be assigned to that cause. Mr. Stone at the Cape, and Dr. Gould at Cordoba, in Argentina, considered that a distinct, though very slight diminution of temperature was shown, at the time of sun-spot maximum, from observations at their stations. According to Dr. Gould, the difference between maximum and minimum amount to about  $1^{\circ}75$  F. Mr. Stone's result was only about half as much. On the other hand, observations in India, Edinburgh, and other places, seem to show that the sun is slightly hotter at times of spot maxima. The influence of sun-spots upon storms and rainfall, however, seems to be somewhat more pronounced ; though here too we may use the words of the late Professor Young, and say, that "in the astronomical world one party holds that the state of the sun's surface is a determining factor in our terrestrial meteorology, making itself felt in our temperature, barometric pressure, rainfall, cyclones, crops, and *even our financial condition* (Jevons);

whilst the other party contends that there is, and can be, no sensible influence upon the earth produced by such slight variations in solar light and heat." From a comparison between the number of cyclones observed in the Indian Ocean, the late Dr. Meldrum, for many years Director of the Royal Alfred Observatory, Mauritius, attempted to show that the number of these disturbances was greatest at the time of sun-spot maximum. His Table is given below :—

| YEARS. |           | No. of Cyclones<br>in each year. | Total number<br>of Cyclones. |
|--------|-----------|----------------------------------|------------------------------|
| Maxima | 1847..... | 4                                | 15                           |
|        | 1848..... | 6                                |                              |
|        | 1849..... | 5                                |                              |
|        | 1855..... | 4                                |                              |
| Minima | 1856..... | 1                                | 8                            |
|        | 1857..... | 3                                |                              |
|        | 1859..... | 5                                |                              |
| Maxima | 1860..... | 8                                | 21                           |
|        | 1861..... | 8                                |                              |
|        | 1866..... | 5                                |                              |
| Minima | 1867..... | 2                                | 9                            |
|        | 1868..... | 2                                |                              |
|        | 1870..... | 3                                |                              |
| Maxima | 1871..... | 4                                | 14                           |
|        | 1872..... | 7                                |                              |

By including other great storms, Meldrum arrived at a similar result, but the number of observations is scarcely sufficient to lend conviction ; moreover, the variations from year to year are very considerable. Attempts have been made to confirm this relationship by tabulating the rainfall at stations on or near the Indian Ocean. However, the results of the late Mr. Symons from the British rainfall of more than a century, do not show any evidence of the connection between sun spots and the rain, an immense number of rainfall observations were tabulated by him, but the result was "equivocal" ; whilst the results of observations in the United States and elsewhere "are in direct conflict to the theory." Meldrum's general conclusion was that the average rainfall for the whole Earth is about 38·5 inches, the range between maximum and minimum is about 4 inches, the maximum occurring about a year after the sun-spot maximum.

About five years ago, Mr. Maunder, of Greenwich, from a discussion of the Magnetic disturbances as recorded at the Royal Observatory for the period 1882 to 1903, showed that these disturbances tended to recur at intervals corresponding to one or more synodic rotations of the Sun (about  $27\frac{1}{4}$  days), with a frequency much greater than could be ascribed to chance. From this it followed that these magnetic disturbances are intimately connected with the solar rotation, and the action, whatever its nature, does not proceed from the Sun as a whole, but from limited portions of the surface, and seems to proceed in a definite and restricted direction. The discovery of this "Interval

Relation," as he called it, led him to enquire whether any meteorological phenomena tended likewise to recur in a similar manner. Though it is, of course, obvious that the Sun's general action upon terrestrial meteorology is of paramount importance, yet any action from limited regions along restricted lines would be liable to be masked by the much greater effects of season and climate. A magnetic disturbance, if sufficiently intense, is instantaneously manifested over the whole planet, but a meteorological one would probably take an appreciable time to develop. The number of striking changes is so great, that it is only under exceptional circumstances that a sufficiently simple record can be found for the "Interval Relation" to be detected, if it exist. For these and other reasons he has examined several lists of tropical cyclones, to ascertain, if possible, whether they manifested such a relation. Father Algué's work on the "Cyclones of the Philippines" did not prove suitable for the enquiry; the cyclones recorded were too numerous, and their dates of origin too uncertain. Sir John Eliot's "Handbook of Cyclonic Storms in the Bay of Bengal" seemed to give some indications, but not of a very decided character. The case was different, however, with the list of "Cyclones in the Southern Indian Ocean," compiled by the late Dr. Meldrum, whose work we have already referred to in connection with the supposed relationship between these phenomena and sun-spot periodicity; 109 cyclones for the period 1856—1867 were examined, and found to present several remarkable series. The longest succession of cyclones following each other at the required intervals, is the following: 1865—December 8th; 1866—Jan. 6th, February 2nd, March 3rd, March 30th. Mr. Maunder remarks that, if we suppose the actual commencements of the storms of January 6th and March 3rd had really been a little before the midnights of January 5th and March 2nd respectively, but were not recorded until after those midnights, an error which might be due to the scattered positions of shipping in the Indian Ocean, or to a failure to allow for difference of longitude, the sequence would be absolutely regular. Even so the probability that there is an accidental relation is exceedingly small, for no other cyclones were catalogued at Mauritius during the half-year, October, 1865, to March, 1866, the cyclone season in Mauritius being limited to the eight months October to May. Another somewhat less striking sequence occurred in 1862:—January 2nd, January 28th, February 23rd, March 23rd. There were, however, several other cyclones during the same period; and, indeed, a third sequence ran its course during the same period, viz.:—1861—December 26th; 1862—January 23rd, February 21st.

Since the Moon's sidereal period (27·3 days) has nearly the same length as the Sun's synodic rotation, a single sequence might conceivably be as well connected with the former as the latter; but the influence due to the Moon must be strictly periodic in character, whilst an influence depending on the Sun's synodic rotation cannot be so in the main. It is only when we have irregularity, when there

are certain regions where action is greater or less than that of the general surface, and this is long continued, that the rotation period can be brought out. During the last 50 years, much labour has been devoted to analysing meteorological and magnetic observations, with a view to finding a period in them corresponding to that of the Sun's rotation, notwithstanding the well-known fact that out of 6,000 groups of sun-spots observed at Greenwich during 33 years, only 468 were seen at a second rotation, and *one* only survived to be seen in a sixth apparition, they being such transitory phenomena. If, however, we search for an *interval*, not for a *period*, we get more satisfactory results, and out of a total of 135 cyclones (including "Bengal"), no less than 93 fall into sequences of cyclones arranged according to "day of rotation."

Usually the sequences have been limited to intervals of not more than 3 rotation periods, but sometimes, as in the first case given (1865-6), we have 5 cyclones following at this interval. A cyclone does not always recur at the end of a single rotation, the tendency is, perhaps, rather for the recurrence to take place at the end of two or three rotations. Since the cyclone season is limited at Mauritius, it is evident that in many cases no return could be expected. There were 82 possible cases of the return of a cyclone at the end of one rotation, and 15 returns were registered; 69 possible cases at the end of two rotations, and 31 occurred; 50 possible cases at the end of three, of which 30 happened.

In addition, the cyclones registered for the Bay of Bengal, during the quiet season for Mauritius, supplement the Mauritius sequences in quite a number of cases, and this is the more remarkable, since the area of the Bay of Bengal is so much more restricted, and the cyclones recorded there are much fewer in number. With regard to the possible cause of these recurrences, whether due to a "stream line" from the Sun striking the Earth or otherwise, it does not follow that there is any connection between cyclones and sun-spots, nor can it be expected that the meteorology of the whole Earth should respond in the same way that its magnetism does to solar activity. The hemisphere in darkness may be expected to escape wholly or partially whatever action the "stream line" may produce. For this reason, seeing that the mean synodic period, after which the Sun and Earth are relatively in the same presentment as at first, is  $27\frac{1}{3}$  days, a region presented to the Sun on the first occasion would probably be turned away from it either on the second or third occasion, or perhaps on both. We find in the first sequence noted (1856-7): Cyclones, 1856—November; 1857—January 28th, March 23rd, an interval of three rotations separates the first and second, and two the second and third. The longest sequence of all, however (1865-6), shows the cyclones following at intervals of a single rotation. A full confirmation of the case would be afforded if the intervals in the sequences could be filled up by cyclones occurring in the Pacific or Atlantic Oceans, but so far the comparison has not been made.



## REVIEWS.

*Quelques Recherches sur les Centres d'Action de l'Atmosphère* par H. HILDEBRAND HILDEBRANDSSON. III.—IV. Sur la compensation entre les types des saisons simultanés en différentes régions de la Terre. [Some Researches on the Centres of Action of the Atmosphere. III. & IV. On the compensation between the types of seasons occurring simultaneously in different parts of the Earth.] Reprinted from the Transactions of the Royal Swedish Academy of Science. Vol. 45. Nos. 2 and 11, 1909 and 1910. Size  $12\frac{1}{2} \times 10$ . Pp. 12 and 22. Plates.

IN these important papers Professor Hildebrandsson pursues his researches into the relation of the meteorological conditions in distant places at the same time. In his previous memoirs he showed that there was a sort of compensation between certain regions which he named centres of action, in such a way for example that the variations of barometric pressure and rainfall at the Azores and Iceland are almost always in opposite directions, especially in winter, the same being true of Siberia and Alaska, and of Tahiti and Tierra del Fuego, while on the other hand there is a marked agreement between the variations of pressure at the Azores and in Siberia in winter.

The analogies and contrasts have been studied farther by Sir John Eliot, Dr. Gilbert Walker and Sir Norman Lockyer. The work of the last named authority shows that the relation between Bombay and Cordoba is not always uniform, and in some cases the differences of mean annual pressure are represented by  $+(?)$  or  $--(?)$  over considerable areas. These discrepancies Professor Hildebrandsson traces to the differences between the two regions being in opposite directions at different seasons. The work of Professor Pettersson, of Stockholm, and Professor Meinardus, of Berlin, points to the temperature of the water of the North Atlantic as an important influence in modifying the temperature of the air in north-western Europe, and Professor Hildebrandsson considers it probable that we must attribute the principal cause of the different types of European seasons to the condition of the ice in the polar seas. The slight variability of climate in the tropics lends support to this view.

Memoir No. III. contains tables and curves showing the relations between various places, and we think it right to occupy a considerable amount of space in quoting the general result of each set of comparisons. The temperature, pressure and rainfall curves referred to are those for particular seasons in successive years of a long series.

1. The temperature curve at the North Cape for summer is opposite to that for the following spring at Grimsey in Iceland.

2. The curve of spring air temperature at Godthaab in Greenland is similar to that at Grimsey for March of the previous year.

3. The temperature curve of the air at Upernivik, Greenland, for winter is the inverse of that at St. John's, Newfoundland, for the following July.

4. A chilled sea-surface leads to lower air temperature and higher pressure; and the variation of pressure in spring at Thorshavn (Faröes) is the opposite of that of the simultaneous temperature at Debreczin in Hungary. At the same time the curve of temperature at Barnaul in Siberia is the inverse of that at Upsala in Sweden.

5. For autumn the same opposition is remarked between the temperature curves at Barnaul and Thorshavn.

6. For the winter half-year (October to March) the curves of rainfall at Thorshavn and Barnaul are opposed; but those at Thorshavn and Zi-ka-wei, in the east of China, are almost identical.

7. For the winter half-year the rainfall curves at Thorshavn and the mean of Vienna and Trieste are opposed.

8. For the middle of winter, however (January and February) the temperature curves at Thorshavn and for the centre of northern Asia, Barnaul and Yeneseisk, are rather in accord than in opposition.

9. The winter rain curve at Java is almost identical with the barometer curve for the following summer at Bombay.

10. On the other hand, there is an opposition in the rainfall curve for summer at Barnaul and Yeneseisk on the one side and Mauritius on the other.

11. In the winter half-year there is an opposite tendency in the barometer curves at St. Helena and at Ponta Delgada in the Azores.

Memoir No. IV. goes more fully into the question, and shows:—

1. For January—February the temperature over the sea between Iceland and Norway is almost always in accord with that of the whole of the north of Europe between the North Cape and Hamburg.

2. On the contrary, the temperature curves at Thorshavn and Beruffjord are opposed to those at San Fernando, Lisbon and Algiers.

3. In a middle zone the temperature of winter is sometimes in accordance with the north European and sometimes with the south European system.

4. The observations at Stykkisholm in Iceland are not representative of the typical Icelandic centre of action, but rather of the intermediate zone between that and the south European centre.

5. In North America the same opposition between the curves of atmospheric conditions between north and south is apparent. The whole northern region between California and British Columbia on the west, and Greenland and Newfoundland on the east, has in general a curve of winter temperature opposite to that of the southern region extending from Mexico on the west to Bermuda on the east, and from Toronto on the north to Key West on the south.

6. Comparing European and American curves we see that if the winter is cold in the north of Europe it is mild in the south of Europe and in the north of America, but severe in the United States east of the Rocky Mountains and in Mexico; and *vice versa*.

7. There must be an intermediate zone between the two centres of action in North America as in Europe, and Winnipeg undoubtedly belongs to this zone in winter.

8. For winter the same opposition occurs in rainfall curves as in temperature curves between the United States and southern Europe.

9. Exceptions to the foregoing relations may arise from the fact that rain in summer or in hot climates lowers the temperature of the air, whereas rain in winter or in cold climates raises the temperature.

10. In summer the high pressure of the Azores centre of action is more influential in Europe than the low pressure of the Iceland centre of action, still, the western coasts of north-western Europe are under the direct influence of the sea, and their temperature curves are in accord with those of Thorshavn.

11. The direct influence of the sea diminishes as one goes inland, and in fact the summer temperature of the whole Baltic region and the north of Germany depends on the general cooling of the previous winter, *i.e.*, on the temperature of the preceding winter between Norway and Iceland.

12. In the south of Europe the summer temperature curves are in opposition with those of the Baltic region, *i.e.*, of the preceding winter at Thorshavn.

13. There is in summer an intermediate zone extending from Greenwich, across central Europe to Vienna and Debreczin in Hungary.

14. The same opposition exists between the temperature of the northern and southern parts of North America in summer as in winter.

15. In summer the temperature curve in southern Siberia is the inverse of that in the neighbourhood of Iceland for the preceding winter, and thus also the inverse of the temperature curve of northern Europe. Thus in summer there is opposition between the north of Europe on the one side and southern Europe and Siberia on the other.

The attempt to enquire into similar relationships in the Southern Hemisphere is hampered by the absence of trustworthy records of sufficient duration; but a comparison of the observations at Punta Arenas in Magellan Strait with those at Cordoba and Santiago seems to show that the same opposition in the form of the seasonal temperature curve seems to prevail between the temperate and the sub-tropical zones in South America. The attempt to find a relationship between the temperature and the rainfall of North and South America has not been successful. There are, however, resemblances between the winter half-year's rainfall for Java and the following summer half year's rainfall at Santiago de Chile; and also a resemblance between the pressure curves for the summer half-year in South America, those for Southern Australia for the preceding winter half-year, and for Cape Town for the winter months of the preceding year. The impression suggested is that these phenomena are propagated like a wave from the Cape of Good Hope to Australia and thence with accelerated speed to South America.

Professor Hildebrandsson points out that the marked opposition between the rainfall at Stykkisholm and Brussels for the 21 years, 1857-1878, which diminished later and disappeared about 1900, as Professor Hann observed, is due to the fact that neither station is in a typical centre of action, but each in a transitional zone. The whole research is of profound interest, not only because of its importance in the theory of meteorology, but because it opens up prospects of the possibility of long-range weather forecasts on a satisfactory basis. It is a striking reply to the criticism of some mathematical physicists that new observations are not wanted so much as discussions of existing observations. The fact is that long homogeneous series of observations are the most valuable and the rarest of all scientific data, and any criticism which disheartens an observer and causes him to break a conscientious record of many years' standing, perhaps carried on by several generations, is a harm no mathematician can heal.

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*Weather Instruments and how to use them.* By D. W. HORNER.  
London, Witherby & Co., 1910. Size  $7\frac{1}{2} \times 5$ . Pp. 48. Price 6d.

A SIMPLE outline of the requirements for elementary meteorological observations, designed to meet the needs of the amateur who is taking them up as a hobby without previous knowledge. Mr. Horner very wisely enforces the desirability of proceeding along the lines which have met with official sanction, thereby securing the uniformity which is essential in all climatological work, but he recommends deviations from these in one or two instances with which we cannot agree. We cannot join him in approving Six's thermometer as a scientific instrument, and we consider that the author was rarely fortunate to have used one of these for fifteen years without any mishap.

Mr. Horner's little book should help in popularizing the habit of making meteorological observations, of which those concerning rainfall are the simplest and most useful, and we hope that it will induce many to proceed further with this fascinating study.

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*Oxford Wall Maps. Mean Annual Rainfall of the British Isles.*  
By DR. H. R. MILL. Scale 1:1,000,000 (about 16 miles to an inch). Oxford, Clarendon Press, 1910. Size  $59 \times 39$ . Price 7s. 6d.

THIS map is one of a series of wall maps designed by Professor Herbertson to exhibit the physical conditions of the British Isles. It is an advance on the Average Rainfall map, published in the Minutes of Proceedings of the Institution of Civil Engineers in 1904, but refers to the average of the same period, 1870-1899.

## RAINFALL TABLE FOR DECEMBER, 1910.

| STATION.                       | COUNTY.                   | Lat.<br>N. <sup>o</sup> | Long.<br>W.<br>[ <sup>o</sup> E.] | Height<br>above<br>Sea.<br>ft. | RAINFALL<br>OF MONTH           |              |
|--------------------------------|---------------------------|-------------------------|-----------------------------------|--------------------------------|--------------------------------|--------------|
|                                |                           |                         |                                   |                                | Aver.<br>1875—<br>1909.<br>in. | 1910.<br>in. |
| Camden Square.....             | <i>London</i> .....       | 51 32                   | 0 8                               | 111                            | 2'13                           | 3'29         |
| Tenterden.....                 | <i>Kent</i> .....         | 51 4                    | *0 41                             | 190                            | 2'77                           | 4'39         |
| Stevington.....                | <i>Sussex</i> .....       | 50 53                   | 0 20                              | 80                             | 3'45                           | 3'81         |
| Southampton (Cadland) ...      | <i>Hampshire</i> .....    | 50 50                   | 1 22                              | 52                             | 3'23                           | 5'08         |
| Hitchin.....                   | <i>Hertfordshire</i> ..   | 51 57                   | 0 17                              | 238                            | 2'11                           | 4'47         |
| Oxford (Magdalen College)..    | <i>Oxfordshire</i> .....  | 51 45                   | 1 15                              | 186                            | 2'06                           | 4'16         |
| Bury St. Edmunds (Westley)     | <i>Suffolk</i> .....      | 52 15                   | *0 40                             | 226                            | 2'14                           | 4'35         |
| Geldeston [Beccles].....       | <i>Norfolk</i> .....      | 52 27                   | *1 31                             | 38                             | 2'07                           | 4'02         |
| Polapit Tamar [Launceston]     | <i>Devon</i> .....        | 50 40                   | 4 22                              | 315                            | 4'46                           | 7'46         |
| Rousdon [Lyme Regis].....      | ".....                    | 50 41                   | 3 0                               | 516                            | 3'68                           | 6'21         |
| Stroud (Upfield).....          | <i>Gloucestershire</i> .. | 51 44                   | 2 13                              | 226                            | 2'71                           | 5'07         |
| Church Stretton (Wolstaston).. | <i>Shropshire</i> .....   | 52 35                   | 2 48                              | 800                            | 2'99                           | 6'95         |
| Coventry (Kingswood).....      | <i>Warwickshire</i> ..    | 52 24                   | 1 30                              | 340                            | 2'66                           | 4'21         |
| Market Overton.....            | <i>Rutland</i> .....      | 52 44                   | 0 41                              | 475                            | 2'41                           | 6'89         |
| Boston.....                    | <i>Lincolnshire</i> ..... | 52 58                   | 0 1                               | 25                             | 1'88                           | 4'22         |
| Workshop (Hodsock Priory).     | <i>Nottinghamshire</i> .. | 53 22                   | 1 5                               | 56                             | 2'17                           | 3'53         |
| Macclesfield.....              | <i>Cheshire</i> .....     | 53 15                   | 2 7                               | 501                            | 3'35                           | 2'87         |
| Southport (Hesketh Park)..     | <i>Lancashire</i> .....   | 53 38                   | 2 59                              | 38                             | 3'10                           | 2'81         |
| Wetherby (Ribston Hall) ...    | <i>Yorkshire, W.R.</i>    | 53 59                   | 1 24                              | 130                            | 2'27                           | 2'90         |
| Arnccliffe Vicarage.....       | ".....                    | 54 8                    | 2 6                               | 732                            | 6'75                           | 7'95         |
| Hull (Pearson Park).....       | "..... <i>E.R.</i>        | 53 45                   | 0 20                              | 6                              | 2'32                           | 2'89         |
| Newcastle (Town Moor) ...      | <i>Northumberland</i> ..  | 54 59                   | 1 38                              | 201                            | 2'46                           | 2'04         |
| Borrowdale (Seathwaite) ...    | <i>Cumberland</i> .....   | 54 30                   | 3 10                              | 423                            | 15'14                          | 21'41        |
| Cardiff (Ely).....             | <i>Glamorgan</i> .....    | 51 29                   | 3 13                              | 53                             | 4'70                           | 6'10         |
| Haverfordwest.....             | <i>Pembroke</i> .....     | 51 48                   | 4 58                              | 95                             | 5'18                           | 7'11         |
| Aberystwyth (Gogerddan)..      | <i>Cardigan</i> .....     | 52 26                   | 4 1                               | 83                             | 4'66                           | 5'73         |
| Llandudno.....                 | <i>Carnarvon</i> .....    | 53 20                   | 3 50                              | 72                             | 2'84                           | 4'24         |
| Cargen [Dumfries].....         | <i>Kirkcudbright</i> ...  | 55 2                    | 3 37                              | 80                             | 4'84                           | 6'95         |
| Marchmont House.....           | <i>Berwick</i> .....      | 55 44                   | 2 24                              | 498                            | 2'83                           | 2'04         |
| Girvan (Pinnore).....          | <i>Ayr</i> .....          | 55 10                   | 4 49                              | 207                            | 5'48                           | 6'79         |
| Glasgow (Queen's Park) ...     | <i>Renfrew</i> .....      | 55 53                   | 4 18                              | 144                            | 3'95                           | 3'52         |
| Inveraray (Newtown).....       | <i>Argyll</i> .....       | 56 14                   | 5 4                               | 17                             | 8'57                           | 8'70         |
| Mull (Quinish).....            | ".....                    | 56 34                   | 6 13                              | 35                             | 6'59                           | 5'03         |
| Dundee (Eastern Necropolis)    | <i>Forfar</i> ..          | 56 28                   | 2 57                              | 199                            | 2'67                           | 2'70         |
| Braemar.....                   | <i>Aberdeen</i> .....     | 57 0                    | 3 24                              | 1114                           | 3'13                           | 4'80         |
| Aberdeen (Cranford).....       | ".....                    | 57 8                    | 2 7                               | 120                            | 3'43                           | 3'44         |
| Cawdor.....                    | <i>Nairn</i> .....        | 57 31                   | 3 57                              | 250                            | 2'53                           | 1'85         |
| Fort Augustus (S. Benedict's)  | <i>E. Inverness</i> ..    | 57 9                    | 4 41                              | 68                             | 5'62                           | 3'96         |
| Loch Torridon (Bendamph)       | <i>W. Ross</i> .....      | 57 32                   | 5 32                              | 20                             | 9'70                           | 7'97         |
| Dunrobin Castle.....           | <i>Sutherland</i> .....   | 57 59                   | 3 56                              | 14                             | 3'09                           | 3'46         |
| Wick.....                      | <i>Caithness</i> .....    | 58 26                   | 3 6                               | 77                             | 3'11                           | 3'42         |
| Killarney (District Asylum)    | <i>Kerry</i> .....        | 52 4                    | 9 31                              | 178                            | 6'92                           | 5'11         |
| Waterford (Brook Lodge)...     | <i>Waterford</i> .....    | 52 15                   | 7 7                               | 104                            | 4'32                           | 4'08         |
| Nenagh (Castle Lough).....     | <i>Tipperary</i> .....    | 52 54                   | 8 24                              | 120                            | 4'34                           | 3'49         |
| Miltown Malbay.....            | <i>Clare</i> .....        | 52 52                   | 9 26                              | 400                            | 4'84                           | 4'72         |
| Gorey (Courtown House) ..      | <i>Wexford</i> .....      | 52 40                   | 6 13                              | 80                             | 3'42                           | 6'21         |
| Abbey Leix (Blandsfort)...     | <i>Queen's County</i> ..  | 52 56                   | 7 17                              | 532                            | 3'41                           | 4'75         |
| Dublin (Fitz William Square)   | <i>Dublin</i> .....       | 53 21                   | 6 14                              | 54                             | 2'27                           | 5'57         |
| Mullingar (Belvedere).....     | <i>Westmeath</i> .....    | 53 29                   | 7 22                              | 307                            | 3'39                           | 4'28         |
| Ballinasloe.....               | <i>Galway</i> .....       | 53 20                   | 8 15                              | 160                            | 3'69                           | 3'55         |
| Crossmolina (Enniscroe)...     | <i>Mayo</i> .....         | 54 4                    | 9 18                              | 74                             | 6'11                           | 2'43         |
| Collooney (Markree Obsy.)..    | <i>Sligo</i> .....        | 54 11                   | 8 27                              | 127                            | 4'34                           | 2'68         |
| Seaforde.....                  | <i>Down</i> .....         | 54 19                   | 5 50                              | 180                            | 3'77                           | 5'69         |
| Bushmills (Dundarave).....     | <i>Antrim</i> .....       | 55 12                   | 6 30                              | 162                            | 3'87                           | 3'43         |
| Omagh (Edenfel).....           | <i>Tyrone</i> .....       | 54 36                   | 7 18                              | 280                            | 3'91                           | 3'56         |

## RAINFALL TABLE FOR DECEMBER, 1910—continued.

| RAINFALL OF MONTH (con.) |          |                   |       |             | 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. in.  | 1910. in. | Diff. from Aver. in. | % of Av. |                        |                 |
|                          |          | in.               | Date. |             |                       |           |                      |          | in.                    |                 |
| +1.16                    | 154      | .52               | 1     | 20          | 25.11                 | 25.36     | + .25                | 101      | 25.11                  | Camden Square   |
| +1.62                    | 159      | .76               | 12    | 22          | 27.64                 | 31.04     | +3.40                | 112      | 27.64                  | Tenterden       |
| + .36                    | 110      | .77               | 15    | 18          | 33.58                 | 39.89     | +6.31                | 119      | 33.58                  | Steyning        |
| +1.85                    | 157      | .61               | 14    | 21          | 31.87                 | 33.73     | +1.86                | 106      | 31.87                  | Cadland         |
| +2.36                    | 212      | .63               | 14    | 23          | 25.16                 | 27.74     | +2.58                | 110      | 25.16                  | Hitchin         |
| +2.10                    | 202      | .99               | 14    | 20          | 24.58                 | 25.82     | +1.24                | 105      | 24.58                  | Oxford          |
| +2.21                    | 203      | 1.12              | 1     | 21          | 25.40                 | 29.02     | +3.62                | 114      | 25.40                  | Westley         |
| +1.95                    | 194      | 1.19              | 1     | 27          | 23.73                 | 30.44     | +6.71                | 128      | 23.73                  | Geldeston       |
| +3.00                    | 167      | 1.18              | 12    | 29          | 38.27                 | 49.05     | +10.78               | 128      | 38.27                  | Polapit Tamar   |
| +2.53                    | 168      | .86               | 8     | 23          | 33.54                 | 37.76     | +4.22                | 113      | 33.54                  | Rousdon         |
| +2.36                    | 187      | .80               | 15    | 27          | 29.81                 | 34.94     | +5.13                | 117      | 29.81                  | Stroud          |
| +3.96                    | 233      | 1.42              | 1     | 25          | 32.41                 | 36.69     | +4.28                | 113      | 32.41                  | Wolstaston      |
| +1.55                    | 158      | .73               | 15    | 25          | 28.98                 | 29.89     | + .91                | 103      | 28.98                  | Coventry        |
| +4.48                    | 286      | 2.28              | 1     | 28          | 27.10                 | 32.25     | +5.15                | 119      | 27.10                  | Market Overton  |
| +2.34                    | 225      | 1.23              | 1     | 23          | 23.35                 | 26.23     | +2.88                | 112      | 23.35                  | Boston          |
| +1.36                    | 163      | .92               | 1     | 22          | 24.46                 | 24.87     | + .41                | 102      | 24.46                  | Hodsock Priory  |
| — .48                    | 86       | .39               | 15    | 24          | 34.73                 | 37.89     | +3.16                | 109      | 34.73                  | Macclesfield    |
| — .29                    | 91       | .35               | 15    | 27          | 32.70                 | 35.04     | +2.34                | 107      | 32.70                  | Southport       |
| + .63                    | 128      | .60               | 3     | 24          | 26.87                 | 30.82     | +3.95                | 115      | 26.87                  | Ribston Hall    |
| +1.20                    | 118      | 1.91              | 23    | 26          | 61.49                 | 69.33     | +7.84                | 113      | 61.49                  | Arncliffe       |
| + .57                    | 125      | .48               | 1     | 21          | 26.42                 | 25.63     | — .79                | 97       | 26.42                  | Hull            |
| — .42                    | 83       | .43               | 3     | 22          | 27.94                 | 27.38     | — .56                | 98       | 27.94                  | Newcastle       |
| +6.27                    | 142      | 3.05              | 9     | 28          | 129.48                | 134.24    | +4.76                | 104      | 129.48                 | Seathwaite      |
| +1.40                    | 130      | 1.01              | 23    | 25          | 42.28                 | 50.56     | +8.28                | 120      | 42.28                  | Cardiff         |
| +1.93                    | 137      | 1.30              | 8     | 24          | 46.81                 | 45.67     | —1.14                | 98       | 46.81                  | Haverfordwest   |
| +1.07                    | 123      | .79               | 16    | 28          | 45.46                 | 54.51     | +9.05                | 120      | 45.46                  | Gogerddan       |
| +1.40                    | 149      | .86               | 16    | 26          | 30.36                 | 36.68     | +6.32                | 121      | 30.36                  | Llandudno       |
| +2.11                    | 144      | 1.18              | 16    | 22          | 43.47                 | 56.21     | +12.74               | 130      | 43.47                  | Cargen          |
| — .79                    | 72       | .42               | 16    | 22          | 33.76                 | 28.86     | —4.90                | 85       | 33.76                  | Marchmont       |
| +1.31                    | 124      | .88               | 13    | 29          | 49.77                 | 54.60     | +4.83                | 110      | 49.77                  | Girvan          |
| — .43                    | 89       | .50               | 6     | 24          | 35.97                 | 38.53     | +2.56                | 107      | 35.97                  | Glasgow         |
| +1.13                    | 102      | 1.24              | 23    | 30          | 68.67                 | 68.21     | — .46                | 99       | 68.67                  | Inveraray       |
| —1.56                    | 76       | .51               | 21    | 28          | 56.57                 | 52.21     | —4.36                | 92       | 56.57                  | Quinish         |
| + .03                    | 101      | .46               | 4     | 19          | 28.64                 | 28.70     | + .06                | 100      | 28.64                  | Dundee          |
| +1.67                    | 153      | ...               | ...   | ...         | 34.93                 | 40.57     | +5.64                | 116      | 34.93                  | Braemar         |
| + .01                    | 100      | .43               | 9     | 25          | 32.73                 | 31.58     | —1.15                | 96       | 32.73                  | Aberdeen        |
| — .68                    | 73       | .27               | 24    | 11          | 29.33                 | 31.45     | +2.12                | 107      | 29.33                  | Cawdor          |
| —1.66                    | 70       | .72               | 21    | 25          | 44.53                 | 42.22     | —2.31                | 95       | 44.53                  | Fort Augustus   |
| —1.73                    | 82       | 1.27              | 20    | 20          | 83.61                 | 83.02     | — .59                | 99       | 83.61                  | Bendarnagh      |
| + .37                    | 112      | .56               | 31    | 20          | 31.90                 | 33.46     | +1.56                | 105      | 31.90                  | Dunrobin Castle |
| + .31                    | 110      | .50               | 31    | 28          | 29.88                 | 32.41     | +2.53                | 109      | 29.88                  | Wick            |
| —1.81                    | 74       | .82               | 16    | 29          | 54.81                 | 58.85     | +4.04                | 107      | 54.81                  | Killarney       |
| — .24                    | 94       | 1.16              | 15    | 21          | 39.57                 | 39.60     | + .03                | 100      | 39.57                  | Waterford       |
| — .85                    | 80       | 1.05              | 15    | 26          | 39.43                 | 40.98     | +1.55                | 104      | 39.43                  | Castle Lough    |
| — .12                    | 98       | 1.47              | 15    | 29          | 45.11                 | 44.73     | — .38                | 99       | 45.11                  | Miltown Malbay  |
| +2.79                    | 182      | .97               | 15    | 22          | 34.99                 | 39.63     | +4.64                | 113      | 34.99                  | Courtown Ho.    |
| +1.34                    | 139      | .93               | 15    | 26          | 35.92                 | 42.97     | +7.05                | 120      | 35.92                  | Abbey Leix      |
| +3.30                    | 245      | .77               | 1     | 25          | 27.68                 | 35.44     | +7.76                | 128      | 27.68                  | Dublin          |
| + .89                    | 126      | .95               | 15    | 22          | 36.15                 | 41.19     | +5.04                | 114      | 36.15                  | Mullingar       |
| — .14                    | 96       | 1.03              | 15    | 28          | 36.64                 | 36.05     | — .59                | 98       | 36.64                  | Ballinasloe     |
| —3.68                    | 40       | .40               | 16    | 25          | 52.87                 | 52.01     | — .86                | 98       | 52.87                  | Enniscroe       |
| —1.66                    | 62       | .46               | 15    | 27          | 42.71                 | 53.38     | +10.67               | 125      | 42.71                  | Markree         |
| +1.92                    | 151      | .90               | 9     | 27          | 38.91                 | 38.62     | — .29                | 99       | 38.91                  | Seaford         |
| — .44                    | 89       | .46               | 16    | 28          | 37.56                 | 41.13     | +3.57                | 109      | 37.56                  | Dundarave       |
| — .35                    | 91       | .65               | 15    | 25          | 39.38                 | 43.74     | +4.36                | 111      | 39.38                  | Omagh           |

## SUPPLEMENTARY RAINFALL, DECEMBER, 1910.

| Div.  | STATION.                     | Rain<br>inches | Div.   | STATION.                     | Rain<br>inches |
|-------|------------------------------|----------------|--------|------------------------------|----------------|
| II.   | Warlingham, Redvers Road     | 4.79           | XI.    | Llangyhanfal, Plâs Draw....  | 6.66           |
| "     | Ramsgate .....               | 3.38           | "      | Dolgelly, Bryntirion .....   | 11.54          |
| "     | Hailsham .....               | 3.77           | "      | Bettws-y-Coed, Tyn-y-bryn    | 7.41           |
| "     | Totland Bay, Aston House.    | 4.21           | "      | Lligwy .....                 | 4.48           |
| "     | Stockbridge, Ashley .....    | 5.28           | "      | Douglas .....                | ...            |
| "     | Grayscott .....              | 7.18           | XII.   | Stoneykirk, Ardwell House    | 5.88           |
| "     | Reading, Calcot Place.....   | 4.29           | "      | Dalry, The Old Garroch ..... | 10.36          |
| III.  | Harrow Weald, Hill House.    | 3.82           | "      | Langholm, Grove Road.....    | 6.14           |
| "     | Pitsford, Sedgebrook .....   | 5.91           | "      | Moniaive, Maxwelton House    | 7.12           |
| "     | Huntingdon, Brampton.....    | 5.70           | XIII.  | St Mary's Loch, Cramilt Ldge | 5.56           |
| "     | Woburn, Milton Bryant.....   | 4.82           | "      | Edinburgh, Royal Observty.   | .99            |
| "     | Wisbech, Monica Road.....    | 4.01           | XIV.   | Maybole, Knockdon Farm..     | 3.66           |
| IV.   | Southend Water Works.....    | 2.89           | XV.    | Campbeltown, Witchburn...    | 6.08           |
| "     | Colchester, Lexden.....      | 3.05           | "      | Glenreadell Mains.....       | 4.95           |
| "     | Newport .....                | 3.56           | "      | Ballachulish House.....      | 8.65           |
| "     | Rendlesham .....             | 4.86           | "      | Islay, Eallabus .....        | 5.18           |
| "     | Swaffham .....               | 3.94           | XVI.   | Dollar Academy .....         | 2.11           |
| "     | Blakeney .....               | 3.20           | "      | Balquhiddy, Stronvar .....   | 9.20           |
| V.    | Bishops Cannings .....       | 4.97           | "      | Coupar Angus .....           | 3.65           |
| "     | Winterbourne Steepleton ..   | 7.86           | "      | Blair Atholl.....            | 4.24           |
| "     | Ashburton, Druid House ..    | 12.77          | "      | Montrose, Sunnyside Asylum   | 2.99           |
| "     | Honiton, Combe Raleigh ..    | 8.32           | XVII.  | Alford, Lynturk Manse ..     | 5.09           |
| "     | Okehampton, Oaklands.....    | 8.82           | "      | Keith Station .....          | 3.72           |
| "     | Hartland Abbey .....         | 5.51           | XVIII. | Glenquoich, Laon .....       | ...            |
| "     | Lynmouth, Rock House ..      | 7.06           | "      | Skye, Dunvegan.....          | 6.67           |
| "     | Probus, Lamellyn .....       | 8.19           | "      | N. Uist, Lochmaddy.....      | 4.84           |
| "     | North Cadbury Rectory ..     | 6.59           | "      | Alvey Manse .....            | 1.70           |
| VI.   | Clifton, Pembroke Road ..    | 5.77           | "      | Loch Ness, Drumnadrochit.    | 2.50           |
| "     | Ross, The Graig .....        | 5.79           | "      | Glen carron Lodge .....      | 9.60           |
| "     | Shifnal, Hatton Grange.....  | 4.78           | "      | Fearn, Lower Pitkerrie.....  | 1.58           |
| "     | Blockley, Upton Wold .....   | 5.19           | XIX.   | Invershin .....              | 3.46           |
| "     | Worcester, Boughton Park.    | 4.24           | "      | Altnaharra .....             | ...            |
| VII.  | Market Rasen .....           | 3.52           | "      | Bettyhill .....              | 3.52           |
| "     | Bawtry, Hesley Hall.....     | 3.27           | XX.    | Dunmanway, The Rectory..     | 6.48           |
| "     | Derby, Midland Railway ..    | 4.82           | "      | Cork .....                   | 4.62           |
| "     | Buxton.....                  | 6.92           | "      | Mitchelstown Castle .....    | 4.70           |
| VIII. | Nantwich, Dorfold Hall.....  | 3.72           | "      | Darrynane Abbey .....        | 6.05           |
| "     | Liscard .....                | 3.49           | "      | Glenam [Clonmel] .....       | 4.30           |
| "     | Chatburn, Middlewood .....   | 4.67           | "      | Nenagh, Traverston .....     | 5.13           |
| "     | Cartmel, Flookburgh .....    | 4.32           | "      | Newmarket-on-Fergus, Fenloe  | 3.20           |
| IX.   | Langsett Moor, Up. Midhope   | 6.51           | XXI.   | Laragh, Glendalough .....    | 14.56          |
| "     | Scarborough, Scalby .....    | 3.08           | "      | Moynalty, Westland .....     | 4.10           |
| "     | Ingleby Greenhow .....       | 3.49           | "      | Athlone, Twyford .....       | 3.40           |
| "     | Mickleton.....               | 2.56           | XXII.  | Woodlawn .....               | 2.60           |
| X.    | Bardon Mill, Beltingham ..   | 2.11           | "      | Westport, St. Helens .....   | 3.48           |
| "     | Ilderton, Lilburn Cottage... | 2.19           | "      | Achill Island, Dugort .....  | 4.12           |
| "     | Keswick, The Bank .....      | 7.99           | "      | Mohill .....                 | 3.21           |
| XI.   | Llanfrehfa Grange.....       | 6.36           | XXIII. | Enniskillen, Portora .....   | 2.73           |
| "     | Treherbert, Tyn-y-waun ..    | 14.65          | "      | Dartrey [Cootehill].....     | 4.03           |
| "     | Carmarthen, The Friary....   | 7.23           | "      | Warrenpoint, Manor House     | 5.41           |
| "     | Castle Malgwyn [Llechryd].   | 7.92           | "      | Banbridge, Milltown .....    | 3.53           |
| "     | Plynlimon.....               | 5.50?          | "      | Belfast, Springfield .....   | 5.09           |
| "     | Crickhowell, Ffordlas.....   | 5.00           | "      | Glenarm Castle.....          | 6.38           |
| "     | New Radnor, Ednol .....      | 11.49          | "      | Londonderry, Creggan. Res.   | 3.31           |
| "     | Rhayader, Tyrmynydd .....    | 12.39          | "      | Killybegs .....              | 5.48           |
| "     | Lake Vyrnwy .....            | 8.40           | "      | Horn Head .....              | 2.62           |

## METEOROLOGICAL NOTES ON DECEMBER, 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 extreme cold of November was followed by a singularly mild December, temp. remaining high throughout. On one day only, the 27th, did it fail to reach 40°, and on 18 days the shade max. exceeded 50°. The persistency of the R was also remarkable, the duration amounting to 81·4 hours, the greatest recorded in December in the past 31 years. The duration of sunshine, was 13·1\* hours, of which more than half occurred on two days, the 18th and 25th. Mean temp. 44°·5, or 4°·9 above the average, and excepting 1868, 1898 and 1900 the highest for December in 53 years' record. Shade max. 54°·6 on 16th; min. 26°·8 on 28th. F 3, f 8.

TENTERDEN.—Duration of sunshine, 41·6† hours. Shade max. 54°·0 on 5th; min. 28°·0 on 28th and 31st. F 5, f 11.

TOTLAND BAY.—The wettest December during the past 25 years, and the warmest since 1900. Great destruction along the coast line by high seas on 16th. Duration of sunshine 53·4\* hours. Shade max. 54°·0 on 16th; min. 29°·7 on 28th. F 2, f 2.

PITSFORD.—R 3·7 in. above the average. Mean temp. 41°·7. Shade max. 52°·3 on 15th; min. 25°·6 on 28th. F 5.

NORTH CADBURY.—The wettest month in the record. Much the warmest December since 1900, and very much warmer than November. Shade max. 54°·0 on 16th; min. 25°·0 on 28th. F 2, f 7.

HODSOCK PRIORY.—Very mild, with no S or winter weather, but with an excess of R during the first half. Shade max. 54°·8 on 23rd; min. 26°·3 on 28th. F 6, f 17.

SOUTHPORT.—Mean temp. 44°·0, or 4°·7 above the average and 5°·1 higher than for November, a circumstance unapproached since 1868. Mean daily range of temp. only 6°·0, or less than in any month in 40 years' record. Duration of sunshine 39·2\* hours, and of R 70·0 hours. Shade max. 52°·6 on 5th; min. 28°·2 on 28th. F 1, f 8.

HULL.—Excepting from 26th to 28th the weather was mild generally, but few fine periods were experienced, being usually dull and gloomy, with frequent R. Shade max. 57°·0 on 24th; min. 28°·0 on 28th. F 6, f 10.

HAVERFORDWEST.—Great damage done by heavy gale on 16th, when the wind reached a force of 70 miles per hour. Duration of sunshine, 32·7\* hours. Shade max. 53°·9 on 16th.

LLANDUDNO.—Shade max. 56°·5 on 9th; min. 30°·2 on 28th. F 1.

CARGEN.—Mean temp. 4°·0 above the average of 50 years, and 6°·5 above the mean for November. Shade max. 52°·0 on 23rd; min. 23°·0 on 28th. F 3.

EDINBURGH.—Shade max. 52°·7 on 23rd; min. 28°·9 on 28th. F 2, f 6.

COUPAR ANGUS.—Persistently wet, but without heavy falls. Shade max. 54°·5 on 23rd; min. 21°·5 on 1st.

FORT AUGUSTUS.—Shade max. 52°·0 on 23rd; min. 23°·0 on 28th. F 7.

CORK.—Shade max. 50°·0 on 12th; min. 28°·0 on 1st and 28th. F 4, f 8.

DUBLIN.—A mild, wet month. R fell daily to 16th, but the second half was finer though continuing mild. Mean temp. 44°·5, or 3°·7 above that for November. Shade max. 55°·4 on 23rd; min. 30°·2 on 28th. F 1, f 3.

MARKREE.—Shade max. 53°·2 on 23rd; min. 23°·5 on 1st. F 5, f 5.

WARRENPOINT.—Shade max. 53°·0 on 23rd; min. 33°·0 on 27th. F 0, f 2.



## Climatological Table for the British Empire, July, 1910.

| STATIONS.<br><br>(Those in italics are<br>South of the Equator.) | Absolute. |       |          |       | Average. |      |               |           | Absolute.       |                   | Total Rain |       | Aver.<br>Cloud. |
|------------------------------------------------------------------|-----------|-------|----------|-------|----------|------|---------------|-----------|-----------------|-------------------|------------|-------|-----------------|
|                                                                  | Maximum.  |       | Minimum. |       | Max.     | Min. | Dew<br>Point. | Humidity. | Max. in<br>Sun. | Min. on<br>Grass. | Depth.     | Days. |                 |
|                                                                  | Temp.     | Date. | Temp.    | Date. |          |      |               |           |                 |                   |            |       |                 |
|                                                                  |           |       |          |       |          |      |               | 0-100     |                 |                   | inches     |       |                 |
| London, Camden Square                                            | 79.2      | 28    | 47.3     | 19    | 68.5     | 53.1 | 53.5          | 82        | 124.8           | 42.2              | 2.53       | 17    | 8.6             |
| Malta ... ..                                                     | 92.7      | 20    | 63.9     | 7     | 81.8     | 69.9 | 67.7          | 79        | 154.4           | ...               | .00        | 0     | 1.1             |
| Lagos ... ..                                                     | ...       | ...   | ...      | ...   | ...      | ...  | ...           | ...       | ...             | ...               | ...        | ...   | ...             |
| Cape Town ... ..                                                 | 79.2      | 2     | 40.9     | 14    | 63.9     | 50.4 | 50.9          | 82        | ...             | ...               | 4.30       | 19    | 3.2             |
| Durban, Natal ... ..                                             | 82.8      | 19    | 49.0     | 12    | 73.7     | 54.3 | ...           | ...       | 132.5           | ...               | .39        | 5     | 2.7             |
| Johannesburg ... ..                                              | 69.8      | 23    | 28.1     | 9     | 61.2     | 40.8 | 35.3          | 64        | 119.7           | 26.8              | .00        | 0     | 1.1             |
| Mauritius ... ..                                                 | 78.0      | 22    | 54.9     | 12    | 75.1     | 62.8 | 60.1          | 76        | 142.2           | 47.7              | 4.01       | 22    | 5.8             |
| Calcutta... ..                                                   | 94.8      | 13    | 74.8     | 26†   | 89.8     | 78.5 | 77.5          | 84        | ...             | 73.5              | 11.14      | 14    | 8.3             |
| Bombay... ..                                                     | 89.1      | 21    | 76.4     | 6     | 85.6     | 78.8 | 76.0          | 82        | 133.1           | 73.8              | 7.42       | 22    | 7.5             |
| Madras ... ..                                                    | 102.4     | 6     | 73.9     | 28    | 94.0     | 78.1 | 73.4          | 74        | 142.5           | 72.4              | 8.08       | 14    | 5.7             |
| Kodaikanal ... ..                                                | 68.2      | 13    | 48.1     | 11    | 62.2     | 52.2 | 52.4          | 88        | 136.3           | 41.8              | 10.94      | 28    | 7.8             |
| Colombo, Ceylon ... ..                                           | 87.6      | 14*   | 72.2     | 23    | 85.3     | 76.1 | 73.7          | 80        | 158.1           | 67.8†             | 2.77       | 12    | 7.0             |
| Hongkong ... ..                                                  | 90.7      | 17    | 74.6     | 1     | 87.0     | 78.8 | 75.8          | 81        | 142.8           | ...               | 13.91      | 13    | 5.8             |
| Melbourne ... ..                                                 | 60.9      | 12    | 31.8     | 18    | 54.9     | 42.7 | 42.4          | 79        | 102.5           | 29.7              | 2.47       | 20    | 7.3             |
| Adelaide ... ..                                                  | 65.1      | 12    | 36.8     | 18    | 58.3     | 45.7 | 46.0          | 78        | 127.5           | 27.7              | 4.05       | 20    | 6.3             |
| Coolgardie ... ..                                                | 64.2      | 25    | 32.0     | 27    | 56.8     | 40.6 | 41.0          | 74        | 133.0           | 29.0              | 1.69       | 20    | 6.0             |
| Perth ... ..                                                     | 65.9      | 8     | 41.1     | 15    | 60.3     | 48.1 | 47.9          | 79        | 114.9           | 33.2              | 10.59      | 26    | 5.5             |
| Sydney ... ..                                                    | 65.5      | 2     | 42.0     | 19    | 59.5     | 46.8 | 43.5          | 78        | 112.1           | 34.0              | 8.69       | 18    | 4.7             |
| Wellington ... ..                                                | 58.8      | 16    | 36.0     | 25‡   | 51.8     | 42.3 | 37.4          | 69        | 95.0            | 27.0              | 2.76       | 18    | 8.0             |
| Auckland ... ..                                                  | 63.0      | 23    | 39.5     | 30    | 57.5     | 46.9 | 47.5          | 84        | 128.0           | 33.0              | 6.32       | 30    | 6.5             |
| Jamaica, Kingston ... ..                                         | 92.3      | 27    | 70.7     | 11    | 89.7     | 72.3 | 68.7          | 70        | ...             | ...               | 1.49       | 5     | 4.4             |
| Grenada ... ..                                                   | 86.0      | 17    | 72.0     | 29    | 84.0     | 74.7 | 71.4          | 77        | 139.0           | ...               | 8.64       | 25    | 5.0             |
| Toronto ... ..                                                   | 93.3      | 9     | 51.5     | 29    | 82.4     | 59.8 | ...           | ...       | 110.2           | 43.7              | 3.90       | 11    | 3.9             |
| Fredericton ... ..                                               | 89.0      | 11    | 43.9     | 5     | 77.7     | 54.6 | ...           | 75        | ...             | ...               | 4.70       | 12    | 6.0             |
| St. John's, N.B. ... ..                                          | 76.5      | 26    | 49.7     | 5     | 67.5     | 55.0 | ...           | ...       | ...             | ...               | 3.83       | 11    | ...             |
| Victoria, B.C. ... ..                                            | 86.7      | 10    | 45.3     | 27    | 71.4     | 51.2 | ...           | 65        | ...             | ...               | .01        | 1     | 2.0             |
| Dawson ... ..                                                    | 86.5      | 29    | 38.0     | 25    | 73.5     | 47.9 | ...           | ...       | ...             | ...               | .82        | 11    | 5.9             |

\* and 16. † and 28. ‡ and 29. || 19 and 31.

MALTA.—Mean temp. of air 75°·0. Average bright sunshine 11·8 hours.

Johannesburg.—Bright sunshine 298· hours.

Mauritius.—Mean temp. of air 0°·7, of dew point 0°·7, and R 1·77 in., above averages. Mean hourly velocity of wind 10·1 miles, or 1·9 below average.

KODAIKANAL.—Bright sunshine 111 hours.

COLOMBO.—Mean temp. of air 77°·5 or 3°·0 below, of dew point 0°·3 above, and R 1·79 in. below, averages. Mean hourly velocity of wind 6·4 miles.

HONGKONG.—Mean temp. of air 82°·3. Bright sunshine 261·9 hours or 60 hours above average, and R 1·13 in. above average. Mean hourly velocity of wind 10·9 miles.

Melbourne.—Mean temp. of air 0°·3 above, and R ·63 in. above, averages.

Adelaide.—Mean temp. of air 0°·5 above, and R 1·49 in. above, averages.

Perth.—Mean temp. of air slightly below, and R about 4·00 in. above, averages.

Sydney.—Mean temp. of air 0°·9 above, and R 4·08 in. above, averages.

Wellington.—Mean temp. of air 0°·6 below, and R 3·20 in. below averages. Bright sunshine 116·7 hours. Fogs on 10 days.

Auckland.—Rainfall 1·75 in. above 45 years' average.