

# Symons's Meteorological Magazine.

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## LOCAL SOCIETIES AND METEOROLOGY.

*(Continued from p. 125.)*

The value of a record of climate grows with its length, and the interruption of private records by death or removal is a difficulty most grievous to the investigator who desires to study the climate of any locality.

A complete meteorological observatory, with self-recording apparatus of the highest accuracy, forming what is technically termed "a first order station," is a costly matter, and involves a paid staff; but a second order station, at which the instruments are read by the eye only, twice a day, is well within the powers of even a small Society. Full particulars of the equipment of such a station may be found in the admirable practical handbook "Hints to Meteorological Observers," by Mr. W. Marriott, of the Royal Meteorological Society, and any request for advice in the establishment of a station addressed to the Secretaries of that Society, at 70, Victoria Street, London, S.W., will receive a sympathetic reply. In Scotland similar enquiries might be addressed to the Scottish Meteorological Society, 122, George Street, Edinburgh.

The Royal Meteorological Society is doing a great deal to disseminate correct views of weather-study, and has arranged a scheme of lectures and exhibitions of apparatus and maps in connection with local societies that ought to be taken advantage of largely. It would be well for any Society taking up such work to arrange for two or three observers who could be trusted to relieve each other, so that the work could be carried on continuously, without imposing too heavy a burden on any one person; but it would be well also for one individual to be responsible for the record, both for preserving the original in safety and for making an authentic copy for transmission to some central authority.

There is an amount of uncertainty as to the mean temperature and the other conditions of climate, even in the thickly-peopled parts of England, which is hard to believe until one tries to ascertain definite figures on the subject. It is not creditable that such a state of matters exists, and it is very easy to obviate it at small expense, though for many years the chief value of the work must

lie in the future. Meteorological data differ greatly in their nature, and some require more observers than others. To two of these I wish to direct special attention, one is the least known, the other the best known, of the elements of climate.

The first is the duration of sunshine. No full or trustworthy map of the average annual duration of sunshine exists, although from the points of view of agriculture and of health, sunshine is of very great importance. Unfortunately there are photographic sunshine recorders on the market which give results that cannot be properly compared, and their use has led to considerable confusion. The instrument which is accepted as a standard by the Meteorological Office and by the Royal Meteorological Society, is the Campbell-Stokes sunshine recorder, which consists in principle of a clear glass sphere focussing the sun's image on a prepared card, in which it burns a hole when the sun is shining. By this instrument only bright sunshine is measured, but the records of different instruments of this type are strictly comparable, and it is most important that the number in use should be greatly increased. I would urge any Society desirous of undertaking an interesting and useful set of observations, but unwilling to establish a complete meteorological station, to set up a sunshine recorder, and after measuring the cards send them to the Meteorological Office, or to one of the Meteorological Societies, for preservation and discussion.

The second matter is on a different footing. It is the measurement of rainfall. A few hundred stations would suffice to give a perfectly fair view of the distribution of pressure or temperature over the whole of the British Isles, because these phenomena affect the air nearly uniformly over wide areas, and are almost independent of local accidents of configuration of the ground. The changes due to altitude above sea-level are simple and can be calculated for any place when the altitude is known. With rainfall it is entirely different. While widespread rains sometimes occur uniformly affecting large areas, there are often sudden heavy showers so local that places a mile apart may have in an afternoon rain differing in amount by an inch or more. It is also known that every variation of form in the land exercises its individual influence on the rain-bearing winds so that every locality has its own characteristic average rainfall with a large range from year to year and a varying chance of sudden heavy falls. For this reason it is necessary in order to represent the conditions of rainfall in the country to have a very large number of stations, and there are, in fact, more than 4,000 observers in the British Isles whose results are regularly published and discussed in *British Rainfall*. If these 4,000 gauges were uniformly spaced out like trees in a new plantation, and if they were all secured against the risk of interruption, no more would be required; but as neither of these conditions hold good, there is an urgent need for new observers in many places, and room for them everywhere. In order not to miss the interesting features of the

more widespread heavy falls of rain there should be a station at every 5 miles, and in order to secure continuity in one locality there should at each five-mile centre be two, if not three stations within half-a-mile of each other, so that when one record comes to an end there may be another close by the relation of which to that ceasing has been established. This is a counsel of perfection, and I do not expect to see it realized ; but it is not too much to hope that five-mile circles from every rain gauge in England and Wales shall intersect, and that ten-mile circles in Scotland and Ireland may at least touch. How far that is from being the case at present can be seen from the map exhibited,\* which shows some great gaps the existence of which makes the preparation of annual rainfall maps a matter of doubt and difficulty.

I know of no way so open as this for any Society to advance science and interest its members in a piece of valuable scientific work. While I think it is desirable, in order to ensure uniformity of methods and direct communication as to doubtful points in the records, that every rainfall observer in the country should be in personal communication with the British Rainfall Organization, I feel also that an immense amount of encouragement is given and a valuable check afforded by subsidiary local organizations such as are carried on by numerous scientific societies in many parts of the country. The Meteorological Office supports and inspects a small number of selected stations spread over all parts of the British Isles, the Royal Meteorological Society in England and Wales and the Scottish Meteorological Society in the northern kingdom arrange for and inspect a larger number, and I am not sure whether the following list of local societies which do similar work systematically is complete ; I hope it may be extended, but at any rate it is extremely creditable to the societies concerned and deserves to be followed as an example. For the sake of impartial enumeration they are given alphabetically :—

*Croydon Natural History and Scientific Society* (Mr. F. Campbell Bayard).—102 stations in north-western Kent and eastern Surrey.

*Dorset Field Club* (Mr. H. Stilwell).—48 stations in Dorset.

*Hertfordshire Natural History Society* (Mr. J. Hopkinson).—55 stations in Herts.

*Northamptonshire Natural History Society* (Mr. C. A. Markham).—41 stations in Northamptonshire.

*North Devon Athenæum* (Mr. Wainwright, Barnstaple).—30 stations in North Devon and Somerset.

In addition to these Societies there are several county or group organizations which I believe are kept up by individuals without the guarantee of continuity that a Society affords ; these are :—

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\* Published in *British Rainfall*, 1905.

*Cambridge and Huntingdon.*—59 stations formerly under the care of Mr. Warren, now being continued by the Editor of *British Rainfall*.

*Isle of Man.*—9 stations in the care of Mr. A. W. Moore.

*The English Lake District.*—27 stations the data from which are collected by Miss Marshall, in succession to her father, the late Mr. Stephen Marshall.

*Norfolk.*—35 stations under the care of Mr. A. W. Preston.

*Mid-Wessex.*—32 stations in portions of Wilts, Dorset and Somerset, in the care of Rev. H. A. Boys.

*Stirlingshire.*—22 stations in the care of Mr. C. Stirling.

In addition to these there is the Cornwall County Council with 27 stations, and the Great Central Railway and most of the Canal and Water Companies and Water Authorities in the country which maintain rain gauges on their gathering grounds are enlightened enough to make their records available for scientific purposes.

I am happy at all times to supply full instructions for commencing and carrying on records of rainfall and to endeavour to remove any difficulties which may arise in the course of such work.

## REPORT OF KITE COMMITTEE OF BRITISH ASSOCIATION.

*Investigation of the Upper Atmosphere by means of Kites in co-operation with a Committee of the Royal Meteorological Society.*—*Fifth Report of the Committee, consisting of Dr. W. N. SHAW (Chairman), Mr. W. H. DINES (Secretary), Mr. D. ARCHIBALD, Mr. C. VERNON BOYS, Dr. A. ECHAN, Dr. R. T. GLAZEBROOK, Dr. H. R. MILL, Professor A. SCHUSTER, and Dr. W. WATSON. (Drawn up by the Secretary.)*

SINCE the date of sending in the last report an investigation into the conditions prevailing over the North Sea has been carried on by Mr. G. C. Simpson, who kindly undertook the work at the request of the Joint Committee. Mr. Simpson spent three weeks on the North Sea in the mission ship *Alexandra*, which was attached to the Red Cross Trawling Fleet. The results he obtained have been published in the *Quarterly Journal of the R. Met. Soc.*, Vol. XXXII., No. 137.

Observations were also continued at Oxshott, on behalf of the Joint Committee, down to the end of September, 1905, and the results of these observations, together with those previously obtained at Crinan and at Oxshott, have been published in the *Proceedings of the Royal Society, A*, Vol. LXXVII., 1906.

Since October 1, 1905, the work of obtaining systematic observations has been undertaken by the Meteorological Office, whose station is at present situated at Oxshott; but Mr. Simpson is arranging a kite station on the moors near Manchester, at which it is hoped that kite ascents can be made on suitable days, and more particularly on the days appointed by the International Committee.

The Committee ask for re-appointment, and for a grant of £25.

## BRITISH RAINFALL, 1905.\*

THE new volume of *British Rainfall* records the total annual rainfall at 4096 stations in Great Britain and Ireland, the number of records having increased from last year approximately at the rate of  $1\frac{1}{2}$  per cent. in Ireland, 2 per cent. in Wales, 3 per cent. in England, and 4 per cent. in Scotland. In the usual article on the Staff of Observers a map is given showing the density of distribution of rain gauges over the British Isles, on which all parts of the country more than five miles from the nearest existing gauge are shown in white, and a line encircles those parts of this area which are more than ten miles from a gauge. The largest of these totally unrepresented areas lie in the west, south and north of Ireland; in the central Highlands of Scotland south of the Caledonian Canal, and in Rossshire, Sutherland and Caithness: these are the parts of the country where the establishment of new records is most to be desired.

The usual discussion and maps of monthly and annual rainfall appear, and the occurrence of heavy rain on rainfall days is dealt with in the same detail as in recent years. The number of heavy widespread rains was considerably less than usual; but maps are given of five interesting cases, the most remarkable being that which brought the floods of August 25th in Ireland. In all the cases mapped the area in which a great precipitation occurred lay on the left of the path of a cyclonic disturbance.

The distribution of rainfall in time is dealt with as to (1) number of Rain Days and the number of days with various amounts of rain classified in eight groups, (2) Droughts and (3) Rain Spells; 73 carefully selected records, as uniformly distributed over the country as possible and believed to be perfect in all respects, being analyzed for each of the three discussions.

There are records of duration of rainfall at eight stations, being one more than in 1904, and records of evaporation at eleven stations, and regret is expressed that more determinations of these very important conditions are not made, or if made are not communicated to the Editor.

The special articles in this volume deal with "German Rainfall," a 14-page synopsis of Professor Hellmann's great work briefly noticed on pp. 110-111 of our July number; and with a comparison of the evaporation from a water surface at Camden Square with the other meteorological conditions during 1905. For the purpose of the latter article, the amount of evaporation, amount and duration of rainfall, duration of sunshine, wind-movement 1 foot above the water, mean relative humidity, mean daily temperature of air, 9 a.m. tem-

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\* The full title is: *British Rainfall, 1905. On the Distribution of Rain in space and time over the British Isles during the year 1905, as recorded by more than 4000 Observers in Great Britain and Ireland, and discussed with Articles on various branches of Rainfall Work, by Hugh Robert Mill.* The forty-fifth annual volume. London: Edward Stanford. 1906. Pp. 360.

perature of soil at 1 foot, and daily maximum black bulb temperature are all calculated for 5-day periods and also shown on a diagram in the form of smoothed curves. The result of the comparison was to show that when the rate of evaporation was below the average for the year it followed the mean temperature; when it was above the average for the year it followed the sunshine and the black bulb temperature, and that the wind appeared to have had but little effect on the evaporation.

In the introductory "Report" attention is called to one or two definitions intended to improve the terms employed in the discussion of rainfall. These are as follows: *Mean* is used to express the sum of any number of figures divided by that number, and this use of the word sets free *Average* to be employed to denote the mean of any quantity for a number of years. The word *General* is used to designate the mean of any quantity at a number of stations at the same time, or, in the case of rainfall, the mean depth of the rain over any defined area. Thus the average general rainfall of the British Isles means the average depth of the general rainfall of the country for a definite number of years. The words *Rain Day* (instead of rainy day) are taken to mean a day on which at least .01 in. of rain is recorded; a succession of a certain number of days with no recorded rain is a *Drought*, and a succession of a certain number of rain days is a *Rain Spell*. These terms have been used also in this Magazine for some time and no objection has been taken to them. The most recent, *Rain Spell*, has been approved by Dr. J. A. H. Murray, the eminent lexicographer.

All the familiar features of *British Rainfall* remain as before, but the Editor asks for suggestions as to possible improvement and incidentally indicates the cost of one very obvious improvement—the inclusion of monthly as well as annual values for all stations.

### THE BEAUFORT SCALE OF WIND-FORCE.\*

THERE are two types of instruments employed in the determination of the velocity of motion of the air: (a) the Robinson Cup Anemometer; (b) the Dines Pressure-tube Anemometer. The traces of the Robinson anemometer by recording the total distance travelled in a given time by the centre of the cups revolving under the influence of the wind, show the average velocity of the wind during the given

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\* Abstract of Report of the Director of the Meteorological Office upon an enquiry into the relation between the estimates of Wind-Force according to Admiral Beaufort's scale and the Velocities recorded by Anemometers belonging to the Office, with a report upon certain points in connection with the enquiry, by G. C. Simpson, M.Sc.; and notes by Sir G. H. Darwin, K.C.B., F.R.S., W. H. Dines, F.R.S., and Commander Campbell Hepworth, C.B., R.N.R., Marine Superintendent. Published by authority of the Meteorological Council. Size 12 x 10. Pp. 54. Plates.

time, but afford no information as to the variation of wind velocity during the time; whereas those of the Dines anemometer, consisting of series of oscillations, indicate variations of wind velocity lasting for less than a minute. From the traces of the Dines instrument the mean velocity of the wind per hour can be nearly, though not exactly, estimated by eye, but the measurements are sufficiently accurate for practical purposes. Mr. Dines from his own experiments indicates the relationship between  $P$ , the pressure of the wind in pounds per square foot, and  $V$ , the recorded velocity in miles per hour by the expression:— $P = \cdot 003 V^2$ ; moreover, if  $h$  represents differences of pressure expressed in inches of water, and  $V$  represents velocity in miles per hour (atmospheric pressure at 30 inches of mercury; temperature at 50° F.) he gives:— $h = \cdot 00073 V^2$  as the relation according to which his pressure-tube anemometer should be calibrated. From a number of observations made at different places, and discussed by different observers, it is shown that the velocity of the centres of the cups of the Kew pattern Robinson Anemometer should be multiplied by 2·2, in order that a close agreement may be obtained with the wind velocity as recorded by the pressure-tube anemometer. This method for obtaining a constant for the Robinson anemometer depends upon Mr. Dines' empirical graduation of his own type of instrument; and Mr. Dines, presuming that the relation:— $h = \cdot 00073 V^2$  is correct, is of opinion that his pressure-tube instrument is correct to 1 per cent.

Comparisons between wind velocities as recorded by anemometers, and wind-forces as estimated by observers according to Beaufort's scale, were made a few years ago by Mr. R. H. Curtis and Professor Köppen, who availed themselves of a large number of data, consisting of the wind estimates according to Beaufort's scale, and the mean wind velocities as recorded by anemometers for the hour in which each of the estimates was made. Curtis separates the pairs of data so obtained into groups, having a common Beaufort number, and takes the mean of the velocities in each group; whilst Köppen separates the pairs into groups in such a way that each group has the same recorded velocity, and then by taking the mean of the Beaufort numbers contained in each group, obtains a number (which may contain a fraction) for each velocity. The relation between the Beaufort numbers and wind velocities may be expressed by a curve having Beaufort numbers for abscissa, and velocities for ordinates, and the two curves as obtained by Curtis' and Köppen's method do not correspond. On account of this divergency in the two curves, the Meteorological Council appointed Mr. G. C. Simpson to prepare a report on the subject: he was commissioned to visit the stations at Aberdeen, North Shields, Holyhead, Yarmouth, Oxford and Scilly, and was supplied with the following data:—(1) Data from Scilly, Yarmouth and Holyhead discussed by Curtis; (2) additional data of the same kind for years 1900-02, for five of the above-named stations; (3) special data from Holyhead and Scilly, consisting of

pressure-tube records. The substance of his report may be here summarized :—

- (1) The relation between Beaufort numbers and wind velocities as used by observers is expressed by Köppen's equivalents.
- (2) When dealing with single observations, Köppen's equivalents must be used.
- (3) When it is required to reduce a number of estimates at any place to mean velocities, Curtis' equivalents give the best results.
- (4) When it is required to express a number of wind velocities recorded at a place by means of Beaufort's scale, Curtis' equivalents also give the best results.
- (5) The mean hourly velocity of the wind, as actually used, is as suitable as any other characteristic of wind velocity, such as the mean velocity in gusts and lulls or the extreme velocity in the hour, for comparing records of wind velocity to estimates of wind-force.
- (6) The estimates of wind-force according to Beaufort's scale are affected by the direction of the wind differently in different places; it is not desirable that any allowance be made for the influence of wind direction upon the estimates. The causes of the difference between Curtis' and Köppen's equivalents are discussed by Mr. Simpson in his report.

#### CURTIS'S METHOD.

Equivalent Velocities.	BEAUFORT NUMBERS.										
	0	1	2	3	4	5	6	7	8	9	10
Scilly .....	2	3	6	9	13	20	26	32	39	46	51
Yarmouth .....	2	3	5	9	12	18	24	30	37	42	...
Holyhead .....	2	6	11	15	19	21	24	28	34	42	50
North Shields .....	3	5	8	13	19	24	27	29	43	...	...
Oxford .....	2	4	7	12	16	19	24	27	29	...	...
Mean .....	3	5	8	11	15	19	25	29	36	44	51

#### KÖPPEN'S METHOD.

Scilly .....	0	2	5	8	13	20	27	35	43	50	57
Yarmouth .....	0	1	4	8	13	20	27	35	43	50	...
Holyhead .....	0	5	10	15	18	22	26	31	40	51	...
North Shields .....	0	2	6	15	23	30	34	38	42	...	...
Oxford .....	0	2	7	13	19	24	27	30	35	...	...
Mean .....	0	2	6	11	16	22	28	35	42	50	58

The two causes as given by Köppen for the difference between his equivalents and those of Curtis are found by Simpson to account for

only a small fraction of the whole difference. The chief cause of the difference is due to the fact that, it being impossible for observers to estimate the force of the wind with accuracy, the errors of observation are not symmetrical with regard to the true mean velocity corresponding to each Beaufort number. Owing to the different frequencies of different wind strengths, the observer when estimating winds of low force has greater chances of estimating winds as of, say, force 2, which (if he made no errors) he would estimate as of force 3, than he has of estimating winds as of force 2, which (if he made no errors) he would estimate as force 1; hence the mean equivalent velocity for force 2 as deduced by Curtis' method, in which the mean velocities of groups having a *common Beaufort number* are taken, is *higher* than the correct one.

On the other hand, the observer, when estimating winds of higher forces, has more opportunities of estimating winds, say, as of force 6, which he ought to estimate as of force 5, than he has of estimating winds of force 6 which he ought to estimate as of force 7; hence the mean equivalent velocity for force 6 as obtained by Curtis' method is too low. It is then in the nature of observational errors that the discrepancy between the curves of Köppen and Curtis mainly lies.

## Correspondence.

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

### REMARKABLE DROUGHT IN THE SOUTH OF ENGLAND.

THE total rainfall for the three months, June, July and August, has amounted to only 2·97 in. in this district, made up as follows:—

JUNE.		JULY.		AUGUST.	
	in.		in.		in.
1st ...	·12	12th ...	·01	2nd ...	·04
16th ...	·07	13th ...	·06	13th ...	·14
23rd ...	·38	18th ...	·12	14th ...	·08
27th ...	·06	19th ...	·16	15th ...	·01
28th ...	1·20	20th ...	·01	16th ...	·02
		26th ...	·18	17th ...	·16
		29th ...	·04	24th ...	·11
Totals	1·83		·58		·56
No. of days ...	5		7		7

Thus a period of 92 days included only 19 days on which rainfall was recorded, and it is worthy of note also that had it not been for the heavy isolated fall on June 28th, the totals for the three months would have been ·63 in., ·58 in. and ·56 in. respectively.

Another peculiar feature is that although the general dry character of the weather has been maintained for so long a period, there have been only two absolute droughts (*i.e.*, rainless periods of more than 14 days' duration). The first of these occurred between the 1st and 16th of June, and the second between the 28th June and 12th July.

As I write there seems little prospect of a break in the dry weather.

D. W. HORNER.

*Worthing, September 1st, 1906.*

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### THE THUNDERSTORM OF AUGUST 2nd.

IN the many interesting reports on the thunderstorm of August 2nd the evidence seems general that while there was no stint of lightning, thunder was not remarkably heavy. Such, indeed, was my experience here. I had not seen such a fascinating display of lightning for many years, but there was next to no thunder. Is not this somewhat out of the common way? Some of the electric discharges took place at an altitude of 45° or more. As to rain, my gauge caught .07 in. only, whereas near Holborn Bars there must have been a veritable deluge.

WILLIAM GODDEN.

*West Hampstead, August 29th, 1906.*

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### THE GREEN FLASH.

It is now generally accepted that this is produced by atmospheric refraction, and, as this cause is continually operating, it is remarkable that the phenomenon is so seldom seen. I, therefore, hoped that someone better qualified than I would offer some explanation of the point raised by Mr. Whitmell in his letter at p. 21 of this volume. Can the following considerations be held to solve the difficulty? As the fine particles of matter suspended in the air reflect back the shorter light waves, thus preventing them from reaching the eye of an observer, while they allow the longer waves to flow past them, this would tend to prevent the green flash from being seen, and would act the more effectively in proportion to the number of such particles in the air. That this is really so is rendered the more probable by the facts mentioned by Dr. Rambaut at pp. 23 and 45, *viz.*, that the green flash is not usually found to occur when the sun is strikingly red before setting, and that a haze near the horizon reduces the intensity of the blue-green fringe referred to by him, but does not affect the red fringe. But this cannot be the sole cause, seeing that the particles in question reflect back the short waves entirely away from the Earth; and if this occurred to a sufficient extent to obliterate the green flash completely, it could not be seen either by the help of the belfry, as in Mr. Whitmell's experiment, or of a diaphragm, as in Dr. Rambaut's (p. 44); and yet the

latter was able by means of the diaphragm to exhibit not only the red but also the green flashes as often as he pleased ; nor could the green flash be seen through a telescope if it were quite invisible to the naked eye for the reason above suggested. Hence, even if the intensity of the green flash be diminished in the way above indicated, we must search for some additional grounds which would account for its invisibility to the naked eye and its visibility when looked at through a telescope. Dr. Rambaut's diagram (p. 41) shows that the red and blue fringes would always be seen when the sun is low if it were not for the glare of the sunlight. This operates in at least two ways. One is that some of the white rays are deflected from their course by reflection from particles in the air, and such of these deflected rays as are thrown into the lines along which the light from the fringes passes to the eye would overpower this light and prevent the fringes from being seen. This action would continue, though to a smaller extent than formerly, down to the time that the tip of the sun was disappearing, and so it also would make the green flash less conspicuous. If now we adopt Helmholtz's theory that irradiation is caused by the non-homogeneity of the lenses of the eye, we can understand that it should operate more powerfully when the setting or rising sun is looked at directly with the naked eye than with the interposition of a belfry or telescope. In the former case rays of light from a considerable area round the setting sun might, after passing into the eye, be deflected so as to impinge on that portion of the retina where the image of the green flash was, whereas this area would be very greatly restricted in the case of the experiments above referred to. A little consideration will show that if irradiation be supposed to be a sympathetic effect, it might be more intense if the rays from the space around the green fringe came from a wider area ; so that, on this theory of irradiation also, the non-appearance of the flash to the unassisted eye, though it could be seen through a telescope, might be accounted for.

ALEX. THURBURN.

*Keith.*

[This letter travels to the verge of the meteorological aspect of the green flash, and indeed goes beyond it ; but the question of the infrequency of the phenomenon is an interesting one, on which, perhaps, more can be said.—ED. *S.M.M.*]

### LAMBRECHT'S POLYMER AND HYGROMETER.

IT is a somewhat remarkable circumstance that the hair hygrometer, the remarkable properties of which were pointed out by De Saussure a century and a half ago, should have remained so little known as a scientific instrument. The analogous catgut hygrometer, propelling a man or a woman outside a toy house according as the atmosphere is humid or dry, has always retained its popularity on the continent,

though less frequently seen now than formerly in this country. It is interesting to notice that hair hygrometers have been more generally used for scientific purposes in the form of recording instruments than in a form suited for direct reading by the eye; but we think that the very serviceable direct-reading hair-hygrometer which has been introduced under the name of Lambrecht's Polymeter should do much to make this form of instrument supplement or even supersede the wet and dry bulb hygrometer.

The Polymeter, for which Messrs. Gallenkamp and Co. are the London agents, consists of a thermometer with the value of the saturated vapour pressure at each temperature marked on a duplicate scale, and a hair hygrometer the indicator of which is a needle moving on a circular dial. This dial has two scales, one being the relative humidity expressed directly in percentage of saturation, the other a series of figures giving the difference between the dew-point and the temperature of the air. From these four scales, the readings of two of which are subject to a simple adjustment made by means of the trident-shaped end of the indicating hand, it is possible to measure the temperature, relative humidity, dew-point, absolute humidity and other relations of humidity and temperature—hence the name polymeter. A book of instructions for the adjustment and use of the instrument, the English of which might be improved by revision, gives all the necessary precautions for obtaining useful scientific results. We have tested the instrument and found its indications to correspond closely with the relative humidities calculated by Glaisher's Tables. On one occasion with the thermometer above  $90^{\circ}$  we found a serious discrepancy, but inspection showed that the muslin on the wet bulb thermometer had dried on account of the evaporation being greater than the water-conducting power of the wick, the hair hygrometer having been correct.

The great advantage of the polymeter seems to us to be the facility with which the relative humidity may be read off directly without reference having to be made to tables. The rules given for forecasting weather may of course have to be modified in different climates, and it would be an interesting occupation for any amateur meteorologist to test them.

A dew-point hygrometer is supplied by the same makers, which is an interesting modification of the ether hygrometer, the film of moisture being deposited on half of a bright metal mirror which forms one side of the ether chamber, the other half of the mirror, which is not cooled, is separated by a narrow slit cut in the metal, so that the division between the dewed and clear surfaces is extremely sharp and the formation of a film of moisture easily observed.

## THE RECENT GREAT HEAT.

IN England the month of July is the warmest of the year, and very conspicuously marks the height of a relatively short summer, and it is accordingly in that month that the highest average temperature day and night prevails.

Spells of very hot weather—or, as they are popularly termed, “heat-waves”—however, which are the result of peculiar meteorological conditions allowing the sun’s rays to penetrate freely through the atmosphere over a wide area and to produce their maximum heating effect upon the land, are by no means confined to the month of July, but occur frequently in an intense form during August, and occasionally as early as June or as late as September. When a period of great heat occurs early in the autumn, as in the present year, it assumes special prominence in the annals of meteorology, not only because the temperature during it is so much in excess of the normal, but also because it occurs at a time when ordinarily the mean daily temperature begins to decline rapidly with the approaching departure of the vertical sun from the northern hemisphere; and it is a safe deduction to draw that however great the heat may be in the equinoctial month of September, it would have been greater still in the previous June or July *had precisely the same atmospheric and surface conditions then prevailed.*

The most noteworthy features of the recent hot weather were the exceptionally high day temperatures and the low relative humidities associated with them. The shade maximum of  $94^{\circ}0$  at Camden Square on September 2nd, as recorded by the Glaisher screen thermometer, is the highest September reading since 1858, when observations were commenced, and on only three other occasions has this temperature been exceeded or equalled, namely, on July 16th, 1900 ( $95^{\circ}2$  F.), July 25th, 1900 ( $94^{\circ}0$  F.), July 15th, 1881 ( $94^{\circ}6$  F.)

The following are some of the temperatures recorded at Camden Square during the very hot weather; the 9 a.m. and maximum readings being compared with the mean of the averages for August and September:—

		9 a.m. Shade Temp.	Diff. of 9 a.m. Temp. from Average.	Max. Shade Temp.		Min. Shade Temp.	Max. Solar Temp. (black bulb (in vacuo)).
					Diff. from Average.		
Aug.	30, 1906 ...	62·8	+ 2·3	84·8	+14·9	49·5	119·6
„	31, „ ...	74·7	+14·2	93·2	+23·3	54·4	130·5
Sept.	1, „ ...	80·0*	+19·5	92·0	+22·1	58·7	126·0
„	2, „ ...	73·5	+13·0	94·0	+24·1	57·6	131·5
„	3, „ ...	74·7	+14·2	89·5	+19·6	56·8	129·4

\*  $3^{\circ}0$  above previous highest September reading.

The only other occasions with maximum shade temperatures exceeding  $90^{\circ}$  in September were in 1868 with  $91^{\circ}0$  on 7th, and in 1898 with  $91^{\circ}2$  on 8th.

During the 48 years 1858-1906, the maximum shade temperature has exceeded  $90^{\circ}$  on 41 days, of which 23 have been in July, 10 in August, 4 in June and 4 in September; and there have been only two instances of maximum shade temperatures above  $90^{\circ}$  on three successive days, viz., August 16th-18th, 1893, with maxima  $90^{\circ}\cdot7$ ,  $92^{\circ}\cdot7$  and  $93^{\circ}\cdot6$  respectively, and August 31st-September 2nd, 1906, with maxima  $93^{\circ}\cdot2$ ,  $92^{\circ}\cdot0$ ,  $94^{\circ}\cdot0$  respectively. In July, 1868, however, there were 4 days with maximum shade temperatures over  $90^{\circ}$ , and in July, 1900, there were 5, the reading of  $95^{\circ}\cdot2$  on the 16th of the latter month being the highest temperature ever registered at Camden Square.

The recent heat has been very great in the north-midland counties, and the highest shade temperature that has come before our notice was  $96^{\circ}$  at Bawtry, in Nottinghamshire, on September 2nd. Even in Scotland temperatures above  $80^{\circ}$  were common. At the Edinburgh Observatory a maximum of  $85^{\circ}$  was recorded on August 31st, and it is probable that in the interior of southern Scotland higher temperatures still prevailed, a reading of  $88^{\circ}\cdot6$  being actually recorded at the Coats Observatory, Paisley.

The prolonged heat and drought of the past summer culminating at the end of August in the abnormal weather above discussed, has, of course, been very trying to dwellers in town and country alike, and in many rural districts serious apprehensions of water and milk famine have been recently entertained; but with these disadvantages it must nevertheless be admitted that it is in seasons like the one just passed when the sun's rays strike with dazzling brilliancy upon a browned and glowing country-side, that the full glory of summer is best felt.

We print below a few of the numerous letters that have reached us upon the extreme heat.

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Max. Shade Temp.,	Aug. 31st	.....	$92^{\circ}\cdot1$
„	„ Sept. 1st	.....	$93^{\circ}\cdot4$
„	„ Sept. 2nd	..	$93^{\circ}\cdot0$

$93^{\circ}\cdot4$  is the highest recorded here since observations commenced in 1884. In August, 1893, there were three consecutive days with temp. of  $90^{\circ}$  or upwards—but not so high as these.

G. SEARLE.

30, Edith Road, West Kensington, W., Sept. 2nd, 1906.

The following table shows the exceptionally high temperatures recorded here during the period August 31st to September 3rd, 1906. All the instruments are standard ones with Kew certificates.

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	Shade Max.		Shade Min.		Solar Radiation (black bulb in vac.)
August 31st	$92^{\circ}\cdot0$	.....	$63^{\circ}\cdot0$	...	$141^{\circ}\cdot8$
September 1st	$92^{\circ}\cdot1$	.....	$62^{\circ}\cdot2$	.....	$140^{\circ}\cdot2$
„ 2nd	$94^{\circ}\cdot6$	.....	$59^{\circ}\cdot8$	.....	$148^{\circ}\cdot0$
„ 3rd	$89^{\circ}\cdot4$	.....	$60^{\circ}\cdot1$	.....	$136^{\circ}\cdot6$

SPENCER C. RUSSELL.

Parkside, Ashley Road, Epsom, Surrey, Sept. 4th, 1906.

The maximum shade temperatures during the last four days as recorded with verified thermometers in Stevenson screen are as follows :—

August 31st.....	94°·6
September 1st.....	94°·3
„ 2nd .....	94°·6
„ 3rd .....	91°·6

WM. B. BUTLER.

*Alra, Reservoir Road, Old Southgate, N., 4th Sept., 1906.*

The relative humidities recorded during the last few hot days seem low for this country, and the following figures may be of interest :—

		Dry.		Wet.		Dew Point.		Relative Humidity.
Aug. 31st,	9 a.m.....	75·5	...	64·6	...	56·9	...	52
	1 p.m.....	90·7	...	69·1	...	55·6	...	31
	Max. ....	91·8						
Sept. 1st,	Min.....	50·2						
	9 a.m.....	78·1	...	66·5	...	58·6	...	51
	1 p.m.....	91·3	...	67·8	...	52·9	...	27
	Max. ....	93·0						
	3 p.m.....	91·7	...	67·0	...	52·2	...	26
Sept. 2nd,	Min.....	49·9						
	9 a.m.....	75·2	...	65·5	...	58·5	...	56
	1 p.m.....	91·6	...	67·3	...	52·3	...	26
	Max. ....	93·0						
	3 p.m.....	92·2	..	67·7	...	52·5	...	25
Sept. 3rd,	Min.....	52·2						

A temperature of 90° had not previously been recorded here since observations commenced in 1878, but it seems probable that this figure was reached in July and August, 1876.

H. MELLISH.

*Hodsock Priory, Worksop, 3rd Sept., 1906.*

I beg to send you the readings of our shade maximum temperature, the highest I have ever registered since regular observations were begun in 1871 :—

August 31st .....	92°·0
September 1st .....	94°·0
„ 2nd .....	94°·0
„ 3rd .....	89°·0

There are a few clouds floating about this afternoon—the first for several days.

JOHN MATHISON.

*Addington, 3rd September, 1906.*

## TEMPERATURE FOR AUGUST, 1906.

STATION.	COUNTY.	Lat. N.	Long. W. [E.]	Height above Sea. ft.	TEMPERATURE.		No. of Nights at or below 32°	
					Max.	Min.		
					° Date.	° Date.	Shade.	Glass.
Camden Square.....	London.....	51 32	0 8	111	93·2 31	45·7 29	0	0
Tenterden.....	Kent.....	51 4	*0 41	190	90·0 31	47·0 20	0	0
West Dean.....	Hampshire.....	51 3	1 38	137	88·0 30, 31	38·0 29	0	2
Hartley Wintney.....	".....	51 18	0 53	222	90·5 31	39·0 29	0	...
Hitchin.....	Hertfordshire.....	51 57	0 17	238	91·0 31	45·0 27	0	...
Winslow (Addington).....	Buckinghamshir.....	51 58	0 53	309	92·0 31	42·0 19	0	...
Bury St. Edmunds (Westley).....	Suffolk.....	52 15	*0 40	226	93·0 31	...	...	...
Brundall.....	Norfolk.....	52 37	*1 26	66	...	...	...	...
Winterbourne Steepleton.....	Dorset.....	50 42	2 31	316	80·7 31	40·2 29	0	0
Torquay (Cary Green).....	Devon.....	50 28	3 32	12	76·0 31	50·7 18	0	0
Polapit Tamar [Launceston].....	".....	50 40	4 22	315	82·0 31	41·0 30	0	0
Bath.....	Somerset.....	51 23	2 21	67	88·2 31	46·0 29, 30	0	...
Stroud (Upfield).....	Gloucestershire.....	51 44	2 13	226	84·0 31	53·0 29	0	...
Church Stretton (Wooltaston).....	Shropshire.....	52 35	2 48	800	84·5 31	39·5 19	0	...
Bromsgrove (Stoke Reformatory).....	Worcestershire.....	52 19	2 4	225	89·0 31	40·0 29	0	...
Boston.....	Lincolnshire.....	52 58	0 1	25	90·0 31	46·0 28	0	...
Worksop (Hodsock Priory).....	Nottinghamshire.....	53 22	1 5	56	91·8 31	40·6 30	0	1
Derby (Midland Railway).....	Derbyshire.....	52 55	1 28	156	90·0 31	47·0 18, 29	0	...
Bolton (Queen's Park).....	Lancashire.....	53 35	2 28	390	76·2 8	45·5 19	0	0
Wetherby (Ribston Hall).....	Yorkshire, W.R.....	53 59	1 24	130	...	...	...	...
Arneliffe Vicarage.....	".....	54 8	2 6	732	...	...	...	...
Hull (Pearson Park).....	" E.R.....	53 45	0 20	6	91·0 31	44·0 28	0	0
Newcastle (Town Moor).....	Northumberland.....	54 59	1 38	201	...	...	...	...
Borrowdale (Seathwaite).....	Cumberland.....	54 30	3 10	423	82·5 31	47·0 26	0	...
Cardiff (Ely).....	Glamorgan.....	51 29	3 13	53	...	...	...	...
Haverfordwest (High Street).....	Pembroke.....	51 48	4 58	95	79·6 31	42·0 30	0	0
Aberystwyth (Gogerddan).....	Cardigan.....	52 26	4 1	83	86·0 29	45·0 18, 30	0	...
Llandudno.....	Carnarvon.....	53 20	3 50	72	78·0 31	51·5 19	0	0
Cargen [Dumfries].....	Kirkcudbright.....	55 2	3 37	80	80·0 31	43·0 19	0	...
Lilliesleaf (Riddell House).....	Roeburgh.....	55 31	2 46	550	78·0 31	43·0 5†	0	0
Edinburgh (Royal Observatory).....	Midlothian.....	55 55	3 11	442	80·6 31	45·8 19	0	0
Colmonell (Clachanton).....	Ayr.....	55 8	4 54	140	78·0 31	41·0 5	0	...
Glasgow (Queen's Park).....	Renfrew.....	55 53	4 18	144	76·0 28	47·0 30	0	0
Tighnabruaich.....	Argyll.....	55 55	5 14	50	74·0 31	42·0 18	0	...
Mull (Quinish).....	".....	56 36	6 13	35	71·0 31	...	...	...
Dundee (Eastern Necropolis).....	Forfar.....	56 28	2 57	199	79·2 31	43·0 19	0	...
Braemar.....	Aberdeen.....	57 0	3 24	1114	...	...	...	...
Aberdeen (Cranford).....	".....	57 8	2 7	120	81·0 31	40·0 18	0	...
Cawdor (Budgate).....	Nairn.....	57 31	3 57	250	...	...	...	...
Invergarry.....	E. Inverness.....	57 4	4 47	130?	...	...	...	...
Loch Torridon (Bendamph).....	W. Ross.....	57 32	5 32	20	...	...	...	...
Dunrobin Castle.....	Sutherland.....	57 59	3 56	14	70·0 29, 30	38·5 23	0	...
Castletown.....	Caithness.....	58 35	3 23	100	77·5 31	43·0 12, 16	0	0
Killarney (District Asylum).....	Kerry.....	52 4	9 31	178	78·0 31	51·0 9, 17	0	...
Waterford (Brook Lodge).....	Waterford.....	52 15	7 7	104	74·5 7	42·0 19	0	...
Broadford (Hurdlestown).....	Clare.....	52 48	8 38	167	70·0 1, 3, 12	44·0 18	0	...
Carlow (Browne's Hill).....	Carlow.....	52 50	6 53	291	...	...	...	...
Dublin (Fitz William Square).....	Dublin.....	53 21	6 14	54	77·0 31	49·1 19, 30	0	0
Ballinasloe.....	Galway.....	53 20	8 15	160	78·0 31	41·0 19‡	0	...
Clifden (Kylemore House).....	".....	53 32	9 52	105	...	...	...	...
Crossmolina (Enniscroe).....	Mayo.....	54 4	9 18	74	...	...	...	...
Seaford.....	Down.....	54 19	5 50	180	74·0 5, 22	45·0 18	0	0
Londonderry (Creggan Res.).....	Londonderry.....	54 59	7 19	320	...	...	...	...
Omagh (Edenfel).....	Tyrone.....	54 36	7 18	280	80·0 31	46·0 8	0	0

## RAINFALL FOR AUGUST, 1906.

RAINFALL OF MONTH.						RAINFALL FROM JAN. 1.				Mean Annual 1870-1899.	STATION.	
Aver. 1870-99.	1906.	Diff. from Av. in.	% of Av.	Max. in 24 hours.	No. of Days	Aver. 1870-99.	1906.	Diff. from Aver. in.	% of Av.			
in.	in.	in.		in.	Date.	in.	in.	in.		in.		
2'33	·87	-1'46	37	·29	17	8	15'45	12'96	-2'49	84	25'16	Camden Square
2'37	·61	-1'76	26	·17	24	6	16'18	13'33	-2'85	82	28'36	Tenterden
2'60	·73	-1'87	28	·23	25	9	17'83	17'40	-43	98	29'93	West Dean
2'09	1'13	-96	54	·33	13	11	16'06	14'38	-1'68	90	27'10	Hartley Wintney
2'26	·88	-1'38	39	·24	24	9	15'07	13'89	-1'18	92	24'66	Hitchin
2'53	1'16	-1'37	46	·33	2	10	16'58	14'64	-1'94	88	26'75	Addington
2'40	·79	-1'61	33	·27	13	8	15'63	15'09	-54	96	25'39	Westley
2'19	1'25	-94	57	·27	8	10	15'01	17'56	+2'55	117	25'40	Brundall
3'18	·79	-2'39	25	·20	24	13	22'32	23'34	+1'02	105	39'00	Winterbourne Stpltn
2'91	1'91	-1'00	66	·42	1	13	20'69	18'05	-2'64	87	35'00	Torquay
3'19	2'91	-28	91	·77	1	18	21'57	24'52	+2'95	114	38'85	Polapit Tamar
2'96	1'94	-1'02	66	·62	15	13	18'82	16'70	-2'12	89	30'75	Bath
2'83	·94	-1'89	33	·27	3	10	18'56	15'58	-2'98	84	29'85	Stroud
3'24	2'69	-55	83	·87	7	15	20'21	17'00	-3'21	84	33'04	Woolstaston
2'46	·96	-1'50	39	·30	24	10	15'41	13'87	-1'54	90	24'50	Bromsgrove
2'25	2'39	+14	106	·95	8	11	14'45	13'56	-89	94	23'30	Boston
2'31	1'46	-85	63	·39	24	14	15'63	12'20	-3'43	78	24'70	Hodsock Priory
2'42	·92	-1'50	38	·30	24	14	16'53	13'12	-3'41	79	26'18	Derby
4'36	6'57	+2'21	151	1'38	16	19	25'23	31'24	+6'01	124	42'43	Bolton
2'59	2'85	+26	110	·60	10	15	16'83	16'36	-47	97	26'96	Ribston Hall
5'43	5'10	-33	94	·81	15	20	36'87	42'16	+5'29	114	60'96	Arncliffe Vic.
2'81	2'04	-77	73	·60	24	17	16'55	14'10	-2'45	85	27'02	Hull
3'14	3'42	+28	109	·83	24	22	17'40	17'80	+40	102	27'99	Newcastle
1'23	12'93	+1'70	115	2'65	12	22	77'96	84'80	+6'84	109	132'68	Seathwaite
4'52	3'47	-1'05	77	·70	24	20	25'23	28'02	+2'79	111	42'81	Cardiff
4'04	6'74	+2'70	167	1'78	1	16	27'41	31'25	+3'84	114	47'88	Haverfordwest
4'60	4'41	-19	96	·66	12	17	26'46	30'96	+4'50	117	45'41	Gogerddan
2'86	4'14	+1'28	145	1'37	2	18	17'65	20'68	+3'03	117	30'98	Llandudno
4'10	8'74	+4'64	213	1'62	2	18	26'15	31'17	+5'02	119	43'43	Cargen
3'42	5'67	+2'25	166	·82	12	21	20'56	22'50	+1'94	109	33'04	Riddell House
...	5'08	...	...	·95	2	18	...	19'80	...	...	...	Edinburgh
3'98	3'48	-50	87	·77	24	18	26'11	24'86	-1'25	95	44'85	Colmonell
3'79	5'28	+1'49	140	·90	10	23	22'09	25'53	+3'44	116	35'80	Glasgow
5'13	4'91	-22	96	·60	2, 21	21	34'11	40'64	+6'53	119	57'90	Tighnabruach
4'84	3'55	-1'29	73	·58	19	21	33'06	30'83	-2'23	93	57'53	Quinish
3'08	4'65	+1'57	151	1'20	2	21	18'20	16'40	-1'79	90	28'95	Dundee
3'83	2'87	-96	75	...	...	...	21'66	21'48	-18	99	36'07	Braemar
3'22	3'56	+34	111	·71	2	18	19'93	20'05	+12	101	33'01	Aberdeen
3'07	3'15	+8	103	·57	24	20	18'33	19'29	+96	105	29'37	Cawdor
4'19	4'75	+56	113	1'15	2	13	32'69	35'15	+2'46	107	56'00	Invergarry
6'91	4'94	-1'97	71	·60	19	23	49'41	59'66	+10'25	121	86'50	Bendamp
2'65	3'37	+72	127	·41	24	18	18'92	25'01	+6'09	132	31'60	Dunrobin Castle
...	2'76	...	...	·77	3	22	...	23'28	...	...	...	Castletown
4'92	2'84	-2'08	58	·31	24	20	34'90	29'60	-5'30	85	58'11	Killarney
3'71	2'34	-1'37	63	·71	24	13	24'00	21'01	-2'99	88	39'30	Waterford
3'79	3'46	-33	91	·52	1	21	20'85	24'85	+4'00	119	33'47	Hurdlestown
3'51	2'04	-1'47	58	·42	24	14	21'56	18'36	-3'20	85	34'44	Carlow
3'02	1'76	-1'26	58	·38	3	17	17'53	15'42	-2'11	88	27'75	Dublin
3'96	4'07	+11	103	·79	1	25	23'19	26'36	+3'17	114	37'04	Ballinasloe
7'90	5'85	-2'05	74	·90	14	23	48'34	46'85	-1'49	97	80'23	Kylemore House
4'57	4'53	-4	99	·84	23	21	29'90	33'97	+4'07	114	50'50	Enniscoe
3'52	3'85	+33	109	·79	24	20	23'84	21'78	-2'06	91	38'61	Seaforde
3'94	5'93	+1'99	151	·74	24	23	24'48	28'97	+4'49	118	41'20	Londonderry
4'03	4'43	+40	110	·90	1, 24	24	23'28	27'67	+4'39	119	37'85	Omagh

## SUPPLEMENTARY RAINFALL, AUGUST, 1906.

Div.	STATION.	Rain. inches	Div.	STATION.	Rain. inches
II.	Abinger Hall .....	·74	XI.	Rhayader, Tyrmynydd .....	5·65
„	Ramsgate, West Cliff Villas .....	·63	„	Lake Vyrnwy .....	6·83
„	Hailsham .....	1·44	„	Llangyhanfal, Plâs Draw.....	2·58
„	Crowborough, Uckfield Lodge .....	1·71	„	Criccieth, Talarvor.....	6·30
„	Osborne, Newbarn Cottage.....	·87	„	Llanberis, Pen-y-pass .....	16·62
„	Emsworth, Redlands.....	1·37	„	Lligwy .....	5·47
„	Alton, Ashdell .....	1·91	„	Douglas, Woodville .....	4·38
„	Newbury, Welford Park ...	·90	XII.	Stoneykirk, Ardwell House .....	4·11
III.	Harrow Weald, Hill House.....	·81	„	Dalry, The Old Garroch .....	6·57
„	Oxford, Magdalen College..	·86	„	Langholm, Drove Road .....	8·62
„	Bloxham Grove .....	1·00	„	Moniaive, Maxwellton House .....	6·33
„	Pitsford, Sedgebrook .....	·82	XIII.	N. Esk Reservoir [Penicuik] .....	6·55
„	Huntingdon, Brampton.....	1·02	XIV.	Maybole, Knockdon Farm..	4·90
„	Wisbech, Bank House .....	2·26	XV.	Campbeltown, Witchburn...	3·79
IV.	Southend Water Works.....	·40	„	Inveraray, Newtown .....	6·28
„	Colchester, Lexden.....	·45	„	Ballachulish House.....	6·75
„	Newport, The Vicarage.....	·91	„	Islay, Eallabus .....	4·16
„	Rendlesham .....	·46	XVI.	Dollar Academy .....	5·61
„	Swaffham .....	2·10	„	Loch Leven Sluice .....	5·57
„	Blakeney .....	1·74	„	Balquhiddel, Stronvar .....	...
V.	Bishops Cannings .....	1·55	„	Perth, Pitcullen House.....	4·48
„	Ashburton, Druid House .....	2·84	„	Coupar Angus Station .....	4·65
„	Okehampton, Oaklands.....	2·74	„	Blair Atholl.....	4·12
„	Hartland Abbey .....	2·32	„	Montrose, Sunnyside Asylum .....	3·91
„	Lynmouth, Rock House .....	2·90	XVII.	Alford, Lynturk Manse ...	3·31
„	Probus, Lamellyn .....	2·22	„	Keith Station .....	3·66
„	Wellington, The Avenue ...	1·33	XVIII.	N. Uist, Lochmaddy .....	...
„	North Cadbury Rectory ..	2·23	„	Alvey Manse .....	4·67
VI.	Clifton, Pembroke Road .....	2·63	„	Loch Ness, Drumnadrochit.	3·16
„	Moreton-in-Marsh, Longboro'	1·30	„	Glencarron Lodge .....	6·48
„	Ross, The Graig .....	·91	„	Fearn, Lower Pitkerrie.....	3·81
„	Shifnal, Hatton Grange.....	1·59	XIX.	Invershin .....	3·34
„	Cheadle, The Heath House.....	2·11	„	Altnaharra .....	3·24
„	Coventry, Kingswood .....	1·05	„	Bettyhill .....	2·17
VII.	Market Overton .....	·84	„	Watten Station .....	1·82
„	Market Rasen .....	2·19	XX.	Dunmanway, The Rectory..	3·72
„	Bawtry, Hesley Hall.....	1·21	„	Cork .....	1·47
VIII.	Neston, Hinderton.....	2·76	„	Darrynane Abbey .....	3·60
„	Southport, Hesketh Park...	2·96	„	Glenam [Clonmel] .....	1·88
„	Chatburn, Middlewood .....	4·57	„	Ballingarry, Gurteen .....	2·69
„	Cartmel, Flookburgh .....	4·66	„	Miltown Malbay.....	4·84
IX.	Langsett Moor, Up. Midhope ..	2·72	XXI.	Gorey, Courtown House ...	1·99
„	Scarborough, Scalby .....	2·69	„	Moynalty, Westland .....	4·11
„	Ingleby Greenhow .....	2·38	„	Athlone, Twyford .....	3·97
„	Mickleton.....	2·82	„	Mullingar, Belvedere.....	2·64
X.	Bardon Mill, Beltingham ...	4·71	XXII.	Woodlawn .....	4·75
„	Ewesley, Fallowlees .....	5·16	„	Westport, Murrisk Abbey..	3·79
„	Ilderton, Lilburn Cottage...	4·48	„	Collooney, Markree Obsy..	4·59
„	Keswick, York Bank.....	5·16	XXIII.	Enniskillen, Portora .....	...
XI.	Llanfrechfa Grange.....	2·51	„	Warrenpoint, Summer Hill.	4·85
„	Treherbert, Tyn-y-waun ...	6·84	„	Banbridge, Milltown .....	4·09
„	Carmarthen, The Friary....	5·17	„	Belfast, Springfield .....	5·47
„	Castle Malgwyn [Lechryd].	5·49	„	Bushmills, Dundarave .....	3·98
„	Plynlimon.....	8·75	„	Stewartstown, The Square..	4·33
„	Tall-y-llyn.....	8·00	„	Killybegs .....	6·03
„	New Radnor, Ednol .....	2·54	„	Horn Head ... ..	5·53

## METEOROLOGICAL NOTES ON AUGUST, 1906.

**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.

**LONDON, CAMDEN SQUARE.**—Another dry and warm month, being, with two exceptions, the warmest August in the record of 49 years and  $3^{\circ}\cdot7$  more than the average. A heavy TS on the 2nd brought little R, but there was a magnificent display of lightning lasting for several hours. Brilliant weather at the beginning and end of the month, but unsettled in the middle, when the aspect at times became very threatening. Mean temp.  $65^{\circ}\cdot8$ . Duration of sunshine 196·9\* hours and of R 7·6 hours.

**DORKING.**—Month has continued dry and very hot. Harvest operations were finished by 25th, an unusually early date.

**OSBORNE.**—Fine and warm generally, with very little R.

**WINTERBOURNE STEEPLETON.**—A very dry August; smallest R since record began in 1893, and 2·39 in. below the average. Mean temp. about  $1^{\circ}$  above average.

**TORQUAY.**—Mean temp.  $62^{\circ}\cdot9$ , or  $1^{\circ}\cdot4$  above average. Sunshine 224·5\* hours, or 18·0 hours above the average.

**NORTH CADBURY RECTORY.**—1st to 25th generally cloudy, warm and humid; 26th to 31st brilliant and increasingly hot. First summerlike August since 1899. R least since 1900. No T or L.

**ROSS.**—Very dry; R 1·42 in. Max. temp.  $91^{\circ}\cdot5$  on 31st; min.  $42^{\circ}\cdot1$  on 30th.

**WORKSOP, HODSOCK PRIORY.**—Mean temp. higher than that of last 27 Augusts except that of 1893; August, 1899, had warmer days but a lower mean. Max. temp.  $91^{\circ}\cdot8$  on 31st, min.  $40^{\circ}\cdot6$  on 30th. R ·85 in. below the average.

**BOLTON.**—Temperature above normal; sunshine above average, only one day being sunless. R 2·21 in. above average. Severe TSS on 14th and 15th.

**SOUTHPORT.**—Sunny and warm; mean temp.  $61^{\circ}\cdot2$  or  $1^{\circ}\cdot9$  above average. Total sunshine 208·8 hours, or 28·7 hours above average. Total duration of R 40·8 hours; amount of R 2·96 in. at Hesketh Park, 3·70 in. at Birkdale, the difference being due to a TS. Much ozone.

**LILBURN.**—Very unsettled; R excessive. Frequent TSS; very severe TS on night of 2nd, with loss of life. Hot spell set in on 28th.

**CARMARTHEN.**—Unsettled and changeable during first three weeks, but very hot during last few days. Corn crops much injured by heavy R. Grass plentiful.

**HAVERFORDWEST.**—Rainfall considerable; on 1st, 2nd and 12th very heavy falls occurred. High temp. towards end of month with much fog. Barn crops very good, but potato disease very prevalent.

**DOUGLAS.**—Variable weather, with only a few days of real summer, and unusual prevalence of sea fog up to 9th, then wet, cold and gloomy till 24th; last week very beautiful, with brilliant sunshine and high temp. Harvest work made great progress.

**DUMFRIES.**—Wettest August since observations commenced in 1860. Heavy R on 2nd, accompanied by severe T and L. Harvest operations sadly delayed. Potato disease very prevalent; grass abundant.

**ABERDEEN.**—First three weeks wet, with little sunshine; last week dry and clear with max. temperature in shade from  $75^{\circ}$  to  $81^{\circ}$ .

**CASTLETOWN.**—Damp and cloudy, with more fog but less R than usual in August. Last few days of month very close and warm.

**BROADFORD, HURDLESTOWN.**—Damp, warm and muggy. Last few days very fine and of great use to farmers.

**DUBLIN.**—A warm but changeable and showery month. Last week was settled, summerlike and very warm. Mean temp.  $63^{\circ}\cdot1$ . TSS on 3rd and 16th; H on 3rd.

\* Campbell-Stokes.

## Climatological Table for the British Empire, March, 1906.

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.		Cloud.
	Temp.	Date.	Temp.	Date.										
London, Camdens Square	65·1	7	27·3	23	49·9	35·8	36·9	83	103·2	21·7	1·08	17	5·7	
Malta	73·2	22a	43·1	25	63·3	50·6	48·0	79	...	37·4	·26	4	3·5	
Lagos	93·0	22b	72·0	7	90·7	78·6	75·1	67	142·0	66·0	1·11	4	4·6	
Cape Town	97·3	2	52·1	15	77·5	60·5	57·0	68	...	...	·73	6	4·1	
Durban, Natal	89·1	15	61·2	3	81·4	66·0	...	...	146·3	...	4·61	17	5·7	
Johannesburg	82·0	4	43·9	29	70·4	52·2	52·8	83	154·2	39·5	3·41	13	4·5	
Mauritius	88·5	3	69·7	26f	85·2	73·7	73·5	85	157·2	64·6	11·08	19	8·1	
Calcutta	92·9	29c	51·7	1	86·2	67·7	66·6	72	157·3	47·2	2·08	3	4·2	
Bombay	90·8	2	67·7	13	84·4	71·5	67·8	73	138·2	59·9	·00	0	1·4	
Madras	92·4	19	67·7	3	88·5	71·6	70·9	77	145·1	64·1	·00	0	2·3	
Kodaikanal	74·2	26	46·9	3	69·0	50·7	44·9	60	141·7	34·4	2·79	4	3·3	
Colombo, Ceylon	93·4	1	72·8	2,3	89·4	75·9	73·4	78	154·0	69·0	4·42	10	3·8	
Hongkong	80·1	21	48·2	7	65·9	58·1	56·0	79	129·1	...	2·63	15	8·7	
Melbourne	90·0	9	45·7	4	73·6	54·7	53·0	71	147·0	38·1	3·79	11	5·3	
Adelaide	93·7	19	48·0	22	78·1	58·3	52·8	60	152·1	43·0	2·36	7	5·0	
Coolgardie	100·0	8	44·9	17	87·3	58·8	48·3	42	157·0	38·2	·04	1	1·6	
Sydney	91·0	2	53·0	15	74·6	61·6	57·7	72	132·1	48·1	4·23	29	5·9	
Wellington	71·8	5	40·0	27	63·1	50·9	49·3	81	125·0	35·0	3·72	12	7·0	
Auckland	74·0	2d	49·0	8, 28	68·5	55·7	54·3	76	139·0	40·0	1·80	12	5·4	
Jamaica, Negril Point	88·6	18	65·2	20	84·3	69·9	69·7	78	...	...	5·36	13	...	
Trinidad	99·0	24e	60·0	27	89·7	66·8	69·8	78	165·0	58·0	·73	5	...	
Grenada	86·4	13	70·4	20	84·4	72·8	67·3	69	150·0	...	1·59	15	3·4	
Toronto	49·7	27	0·2	23	32·6	21·0	21·0	79	76·0	-5·5	2·55	14	6·6	
Fredericton	52·3	30	-15·3	19	36·4	10·2	9·0	53	...	...	5·00	12	4·6	
Winnipeg	53·4	29	-19·5	13	27·1	5·0	...	...	...	...	·54	5	3·9	
Victoria, B.C.	63·0	8	21·2	15	51·7	37·2	...	...	...	...	·67	9	6·3	
Dawson	48·0	29	-16·0	18	22·5	1·2	...	...	...	...	·22	3	3·3	

a and 27. b and 23, 24. c and 30. d and 14, 15. e and 30. f and 31.

**MALTA.**—Adopted mean temp. of air 55°·6, or 0°·6 above the average. Mean hourly velocity of wind 11·1 miles, or 0·9 below average. Mean temp. of sea 61°·0.

**MAURITIUS.**—Mean temp. of air 1°·3, dew point 2°·9, and R 1·86 in. above averages. Mean hourly velocity of wind 7·3 miles, or 3·1 below average.

**MADRAS.**—Temperature below the average. Bright sunshine 248·4 hours.

**KODAIKANAL.**—Bright sunshine 243 hours.

**COLOMBO.**—Mean temp. of air 82°·6, or 0°·5 above, of dew point 0°·5 above, and R ·27 in. below, averages. Mean hourly velocity of wind 6·1 miles.

**HONGKONG.**—Mean temp. of air 61°·6. Bright sunshine 71·0 hours. Mean hourly velocity of wind 16·1 miles.

**ADELAIDE.**—Mean temp. of air 68°·8, or 1°·3 below, and R 1·32 in. above, averages.

**SYDNEY.**—Mean temp. of air 1°·2 below, humidity 3°·9 below, and R ·92 in. below, averages.

**WELLINGTON.**—Mean temp. of air 3°·5 below, and R ·33 in. above averages.

**AUCKLAND.**—Mean temp. of air 3° below, and R a little more than half the average.

**TRINIDAD.**—R 1·19 in. below 43 years' average.