Symons's Meteorological Magazine.

No. 468. JANUARY. Vol. XXXIX.

THE RAINFALL OF 1904.

THE aggregate table of rainfall, given on the penultimate page of the volume, takes the shape this month of a summary of the rainfall for the year. The ratios in the second column of figures refer to the ten years' average, 1890–99; but for the sake of a wider comparison, we refer in the text of this article to the more satisfactory average of the thirty years, 1870–99, which we hope to use exclusively in our next volume. The following discussion formed part of a letter to *The Times*, published on January 10th.

The Table may be studied in various lights, but it does not appear sensational in any. We may look at it, first, according to actual amounts. The area with a rainfall exceeding 40 inches was but little smaller than in an average year, and the wettest places in Cornwall, Devon, Wales and the west of Scotland, seem to have had nearly their average fall. The area with rainfall under 30 inches was, however, very much larger than in an average year, the whole eastern prominence of Scotland, from the Highland railway to Aberdeen and Peterhead—all of which, except the coastal fringe, has usually more than 30 inches—had less than that amount last year; and the whole of England below the level of about 600 feet, seems also to have had less than 30 inches. The lowest rainfall, that under 20 inches, was found in southern and eastern Essex, and in the counties of Suffolk, Cambridge, Huntingdon, Northampton, and Nottingham. The extremes of rainfall noted were 129·33 at Seathwaite, and 16·09 at Shoeburyness.

We may next consider the Table with relation to the average. The distribution of variation from the average was interesting, and may be expressed by saying that the whole Atlantic border of the British Isles, from Cornwall through the west of Ireland and the west of Scotland to Shetland, had more than the average amount of rain, while the continental aspect of the country had less than the average amount. The excess was most marked in the west of Ireland, the greatest that appears being 18 per cent. at Crossmolina, but the east of Ireland was so dry that the whole island exceeds the average by just 1 per cent. The wet western fringe of Scotland

included the Hebrides and the extreme west coast, though it seems to have spread across the Lowland Valley to the Firth of Forth. For the whole of Scotland, so far as we can judge in the absence of several old Highland records recently allowed to lapse, the year showed a deficiency of 8 per cent. This was due mainly to the exceptional dryness of the east coast, especially in the great triangle cut off by a line drawn from Dundee to Inverness. Braemar appears to have been relatively the driest point in the British Isles, the amount recorded for 1904 showing a deficiency of 31 per cent. from the average.

In England and Wales only a few coast stations, chiefly on the Bristol Channel and in Cornwall, and some on the South Downs, showed an appreciable excess of rainfall; as a whole there was a deficiency of 12 per cent. The driest region occupied the Midlands and extended to the Severn on the south-west, the Humber on the north-east, and Yarmouth on the east. The whole of this area had a deficiency exceeding 20 per cent., and at Wisbech it was as great as 29 per cent. The north of Norfolk and the whole of Lincolnshire seem to have escaped the drought.

Taking the British Isles together, the deficiency of rainfall in 1904 does not seem to have exceeded 8 per cent., so that it may be classed as a moderately dry year, though not quite so dry as 1902, to which dull, ungenial weather gave a bad, but undeserved, name for raininess.

WEATHER INFLUENCES—A REVIEW.

PROFESSOR E. G. DEXTER, who occupies the chair of Education in the University of Illinois, has written a very important book* on the influence of weather on human life and conduct. We are accustomed to think and speak, in a general way, of the weather as affecting not only our physical comfort, but the state of our nerves as well. Such words as "relaxing" and "bracing," applied to climates, cover vaguely a mass of semi-instinctive and wholly indefinite knowledge in which we all believe, though few of us could give any scientific grounds for our belief. Dr. Dexter has made a bold attempt to investigate the influence of weather on human feelings and faculties by exact statistical methods, and he has reached certain conclusions, so definite and so well established by evidence as to command complete confidence for the places and in the climates which he has studied. There is no subject more attractive to the mentally active, but untrained in science, than weather, its effects and its causes. One opens a new book on these matters with trepidation, fearing that it may prove another instance of pathetic

* "Weather Influences, an empirical study of the mental and physiological effects of definite meteorological conditions." By Edwin Grant Dexter, Ph.D., with introduction by Cleveland Abbe, LL.D. New York: The Macmillan Company; London: Macmillan & Co. 1904. Price 8/6, net.

delusion, or cunning charlatanism, and great was the relief on this occasion when chapter after chapter showed that Dr. Dexter, although not professing any special knowledge of meteorology, was a master of scientific method, and a living example of scientific caution.

In the introduction, Professor Cleveland Abbe gives a valuable summary of the earlier literature of the subject, and deals with the question of the direct and indirect influence of climate on mankind, a larger question than that attacked by Dr. Dexter, who carefully limits his study to the effects of weather. Incidentally, however, he touches on climate, and in so doing he makes a somewhat serious blunder. Speaking of the effect of temperature, he asserts that north of 55° N., the vital energy is so much drawn upon to counteract the low temperature, that there is little left for those activities which make leaders. We venture to think that the history of Scotland, of Norway, of Sweden, and of Iceland, refutes this rather random rule.

The first four chapters deal pleasantly and freshly with such familiar themes as weather lore, proverbs, and weather influences, in literature. Then comes a statement of the empirical problem to the solution of which the author set himself. He states it thus:—

"For any given community of limited area, a change in weather conditions means a change in the environment for every inhabitant. If this change in the environment tends to influence conduct, and any statistics of conduct are kept, their study in connection with the records of the weather would disclose the fact. It is just this problem with which our study deals. It is an attempt, by empirical methods, to discover the influence of the weather upon human behaviour. It has nothing to do with the permanent or racial effect of prevailing meteorological conditions, but with the immediate and temporary effect of definite fluctuations of these conditions. In other words—not of climate, but of weather."

Two cities were selected for this detailed study: New York, at sea-level on the Atlantic coast, and Denver, in Colorado, on a plateau 5,200 feet above the sea, in the heart of the continent. Statistics of conduct, or, as it is termed in America, deportment, were obtained from certain prisons and schools, and of crimes from police courts and newspapers, the total number of cases tabulated being very large indeed, and occurring during ten years.

"In the tabulation the average daily occurrence for all the days falling under a given meteorological condition, was compared with the average daily occurrences for the whole period studied, and an excess or deficiency was ascribed to weather influences. The right to do this might at first thought be questioned, but . . . . There is, in fact, but one condition in the environment which changes simultaneously for all the individuals considered, and that is the weather."

It is not suggested that the weather influences moral conduct directly, but that in certain conditions of weather a state of mind is produced in which the power of resistance to temptations, which

in themselves have nothing to do with atmospheric conditions, is weakened or strengthened. The method employed was limited to an investigation of mean barometer, temperature, humidity, total wind movement, character of the day, and precipitation. These data were got out for every day of all the years under investigation. The days were then separately classified for certain small ranges of each of the meteorological conditions, and a curve of expectancy was prepared by which to judge the accordance of the deportment statistics. Thus if 1 per cent. of all the days considered had a range of temperature between 30° and 35°, and 10 per cent. had a range between 70° and 75°, it would be expected that if suicide had no relation to temperature, the total number of suicides during the latter period would be ten times as great as during the former. However, in drawing the curves, all the values are reduced to the excess or deficiency of the daily averages for the period in question, with respect to the expectancy curve, so as to obviate the confusion likely to arise from the mere magnitude of the number.

A series of chapters deals in succession with the influence of the weather on the conduct of children in school, on various forms of crime, on insanity, on health, on suicide, on drunkenness, and on attention, each one illustrated by a series of curves, one for each of the meteorological conditions examined. A general chapter summarizes all the foregoing, and from it rather than from the detailed discussion we draw the following conclusions.

So far as the seasonal occurrence of the conditions studied is concerned, it appears that in the cold months sickness, death, and drunkenness are far more frequent than in the warm months; whereas crime and suicide are most developed in the summer. The effects of temperature (without regard to season) are shown much more distinctly in the case of females than of males, especially in the increase of pugnacity and of "mental unbalancing" in hot weather.

Contrary to one's expectation, the influence of barometric pressure was found to be more distinct than that of any other meteorological condition. A low barometer is characterized by increase in crime, insanity and bad conduct; sickness and suicide also seem to be increased, while drunkenness is diminished, and attention, as tested by the number of clerical errors made by bank clerks, is either more perfect, or special precautions are taken to guard against errors.

Humidity may be dismissed with the remark that a dry atmosphere is a stimulant to all forms of active disorder and to suicide, but is an enemy to intoxication and mental inexactness.

With regard to wind, the most remarkable results ascertained are that calms produce an excessive development of those life phenomena which are due to depleted vitality. Thus crime, insanity and bad conduct in school and prison, drop to a very small frequency, in the case of females especially, while sickness, death, and want of attention, are above the average, and there is a tremendous increase in

the number of absences from school. These facts are explained by the statistics being compiled from large cities, where an absence of wind means stagnation of the atmosphere and the accumulation of carbonic acid and other deleterious constituents. Fogs are not treated specially, but they no doubt assist in intensifying the depressing effects of calms. The diminution in crime and misconduct are due obviously to lack of strength or spirit, not to any tendency to a higher morality in calm weather.

In conclusion, we present Dr. Dexter's final epitome in his own words, some of which will require a careful study of his volume to explain fully, but we feel considerable confidence in accepting the various propositions, after reading the ample proofs presented in his pages.

I.—Varying meteorological conditions affect directly, though in different ways, the metabolism of life. II.—The "reserve energy" capable of being utilized for intellectual processes and activities, other than those of the vital organs, is affected most by meteorological changes. III.—The quality of the emotional state is plainly influenced by the weather states. IV.—Although meteorological conditions affect the emotional states, which without doubt have weight in the determination of conduct in its broadest sense, it would seem that their effects upon that portion of the reserve energy which is available for action are of the greatest importance.

The outcome of the whole study is, that crimes of violence and bad conduct in school or in prison are due to excessive vitality imperfectly controlled, and their frequency is increased by whatever conditions of weather increase vitality; while illness, insanity, and death, result from deficient vitality, and work greater havoc when depressing atmospheric conditions prevail.

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, Captain D. Wilson-Barker, President, in the chair.

An interesting discussion took place on Mr. F. J. Brodie's paper on the "Decrease of Fog in London during recent years," which was read at the previous meeting. [For a summary of this paper, *see* p. 213]. By an apt coincidence, a remarkably dense fog prevailed throughout the day, and so added special emphasis to the occasion.

The President was of opinion that fogs were due to meteorological effects. The presence of dust in the atmosphere was often invoked to explain the formation of fog, but he did not think that was correct, as at sea, where there could not be much dust, fogs were quite as dense as London fogs, only cleaner.

Mr. W. Marriott thought that Mr. Brodie should have clearly

stated what he meant by the term fog, as by speaking about "town fog" one was almost led to suppose that he had dealt only with what was popularly called "London fogs," and not fogs in the ordinary or meteorological acceptance of the term. The International Meteorological Congress of Vienna had adopted the same symbol for both fog and mist, which they evidently believed to be phases of the same phenomenon. Mr. Marriott exhibited some lantern slides, showing by symbols the meteorological phenomena observed at the stations of the Royal Meteorological Society, as printed some years ago in the *Meteorological Record*, and pointed out how his own observations of fog at West Norwood were confirmed by those of Mr. Mawley at Addiscombe. These gave a greater number of days of fog than were recorded in Mr. Brodie's paper for Brixton. Mr. Marriott believed that there was a considerable connection between fogs and the absence of wind. He showed lantern slides on which were given curves of the number of occasions on which the velocity of the wind at the Royal Observatory, Greenwich, was less than 200 miles per day. These curves corresponded in a very remarkable manner with those of the days of fog at West Norwood.

Mr. J. E. Clark described the means which he had employed at his office at Finsbury Square, E.C., for measuring the amount of darkness in the daytime by noting the number of quarters of an hour that it was necessary to resort to artificial light. [*See* this Magazine, **36**, p. 94].

Dr. W. N. Shaw thought that Mr. Marriott's suggestion that fog was most prevalent when there was an absence of wind was probably correct. This was confirmed by the inquiry on "London fogs" taken in hand by the Meteorological Office for the London County Council, as one of the difficulties of the second winter's work was the marked decrease of fog owing to the increase of wind.

Mr. C. Harding was of opinion that wind was a very important factor in connection with the matter under discussion, and referred to the instances in which fog was prevalent when the velocity of the wind at the Royal Observatory, Greenwich, was less than 100 miles per day.

Dr. H. R. Mill said that he had compared Mr. Brodie's figures with those of the number of rainy days and the amount of rain at Camden Square; and found that very often a year which had frequent fogs had few rainy days or little rain, while a year with few fogs had many rainy days or much rain. This relationship is not surprising, for if the years in which fogs are frequent are those in which anticyclonic conditions have been predominant or at least unusually common, they should be dry years as well; while years of frequent cyclonic disturbances ought to be wet and free from fogs.

Captain W. F. Caborne spoke on the work of the Coal Smoke Abatement Society; and letters were read from Mr. A. A. Pearson and the Hon. F. A. Rollo Russell, referring to the influence in

reducing fogs of the increasing number of paved streets and of slate roofs in London.

Mr. F. J. Brodie, in reply, said that he thought it would be found that dust was present in even sea fogs, although not to the same extent as on land. He had used the Brixton figures in his paper because they were the official figures. He thought the connection between fog and absence of wind must be patent to everybody, and that there could not be a London fog when a wind of force 3 or more was blowing.

A paper by Dr. W. N. Shaw, F.R.S., and Mr. W. H. Dines, was also read. The authors described an apparatus called the "Micro-Barograph," which they have designed to magnify the minor fluctuations and at the same time to disentangle them from the general barometric surges. They also showed some interesting records from three of these instruments—two being at South Kensington and the other at Oxshott. The authors wish to obtain information as to the nature of the disturbances and the causes to which they may be assigned. Among the causes which suggest themselves as likely to produce temporary fluctuations of the barometric curves are—(1) Atmospheric billows passing along surfaces where there is discontinuity of density in a manner somewhat similar to ocean waves: (2) the passage of minute whirls, or cyclonic depressions of small dimensions; (3) variations of pressure due to the attraction or repulsion produced by electric stress as masses of air at different potential pass by; (4) the mechanical effects of wind; and (5) the mechanical effects of the rapid condensation of aqueous vapour.

The following gentlemen were elected Fellows of the Society:—Mr. W. H. Chambers Bullen, Dr. H. A. Des Vœux, Mr. R. G. K. Lempfert, M.A., and Mr. R. M. MacFarlaine.

SCOTTISH METEOROLOGICAL SOCIETY.

A MEETING of this Society was held on December 6th at 4 p.m., in the rooms of the Royal Society of Edinburgh, the Hon. Lord M'Laren in the chair.

Dr. W. N. Shaw, F.R.S., communicated an important paper on "The Treatment of Climatological Observations." The practice of summarising observations in the form of weekly and monthly means and extremes was convenient, and the results for some purposes valuable, but since the actual weather of the British Isles does not arrange itself in such regular periods, a system of classification which dealt with consecutive weekly or monthly divisions as homogeneous left something to be desired for certain problems. The distribution of barometric pressure from day to day might be adopted usefully as a basis of classification, and the object of the inquiry, towards which the paper was a first contribution, was threefold:—

First, to combine the climatological data in such a way as to exhibit effectively the modifying influence of geographical position upon the general weather conditions of the locality. Second, to mark out in clear outline and give numerical expression to the specific characteristics of weather associated with distributions of pressure which may be regarded as typical. Third, to secure the co-operation of the observers at the normal climatological stations in filling in the outline by putting together the data for their stations, as they are obtained, upon some plan organized by mutual agreement.

Six different types of isobaric distribution might be distinguished :—

I. S.E. Type.—A pressure distribution favourable for S.E. winds, or, according to the amount of incurvature, for E. winds.
II. S.W. Type.—For winds from S.W., or from some point nearer S.
III. N.W. Type.— ,, ,, ,, N.W., ,, ,, ,, ,, ,, W.
IV. N.E. Type.— ,, ,, ,, N.E., ,, ,, ,, ,, ,, N.
V. Variable Cyclonic Type, with the sequence of winds incidental to the passage of a cyclonic depression.
VI. Variable Anticyclonic Type, with the uncertain winds of the interior of an anticyclonic region.

This was, of course, not an exhaustive classification ; indeed, each of the first four types might be conveniently subdivided into three, according as any station was in a position where the isobars were concave towards the low pressure area, nearly straight, or concave towards the barometric maximum.

So far the inquiry had extended to groups of stations in the districts named and for the periods indicated in the following table, which gives the number of days in the different periods that might be referred to the several types :—

TYPE.	England N.W. 1896-1898.		Midland Counties. 1897-1899.		Scotland E. 1897-1899.
	January.	July.	January.	July.	January.
I. S.E.	13	2	11	7	11
II. S.W.	40	35	32	19	43
III. N.W.	18	28	12	27	18
IV. N.E.	13	6	14	13	5
V. Variable Cyclonic	7	8	5	6	5
VI. Variable Anticyclonic	2	14	19	21	11

The data for the first two districts were for periods with only two years in common, but the January data for Scotland E. and for the Midland Counties of England for one and the same period showed a relative preponderance of the S.W. and N.W. types in the more northern district and represented definitely a difference of climatic conditions for the two districts.

The weather of each station in each group had been analysed as regards rainfall, temperature, &c., and the results gave a definite

measure of the peculiarities of any place or district for any type of weather. Thus in July, both in England N.W. and in the Midland Counties, the dryness of the N.W. and N.E. types was well marked, as also the irregularities of the distribution of rainfall with the variable cyclonic type of weather. Again, in Scotland E. in January there were high temperatures with the N.W. type and low temperatures with the S.W. type, a marked absence of sunshine with the S.E. type, and irregular rainfall with the N.E. type.

Altogether, the method of distributing the observations according to weather types brought out a number of striking points which would be masked or obliterated if only weekly or monthly averages were used. The student of meteorology would be able to get :—

A much clearer and more definite insight into the facts of meteorology by bringing to the numerical test a number of statements which have long been recognised in a more vague and general form.

Such work was necessarily laborious, but might be lightened by the co-operation of observers in the various districts.

The paper was fully illustrated by diagrams and lantern slides.

A short paper on "The Vertical Gradient of Rainfall," by Mr. A. Watt, M.A., was also communicated. The 19 years' series of rainfall records from the Ben Nevis Observatories showed, somewhat unexpectedly, that the ratio of the amount of rainfall at the top of the mountain to that at the foot exhibited very little variation from month to month. On the other hand, comparing the rainfall on the Puy-de-Dôme with that at its base station, Clermont, for an 18 years' period, we had a radically different curve, the two sets of monthly ratios being as follows :—

	J.	F.	M.	A.	M.	Ju.	Jy.	A.	S.	O.	N.	D.
Ben Nevis, Fort William	1·9	1·9	2·3	2·2	2·3	2·2	2·3	2·2	2·1	2·0	2·0	1·9
Puy-de-Dôme, Clermont	5·5	4·5	4·2	2·8	1·8	1·6	1·7	1·8	1·8	2·3	2·9	4·6

The two Scottish stations had much heavier rainfalls than the two French ones, and only the general character and not the amplitude of the two curves was in consideration, especially since differences of height might affect the problem. The speculation was indulged in that the difference of the curves could be accounted for on the following suppositions :—(1). That the greater part of the Ben Nevis rainfall was of cyclonic origin, since there did not seem any theoretical reason why the gradient of rainfall of purely cyclonic origin in a mountainous district should have a seasonal variation ; (2). That a great part of the Central France rainfall was of local convectional origin. The zone of maximum rainfall of such origin varied greatly in height with the seasons—as explained by Hann and others—and would certainly be in summer far above the level of the Puy-de-Dôme, and in winter probably below that level. But all rainfall problems were complex, especially those dealing with high-levels, since the mass of a mountain had a double influence—in deflecting winds upwards and in setting up or assisting local convectional currents in warm weather.

CLIMATE OF THE BRITISH EMPIRE IN 1903.

THE completion of the climatological records of the British Empire for 1903 enables us once more, and for the twenty-second time, to summarise the observations for a year. It is gratifying to notice that out of the sixteen stations which appeared in the table for 1882 no fewer than thirteen are among the twenty-five for which it is possible to give more or less complete records for 1903. It is, however, still obviously impossible to represent the average conditions of the climate of the Empire by so small a number of stations, however well distributed; but the records do display the diversity of the many climates of our scattered dominions.

Adelaide, which has almost constantly held the first place in the summary for extreme maximum temperature, is, as in 1902, naturally outshone by Coolgardie, in Western Australia, which comes to the front with the notable shade temperature of 113°·4, the second highest reading we have ever had occasion to quote. It must be remembered, however, that we do not publish returns from any of the intensely hot stations in the north-west of India. The minimum temperatures at Dawson are unprecedented in these tables, as this station has only been at work for a few years, and the winter returns have frequently been imperfect.

It is of interest in connection with the extremely wet character of 1903 over the greater part of the British Isles to note that the rainfall of London was the highest ever recorded there. The rainfall elsewhere showed no tendency to be exceptional, and more stations had a deficiency than an excess.

The range of shade temperature in the British Empire in 1903 was 174·2 Fahrenheit degrees, between the Coolgardie maximum and the Dawson minimum; and it is a tribute to the power of gold in attracting population to uncomfortable places that thousands of miners brave the torrid heat of the Coolgardie summer, and the more than polar cold of the Dawson winter.

SUMMARY.

Highest Temp. in Shade	113°·4 at Coolgardie, on Jan. 27th.
Lowest „ „	—60°·8 at Dawson, on Jan. 26th.
Greatest Range in year	150°·3 at Dawson.
Least „ „	22°·8 at Grenada.
Greatest Mean Daily Range ...	23°·5 at Winnipeg.
Least „ „ „ ...	8°·5 at Hong-Kong.
Highest Mean Temp. in Shade...	82°·3 at Madras.
Lowest „ „ „ ...	22°·8 at Dawson.
Highest Relative Humidity ...	82% at London.
Lowest „ „ ...	62% at Adelaide.
Highest Temp. in Sun.....	177°·0 at Trinidad, on Nov. 14th.
Greatest Rainfall..:.....	93·67 in. at Hong-Kong.
Least „	10·74 in. at Dawson.
Most Cloud	6·8 at Hong-Kong.
Least „	3·3 at Grenada.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE FOR 1903.

STATIONS. *Those in Italics are South of the Equator.*	ABSOLUTE. Maximum. Temp.	Maximum. Date.	Minimum. Temp.	Minimum. Date.	AVERAGE. Max.	Min.	Mean.	Dew Point.	Humidity.	ABSOLUTE. Max. in Sun.	Min. on Grass.	RAINFALL. Depth.	Days.	AVERAGE. Cloud.
	°		°		°	°	°	°	%	°	°	in.		0—10
London	87·2	July 10	22·1	January 16	58·2	44·0	51·1	45·5	82	133·7	17·3	38·10	179	6·1
Malta	100·3	Sept. 13	42·5	Feb. 4, 19	71·5	58·2	64·8	56·3	78	148·7	37·1	15·87	63	3·5
Lagos	93·0	March 8	68·0	Jan. 1, Sep. 28	86·2	75·6	80·9	...	...	148·0	...	68·85	108	...
Cape Town	92·1	February 11	37·7	July 1, 25	68·5	53·7	61·0	51·5	73	...	...	29·93	120	4·6
Durban	96·1	Sept. 29	46·1	June 27	79·2	61·3	70·2	...	...	152·3	...	35·66	145	4·5
Mauritius	89·0	January 10	55·1	July 13	80·8	67·0	73·9	65·4	75	160·0	45·3	41·75	209	5·9
Calcutta	107·6	April 29	48·9	January 1	87·8	70·7	79·3	68·4	72	164·0	41·9	54·14	79	4·6
Bombay	93·7	May 22	56·0	December 27	85·5	74·1	79·8	71·1	76	140·7	48·9	84·49	111	3·8
Madras	103·1	June 27	65·3	December 8	89·7	74·9	82·3	72·6	79	147·1	60·5	79·62	104	4·6
Kodaikanal	74·5	March 23	42·7	December 14	64·7	51·4	58·1	48·4	76	152·1	28·7	69·55	120	5·8
Colombo	94·0	March 14	68·5	February 1, 3	87·0	75·9	81·5	73·8	81	155·8	62·2	78·09	182	5·8
Hong-Kong	92·4	July 31	41·9	February 3	76·3	67·8	72·0	63·8	77	147·5	...	93·67	135	6·8
Melbourne	105·0	January 31	28·4	June 11	66·9	49·8	58·3	47·6	72	165·3	20·5	28·43	130	6·4
Adelaide	105·6	February 9	32·2	July 11	71·1	52·8	61·9	47·9	62	161·9	27·5	25·47	134	...
Coolgardie[1]	(113·4)	(January 27)	34·4	August 3	...	...	...	...	...	(173·6)	27·3	...	...	...
Sydney	98·1	February 3	38·4	June 26	69·2	56·7	63·0	50·4	73	139·5	29·8	38·62	197	5·4
Wellington	79·5	November 30	31·0	August 2	61·2	48·5	54·8	46·2	74	138·0	21·0	53·80	179	6·2
Auckland	78·0	February 15	34·0	July 16	63·9	53·2	58·6	49·4	72	150·0	32·0	45·13	194	5·3
Jamaica	92·1	August 10	61·0	November 30	86·3	72·0	79·1	70·8	76	...	...	42·84	105	...
Trinidad	96 0	June 1	56·0	Sept. 30	87·0	69·2	78·1	71·4	78	177·0	60·0	51·64	...	...
Grenada	92·4	April 30	69·6	March 13	84·5	74·2	79·4	70·6	74	157·2	...	78·89	232	3·3
Toronto	91·5	July 8	— 9·7	December 28	54·4	37·7	46·0	39·1	76	110·7	—13·5	30·64	...	6·1
Winnipeg	93·8	July 23	—36·7	February 15	46·8	23·3	35·1	...	...	...	...	16·92	95	4·9
Victoria, B.C.	87·8	June 8	26·4	March 12	54·8	43·9	49·3	...	...	...	...	26·27	...	6·7
Dawson	89·5	June 19	—60·8	January 26	32·3	13·4	22·8	...	...	...	...	10·74	59	4·0

[1] December wanting.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

FOG IN LONDON.

THIS morning at 9 a.m. I measured ·04 in. of "rain," consisting of condensed fog for previous 24 hours. I have never measured so much before, and think it worthy of note.

As to fogs being less prevalent in the London district during the last 10 years, as described in your report of the recent meeting of the Royal Meteorological Society, is not that probably due to the mild cyclonic type of the last 9 out of 10 winters?

STANLEY SINGLE.

Park View, Leopold Road, Wimbledon, Dec. 20th, 1904.

WITH regard to the dispersal of fogs, it has often occurred to me that by creating a wind or breeze from different portions of the City and suburbs, fogs might be dispersed or perhaps mitigated.

My idea is to have large shallow tanks, or long narrow troughs, in various open spaces or on eminences; these to be charged with naphtha, methylated spirit, or some other quick burning and smokeless material, that on ignition would produce a sudden and violent flame, which would cause a current of air.

How far is such a scheme practicable? As to the expense, this I imagine would be a mere trifle compared with that of the loss, and inconvenience, not to say sickness due to fog.

J. C. STENNING.

Steel Cross House, Tunbridge Wells, 23rd Dec., 1904.

IN connection with the above, we may quote the following letter from Sir Oliver Lodge, Principal of the University of Birmingham, which appeared in *The Times* of December 23rd.

To the Editor of The Times.

SIR,—The anticyclonic condition prevalent this year gave us a fine summer and is now giving us an opportunity for fog which the great towns are utilizing to the utmost by the imperfection of their combustion and by their habitual employment of crude fuel.

An electrical method of dissipation is not the right remedy for this artificially intensified evil, though it is a hopeful and proper method of attacking natural mist in places where it interferes with navigation or commerce; but, although it is not the right remedy, any more than free meals and free doles are a sound remedy for the problem of poverty, yet, like them, it may have to be used as a temporary palliative in times of stress and while better methods are incubating. The cost of applying such a method to a whole city is probably prohibitory, but there are important

centres where any means of mitigating the nuisance would seem to be legitimate.

If a deputation of municipal or other engineers chose to come to Birmingham, I would show them some apparatus at work, and they could judge how far they could recommend its experimental adoption on a larger scale. No private persons can try experiments in the thoroughfares of a city, nor can an experiment be tried on an adequate scale without some expenditure. The necessary expenditure resolves itself into initial equipment and maintenance; the actual running expense being only occasional, and, moreover, quite insignificant, compared with the power already expended in artificial illumination during daylight fog.

Whether it is worth while for any municipality to try the experiment, it is not for me to say, but it is within the scope of the electrical engineering profession, and my assistants are competent to give the specific supervision and advice necessary to insure its being tried properly, if any authority chose to attempt it.

I am, Sir, faithfully yours,

OLIVER LODGE.

The University, Birmingham, Dec. 22nd.

RAIN GAUGES.

THERE are two sources of error in rain gauges which are more important than any which have been discussed lately in this Magazine.

(1.) There is the difference in sharpness of the rim. For five years my neighbour in this village registered an average of 1·03 in. yearly more than I did, and we were unable to assign a reason; both gauges were Snowdon 5 in. On his leaving the village he allowed me to place his gauge alongside mine for some months, during which it still registered more than mine. Careful measurement showed that his gauge was a trifle wider than mine, only sufficient to cause a difference of 1 per cent., but the rim was not so sharp as mine—one of Casella's, which, as Mr. Symons said, would split a rain drop,—and the higher record was probably due to insplashing.

(2.) The other source is the difference in receptacle. Some deliver direct into the copper cylinder or bucket, others into a wide mouthed bottle; in both cases, if the gauge is not read daily evaporation comes in. A neighbour here, who only records his gauge once a month, registered actually less at the end of the month than he had found in it some days before; the weather had been dry, and his funnel delivered direct into the copper bucket of a Snowdon gauge.

Rain gauges should have rims uniformly sharp, and delivery should be into a glass bottle with a mouth only just wide enough to take the funnel pipe.

J. P. MACLEAR.

Chiddingfold, 15th October.

METEOROLOGICAL NEWS AND NOTES.

THE LARGEST NUMBER OF THIS MAGAZINE, completing the largest volume which has been issued since its foundation in 1866, is now in the hands of the reader. We could without difficulty maintain the size throughout the year, as our correspondents keep us amply supplied with material; but, although the Magazine can never be expected to become a source of financial profit, we hope that the small increase of circulation which has been observed will continue until the loss incurred in improving the Magazine is covered. The next volume will appear in the attractive cover the design of which appears as the frontispiece of the present; and if our readers care for it enough to increase the circulation sufficiently to cover the extra expense of printing and the doubled postage which any expansion demands, it lies in their power to do so. We shall not cease in our efforts to fill such space as our subscribers place at our disposal to the best of our ability.

THE PHYSICS OF THE FREE AIR—that is to say, the scientific investigation of the upper atmosphere—is the subject of a new publication appearing at irregular intervals under the title *Beiträge zur Physik der freien Atmosphäre.* The new journal is edited by Dr. Assmann, of Berlin, and Dr. Hergesell, of Strasburg, with the colloboration of eminent meteorologists in all countries.

THE ROYAL METEOROLOGICAL SOCIETY is, we understand, about to resume the series of exhibitions of meteorological iustruments, which were for some years a source of great interest to the public as well as to the Fellows of the Society.

THE COURSE OF GILCHRIST LECTURES to be delivered in January at Evesham, Stourport and Wolverhampton, and in February at Swadlincote and Atherton, will include a lecture on Climate and its Influence on Human Progress by Dr. H. R. Mill.

ASTRONOMY AND METEOROLOGY are on good terms with each other. They approach though they do not meet; but we confess to a sensation of mild surprise at the far views of a provincial journalist, who, in an eloquent tribute to the dry October, printed on November 1st, permits himself to observe—"With a regular afternoon sun and a gentle dry wind we are placidly approaching the autumnal equinox." We may add that we are also approaching the 29th of February.

REVIEWS.

Neudrucke von Schriften und Karten über Meteorologie und Erdmagnetismus herausgegeben von Professor DR. G. HELLMANN. No. 15. *Schlussheft. Denkmäler Mittelalterlicher Meteorologie.* [Reprints of Works on meteorology and terrestrial magnetism. No. 15, concluding number. Monuments of mediæval meteorology.] Berlin: Asher & Co. 1904. Size 10 × 8. Pp. 46 + 270 + 12. Price 28 mk.

THIS beautiful volume completes the series of monumental works of the past, which Dr. G. Hellmann has brought for a moment within the reach of the students of meteorology of to-day. We say "for a moment" because the first four numbers are already out of print and the whole series is so interesting bibliographically as well as scientifically that the edition will soon be exhausted.

To this volume Dr. Hellmann prefixes an introduction dealing with the character of the meteorology of the Middle Ages, in which he says that the proverbial darkness was pierced by the light of many brilliant stars, and in confirmation of this he gives a series of most interesting notes on the works he has selected for reproduction. These are, of course, mainly in Latin, and the actual manuscripts are reproduced in many cases and always with a perfection that does the greatest credit to publishers and printers. The first chronologically is a selection from the *De Natura Rerum* of Isadorus Hispalensis (A.D. 570-636), a famous bishop of Sevile; the last is from Gregor Reisch's *Margarita Philosophica*, a miniature encyclopædia written at the beginning of the fifteenth century and printed long afterwards, in 1504. This edition, the meteorological section of which is reproduced, contains the first meteorological pictures and diagrams which figured in any printed book. The nine centuries between these two works are represented by 24 authors, including the first English historian, the Venerable Bede. The intellectual side of meteorology will always lie under a delightful debt to Dr. Hellmann for this series.

Climatological Observations at Colonial and Foreign Stations. I., *Tropical Africa*, 1900–1901–1902. *With Summaries for previous years and frontispiece map. Tables prepared by* E. G. RAVENSTEIN. Published by the Authority of the Meteorological Council. London: Printed for H.M. Stationery Office, 1904. Size 12 × 10. Pp. 54 and Map. Price 6s.

IN a short preface Dr. W. N. Shaw explains that the Meteorological Council intend to publish the observations from distant portions of the British dominions and certain foreign countries which are sent in to the Meteorological Office, and they have accepted this discussion by Mr. Ravenstein as a preliminary memoir. The first two para-

graphs of the preface explain the origin of the present publication :—

"Summaries of Climatological Observations made at a number of stations in Tropical Africa have been included in a series of reports made to the British Association by a committee appointed by that Association at the Cardiff meeting in 1891.

"The Committee, of which Mr. E. G. Ravenstein was chairman, the late Mr. G. J. Symons, Dr. H. R. Mill and Mr. H. N. Dickson were successively secretaries, Mr. Baldwin Latham and Sir John Kirk original members, prepared a book of instructions for observers, and in other ways promoted the collection of climatological information. After ten years of activity, the Committee ceased its operations, but returns of observations continued to be received, chiefly by the Foreign Office. Some of these were forwarded to Mr. Ravenstein direct and others were placed in charge of the Meteorological Council."

We rejoice to see a piece of very laborious pioneer work, the initiation of which was due to Mr. Fred. Moir, of Nyasaland, and the burden of which fell mainly on Mr. Ravenstein, taken up by an official body which will secure for it the continuity that can never be attained by individuals upon whose time other matters have prior claims. The portions of tropical Africa dealt with in this report are—The Egyptian Sudan (7 stations), Uganda (8 stations), Congo State (1 station), British East Africa (15 stations), British Central Africa (32 stations), Rhodesia (19 stations), and Portuguese Zambesia (1 station). A valuable bibliography of African tropical climatology concludes the work.

Wind Charts for the South Atlantic Ocean. London : Hydrographic Office. Size, 20 × 27, 12 charts. Price 7s.

A PUBLICATION without a title-page is something of a curiosity in bibliography, but in this instance it is also an important contribution to meteorology. A chart of the South Atlantic with a strip of the South Pacific from the Equator to 65° S. is given for each month of the year. The water-surface is ruled into squares of 5° in the side, and in each square there is a wind-rose showing the average frequency of winds from each point of the compass for that area in that month, based on the observations of a long series of years. Isobars and isotherms are also added. The work was carried out in the Marine Department of the Meteorological Office, and some glimmering of the amount of labour involved and the success achieved may be obtained by the reflection that nearly a million sets of observations have been utilized and so elaborated that the final outcome can be gathered by the eye in half-an-hour without reading a single figure. So notable an achievemcnt deserves to be more fully described than in the scant page of letterpress accompanying the charts.

The National Physical Laboratory. Report for the year 1903. London: 1904. Size 10 × 7. Pp. 76. Plates.

THE Report of the National Physical Laboratory for 1903, in addition to the statistics of instruments tested, &c., embodies tabular statements of the meteorological and magnetic observations during the year at Kew Observatory, and the magnetic observations at Falmouth and Valencia, with notes on the work carried out On the initiative of the Meteorological Office, special observations were made with the Fineman and Strachey nephoscopes in connection with the international scheme of balloon ascents, and some observations of the upper clouds were also made. New earth thermometers were installed at 1 and 4 feet below the surface, and readings were taken three times daily. The rainfall at Kew during 1903 is stated to have been the largest recorded since exact observations began, and 80 per cent. in excess of the average of the preceding 10 years.

Physiography: an Introduction to the Study of Nature. By T. H. HUXLEY, *revised and partly re-written by* R. A. GREGORY, *Professor of Astronomy*, Queen's College, London. With 301 illustrations. London: Macmillan & Co., Ltd. 1904. Size 7 × 5. Pp. xii. + 425. Price 4s. 6d.

WHILE the work of an intellectual giant like Huxley must always stand alone when viewed from the point of view of an advanced student, the change of horizon made necessary by the discovery of new facts, and the increased facility of illustration, make it desirable to recast a book of this sort from time to time, if it is to retain its value for the class for which it was originally written. The new book is less impressive in appearance than the old, but the number of its illustrations is a merit, though the scale of some of them is regretably small. Professor Gregory has done his work well, and has turned out a book such as only an authority on education with a very wide and accurate knowledge of science could produce.

The book keeps prominently before the reader the vital fact of the Earth as a whole, with parts in constant interaction. In reading it, one is reminded how great the whole is which includes the little part, to elucidate which demands the whole attention of a specialist, and it also shows how important the specialist's part is in the grand scheme of the whole. The mutual relations of the Sun, in its actions on the Earth, with air, water and land, are clearly set out. Many of the illustrations are novel and happy, and they are all practical. Few defects have met our eye, though it is offended by the usual typographical contempt for our planet—no editor or printer would write of *the times* as a newspaper, why, we wonder, do they so often refer to *the earth* as a planet. There is one picture which might be

replaced by a better in a new edition. Fig. 56, "Fahrenheit and Centigrade divisions on a simple thermometer," shows 0° C. coincident with 31° F., and 10° C. with 49° F., whereas we all know that the coincidence of 0° C. and 32° F. is essential, and that of 10° C. with 50° F. is a very happy accident. Fig. 57 shows a maximum thermometer graduated down to —25°, while Fig. 58 shows a minimum thermometer graduated only to —10°. This must be rather puzzling for a student, who would naturally expect a minimum thermometer to be able to measure lower temperatures than a maximum.

Klimatographie von Oesterreich. I. Klimatographie von Niederösterreich [Climatography of Austria. I. Climatography of Lower Austria], von J. HANN. Wien, 1904. Size $11\frac{1}{2} \times 7\frac{1}{2}$. Pp. 104, and map. Price 3 kronen (2s. 6d.)

THIS is the first part of a work on the climate of Austria, published as a memorial of the fiftieth anniversary of the Austrian Central Meteorological Institute. Dr. Pernter, the Director of the Institute, mentions in the preface that the work will consist of sixteen parts, one for each of the crown-lands, and these must necessarily be undertaken by different hands. He invited his predecessor, Hofrat Hann, the leading climatologist in the world, to prepare the first memoir to serve as a pattern on which the others could be fashioned, and the master undertook the work, which is now before us. The province of Lower Austria is treated first as a whole, and then in greater detail for each of the four great divisions, Dr. Hann only claims to give the minimum description possible, merely a statistical skeleton on which an ideal description of the climate might be built up. The ideal referred to would include not only the facts of climate, but the relation of climate to vegetation, agriculture, and mankind; in fact, to the general life of the region in question.

The statistical basis consists of the mean, maximum and minimum of each climatological condition, together with the variability from the mean in successive periods. The barometer is left out of account, as the variations over the small surface of a province are of no direct climatological importance, though it would be considered in a general treatise on the climate of all Austria, after the partial descriptions are completed. Temperature and rainfall are the elements discussed in greatest detail, and the memoir contains a finely-executed rainfall map of Lower Austria, on the scale of about 6 miles to an inch, printed in colours. As Vienna is situated in the province dealt with, it has been possible to compare the records of shorter duration in different places with the very long series available for the capital.

Die Anomalien der Witterung auf Island in den Zeitraume 1851 bis 1900 und deren Beziehungen zu den gleichzeitigen Witterungsanomalien in Nordwesteuropa. von J. HANN. [The anomalies of the weather in Iceland during the period 1851–1900 and their relation to the simultaneous anomalies in North-Western Europe.] From *Sitzungsber. Akad. Wiss. Wien. Math.-Naturwiss. Klasse.* January, 1904. Size $9\frac{1}{2} \times 6\frac{1}{2}$. Pp. 88.

A DETAILED discussion of the variations of the monthly values of the various meteorological elements for every year from the fifty years' mean in Iceland, and a comparison with the similar variations in other places. The barometric pressure, temperature and rainfall for 50 years at Stykkisholm, Iceland, are first compared with those at Greenwich, Brussels and Vienna; the pressure at Stykkisholm is then compared with that at Ponta Delgado, both of these being "centres of action," in the terminology of Teisserenc de Bort; the meteorology of Stykkisholm itself is next discussed, and finally the temperature on the east coast of Greenland opposite Stykkisholm.

Cape of Good Hope Report of the Meteorological Commission for the year 1902. Cape Town, 1903. Size 13 × 8. Pp. 178 and plate.

An Introduction to the Study of South African Rainfall, by J. R. SUTTON, M.A. From *Trans. S. African Philos. Soc.* May, 1904. Size $10 \times 6\frac{1}{2}$. Pp. 28. Plates.

A note on the quantities given in Dr. Marloth's paper "On the moisture deposited from the south-east clouds," by CHARLES M. STEWART, B.Sc. From *Trans. S. African Philos. Soc.* January, 1904. Size $10 \times 6\frac{1}{2}$. Pp. 6.

Meteorology in South Africa, a retrospect and prospect, by CHARLES M. STEWART, B.Sc. From *Rep. S. African Assoc.* April, 1903. Size $9\frac{1}{2} \times 6$. Pp. 12.

Cape Town under Water, a series of Realistic Photographs with a complete description of the effects of the Great Storm of June 23rd and 24th, 1904. Cape Town: Central News Agency. Size $9\frac{1}{2} \times 12\frac{1}{2}$. Pp. 16. Price 6d.

WE have had these valuable and interesting publications on our table for months, and the vision of a fitting article to do justice to the efforts now being made in South Africa to improve the study of the weather has flitted before us to the very threshold of that grave of good intentions, a new year. The list of titles would worthily serve as the text for a discourse in a quarterly review, but neither can we find time nor our little monthly space to accomplish our intention. We can only hope that before long some of our South African readers will furnish us with notes of the progress of meteorology in their country, where so much good work is being done.

RAINFALL AND TEMPERATURE, DECEMBER, 1904.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables in *British Rainfall* to which each station belongs.]	RAINFALL. Total Fall.	Diff. from average, 1890-9.	Greatest in 24 hours. Depth	Greatest in 24 hours. Date.	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date.	Min. Deg.	Min. Date.	No. of Nights below 32° Shade	No. of Nights below 32° Grass
		inches	inches.	in.								
I.	London (Camden Square)	1·79	-- ·14	·64	6	19	56·3	29	27·6	9	9	19
II.	Tenterden	3·56	+ 1·33	·78	6	21	55·0	16, 29	24·0	23	8	20
,,	Hartley Wintney	2·39	+ ·25	·55	6	21	55·0	16	25·0	9, 21*c*	13	16
III.	Hitchin	2·12	+ ·18	·50	6	15	55·0	16	21·0	21, 22	15	...
,,	Winslow (Addington)	1·88	— ·13	·43	6	19	56·0	16	16·0	22	13	20
IV.	Bury St. Edmunds (Westley)	1·80	— ·31	·44	6	21	54·8	16	20·5	20, 23	...	...
,,	Brundall	2·55	+ ·47	·47	6	23	56·0	16	21·0	22	13	24
V.	Alderbury	3·29	+ ·63	·65	10	18	55·0	17, 30	26·0	9	15	...
,,	Winterborne Steepleton	4·20	...	·81	6	20	53·3	6	25·0	9	6	13
,,	Torquay (Cary Green)	2·74	...	·67	8	13	55·8	16	34·1	11	0	9
,,	Polapit Tamar [Launceston]	3·75	+ ·09	·47	6	23	54·0	4, 16*a*	23·5	22	8	12
,,	Bath	1·96	...	·43	6	16	56·5	16	27·5	22	11	21
VI.	Stroud (Upfield)	2·15	— ·08	·35	6	19	54·0	17	26·0	23	...	12
,,	Church Stretton (Woolstaston)	2·53	— ·02	·70	5	20	54·0	4	19·0	23	15	...
,,	Bromsgrove (Stoke Reformatory)	1·75	+ ·02	·40	11	16	52·0	16	21·0	22	21	...
VII.	Boston	1·95	+ ·40	·38	11	13	55·0	4	22·0	22	19	...
,,	Bawtry (Hesley Hall)	1·19	— ·67	·32	15	11	56·0	4	16·0	22	22	...
,,	Derby (Midland Railway)	1·39	— ·47	·23	9, 13	18	55·0	16	20·0	22	17	...
VIII.	Bolton (The Park)	3·29	— ·39	·61	15	17	...	...	...	...	...	...
IX.	Wetherby (Ribston Hall)	1·57	— ·35	·25	9	15	...	...	...	...	..	...
,,	Arncliffe Vicarage	4·58	— 1·88	·55	15	19	...	...	...	...	...	...
,,	Hull (Pearson Park)	1·43	— ·77	·27	15	15	55·0	4, 5*a*	23·0	23	14	26
X.	Newcastle (Town Moor)	1·94	— ·49	·69	9	13	...	...	...	...	...	...
,,	Borrowdale (Seathwaite)	15·09	+ ·16	2·84	16	17	54·3	4	18·8	22, 23	18	...
XI.	Cardiff (Ely)	3·38	— ·71	·69	5	22	...	...	...	...	...	...
,,	Haverfordwest (High St.)	5·14	+ ·43	·74	8	21	55·1	4	27·5	24	4	12
,,	Aberystwith (Gogerddan)	4·77	+ ·22	·92	12	16	61·0	14	20·0	23	13	...
,,	Llandudno	3·01	+ ·11	·70	17	20	60·0	4	30·0	24	5	...
XII.	Cargen [Dumfries]	3·47	— 1·25	·75	16	13	55·0	17	22·0	27	19	...
XIII.	Edinburgh (Royal Observy.)	2·40	...	·90	12	17	55·9	17	24·2	11	8	18
XIV.	Colmonell	3·72	— 1·13	·63	11	18	54·0	14*b*	26·0	8	10	...
XV.	Tighnabruaich	6·16	...	·80	6	17	48·0	4, 28	22·0	10	13	14
,,	Mull (Quinish)	4·58	— 1·67	·71	11	22	...	...	...	...	...	...
XVI.	Loch Leven Sluices	2·08	— 1·57	·47	15	13	...	...	...	...	...	...
,,	Dundee (Eastern Necropolis)	1·80	— 1·01	·35	12	18	56·1	29	17·0	11	12	...
XVII.	Braemar	1·87	— 1·14	·63	4	15	51·2	5	6·0	11	17	...
,,	Aberdeen (Cranford)	2·80	— ·18	·70	9	19	55·0	29	10·0	10	15	...
,,	Cawdor (Budgate)	2·26	— ·35	·41	29	17	...	...	...	...	...	...
XVIII.	Glencarron Lodge	10·73	+ ·30	2·38	29	25	53·4	5	15·6	11	8	...
,,	Bendamph	8·73	— 1·66	1·78	29	26	...	...	...	...	...	...
XIX.	Dunrobin Castle	2·45	— 1·01	·70	29	12	54·0	29	23·5	11	7	...
,,	Castletown	4·09	...	1·30	29	24	50·0	16, 28	20·0	10, 11	12	...
XX.	Killarney	5·01	— ·77	1·91	17	19	57·0	20	27·5	8	...	...
,,	Waterford (Brook Lodge)	3·76	— ·11	·62	8	20	54·0	4	28·0	11	6	...
,,	Broadford (Hurdlestown)	3·36	+ ·10	·58	16	23	54·0	28	26·0	7	9	...
XXI.	Carlow (Browne's Hill)	2·09	— 1·29	·33	8	19	...	...	...	...	...	...
,,	Dublin (Fitz William Square)	1·50	— ·85	·44	9	17	59·0	4	28·2	22	5	13
XXII.	Ballinasloe	3·48	— ·11	·75	16	24	64·0	4	23·0	8	13	...
,,	Clifden (Kylemore House)	...	...	...	...	...	...	...	...	...	...	...
XXIII.	Seaforde	2·46	— ·97	·51	9	17	54·0	4, 16	27·0	10*d*	9	16
,,	Londonderry (Creggan Res.)	3·06	— 1·06	·56	4	21	...	...	...	...	...	...
,,	Omagh (Edenfel)	2·85	— 1·09	·50	16	21	54·0	4	25·0	8	11	21

+ Shows that the fall was above the average; that it was below it. *a*—and 17. *b*—and 15, 16. *c*—and 22, 23. *d*—and 11, 18.

SUPPLEMENTARY RAINFALL, DECEMBER, 1904.

Div.	STATION.	Rain. inches	Div.	STATION.	Rain. inches
II.	Dorking, Abinger Hall	3·33	XI.	New Radnor, Ednol	3·21
,,	Sheppey, Leysdown	1·93	,,	Rhayader, Nantgwillt	5·14
,,	Hailsham	3·19	,,	Lake Vyrnwy	5·08
,,	Crowborough	4·43	,,	Ruthin, Plâs Drâw	3·19
,,	Ryde, Beldornie Tower	3·20	,,	Criccieth, Talarvor	3·97
,,	Emsworth, Redlands	3·42	,,	Anglesey, Lligwy	2·59
,,	Alton, Ashdell	3·48	,,	Douglas, Woodville	3·25
,,	Newbury, Welford Park	2·43	XII.	Stoneykirk, Ardwell House	2·80
III.	Harrow Weald	2·14	,,	Dalry, Old Garroch	5·85
,,	Oxford, Magdalen College	1·78	,,	Langholm, Drove Road	4·55
,,	Banbury, Bloxham	1·56	,,	Moniaive, Maxwelton House	4·37
,,	Pitsford, Sedgebrook	1·65	,,	Lilliesleaf, Riddell	2·18
,,	Huntingdon, Brampton	1·78	XIII.	N. Esk Reservoir [Penicuick]	3·60
,,	Wisbech, Bank House	1·65	XIV.	Maybole, Knockdon Farm	3·04
IV.	Southend	1·45	,,	Glasgow, Queen's Park	3·41
,,	Colchester, Lexden	1·91	XV.	Inveraray, Newtown	7·92
,,	Saffron Waldon, Newport	2·01	,,	Ballachulish, Ardsheal	9·99
,,	Rendlesham Hall	2·16	,,	Campbeltown, Redknowe	4·66
,,	Swaffham	1·48	,,	Islay, Eallabus	4·20
,,	Blakeney	1·87	XVI.	Dollar	5·55
V.	Bishop's Cannings	2·53	,,	Balquhidder, Stronvar	9·51
,,	Ashburton, Druid House	4·71	,,	Coupar Angus Station	2·16
,,	Okehampton, Oaklands	4·47	,,	Blair Atholl	3·33
,,	Hartland Abbey	3·23	,,	Montrose, Sunnyside	2·01
,,	Lynmouth, Rock House	3·32	XVII.	Alford, Lynturk Manse	2·38
,,	Probus, Lamellyn	4·46	,,	Keith, H.R.S.	3·72
,	Wellington, The Avenue	2·55	XVIII.	Fearn, Lower Pitkerrie	1·96
,,	North Cadbury Rectory	3·27	,,	S. Uist, Askernish	...
VI.	Clifton, Pembroke Road	2·32	,,	Invergarry	6·66
,,	Moreton-in-Marsh, Longboro'	2·16	,,	Aviemore, Alvie Manse	3·13
,,	Ross, The Graig	2·19	,,	Loch Ness, Drumnadrochit	3·78
,,	Shifnal, Hatton Grange	1·86	XIX.	Invershin	2·78
,,	Wem Rectory	1·60	,,	Altnaharra	5·79
,,	Cheadle, The Heath House	1·89	,,	Bettyhill	3·76
,,	Coventry, Kingswood	1·97	,,	Watten, H.R.S.	2·46
VII.	Market Overton	1·67	XX.	Cork, Wellesley Terrace	2·76
,,	Market Rasen	1·76	,,	Darrynane Abbey	4·21
,,	Worksop, Hodsock Priory	1·20	,,	Glenam [Clonmel]	2·96
VIII.	Neston, Hinderton	2·38	,,	Ballingarry, Hazelfort	2·14
,,	Southport, Hesketh Park	2·38	,,	Miltown Malbay	4·20
,,	Chatburn, Middlewood	3·22	XXI.	Gorey, Courtown House	2·53
,,	Duddon Valley, Seathwaite Vic.	7·54	,,	Moynalty, Westland	2·55
IX.	Langsett Moor, Up. Midhope	3·30	,,	Athlone, Twyford	2·65
,,	Baldersby	2·02	,,	Mullingar, Belvedere	2·23
,,	Scalby, Silverdale	2·68	XXII.	Woodlawn	3·87
,,	Ingleby Greenhow	3·37	,,	Westport, Murrisk Abbey	3·75
,,	Middleton, Mickleton	1·83	,,	Crossmolina, Enniscoe	4·82
X.	Beltingham	1·88	,,	Collooney, Markree Obsy	3·76
,,	Bamburgh	1·34	XXIII.	Enniskillen, Portora	...
,,	Keswick, The Bank	6·73	,,	Warrenpoint	2·22
,,	Melmerby Rectory	3·23	,,	Banbridge, Milltown	1·85
XI.	Llanfrechfa Grange	3·43	,,	Belfast, Springfield	2·95
,,	Treherbert, Tyn-y-waun	8·45	,,	Bushmills, Dundarave	3·27
,,	Llandovery, Tonn	3 87	,,	Stewartstown	2·53
,,	Castle Malgwyn	5·08	,,	Killybegs	4·39
,,	Llandefaelog-fach	...	,,	Horn Head	4·00

METEOROLOGICAL NOTES ON DECEMBER, 1904.

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.

ENGLAND AND WALES.

LONDON, CAMDEN SQUARE.—A mild, gloomy and depressing month, with great absence of sunshine and much damp, foggy weather. From the morning of the 19th till about 11 a.m. on 23rd, London was continuously developed in more or less dense fog. A westerly gale on 30th did considerable damage. Duration of sunshine 15·3* hours, and of R 39·6 hours. Mean temp. 41°·0, or 1°·8 above the average. The total duration of rainfall for the year was 492 hours on 160 days, and of bright sunshine 1,252 hours on 256 days.

TENTERDEN.—Very wet from 4th to 14th, but dry in the latter half, and beautiful from 19th to 22nd. Violent W. to N.W. gale on 30th. Duration of sunshine 48·2† hours.

CROWBOROUGH.—Wet and mild, escaping much of the fog experienced elsewhere. Mean temp. 41°·5.

HARTLEY WINTNEY.—Cold, damp and gloomy, with great lack of sunshine. Frost and R alternated during the first fortnight, in the latter raw, penetrating fog prevailed, lasting 10 days. Ozone on 12 days, with a mean of 5·0.

BRUNDALL.—Ungenial, with much R followed by fogs. Great wind storm on 30th, doing much damage. Mean temp. 39°·4, or 0°·9 above the average.

TORQUAY.—R 1·16 in. below the average. Duration of sunshine 53·4* hours, or 0·1 hour above the average. Mean temp. 46°·6, or 3°·1 above the average. Mean amount of ozone 4·8.

WELLINGTON.—The first 15 days had R, but not in large quantities; the latter part was generally dry, but with dense fog at times before Christmas.

NORTH CADBURY.—Very humid and cloudy, but warm and exceedingly calm.

CLIFTON.—R every day till 17th, with short fine intervals. An anti-cyclone then set in, bringing after one clear day dull, raw and foggy weather, with easterly winds changing to S.W. on 27th with a great increase of temp. S.W. to W. gale on the night of 29th. R one inch below the average.

ROSS.—R daily from 2nd to 17th, with max. temp. above 50° on 10 days. From 19th to 28th was raw, cold and unpleasant, with continual fog. No severe frost, but much low temp.

WOOLSTASTON.—Exceedingly variable temp., with S on five days. Dense fog from 22nd to 25th. Tremendous gale on 29th and 30th.

WORKSOP.—Changeable, with a good deal of slight frost, but no severe cold. Much fog about Christmas.

SOUTHPORT.—Mild and unusually sunny until 8th, and then cold, calm and remarkably foggy till 28th. Mean temp. 0°·4 below the average. Duration of sunshine 13 hours above the average. R ·69 in. below the average. Underground water level exceptionally low.

LLANFRECHFA GRANGE.—Mild till 22nd, when sharp frost set in for 2 days, and much thick fog in the latter part. Heavy gale on the night of the 29th.

HAVERFORDWEST.—Wet, stormy and mild till 17th, after which a dry period set in with considerable fall in temp., and much fog and gloom. Sudden N.W. gale on the night of the 29th. Duration of sunshine 27·6* hours on 13 days.

DOUGLAS.—An open month, with many beautiful days. Some S fell on 7th. Gloomy from 19th to 27th, but no real fog. Gales on 6 days, that on 29th, occurring with high bar., being exceptionally severe.

SCOTLAND.

LANGHOLM.—R 1·07 in. below the average of 28 years. Several gales, the most severe being from N.W. on the night of the 29th.

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* Campbell-Stokes. † Jordan.

MAXWELTON HOUSE.—Very fine, with some high winds, but mostly quite calm or with light breezes. Farmers quite contented.

COUPAR ANGUS.—Mean temp. 35°·2, or practically the average of 25 years. Cold snap during the second week, the min. reaching 8° on 11th, but the duration of the cold weather was short, and it did not affect the mean much. R slightly below the average.

DRUMNADROCHIT.—R ·49 in. below, and rainy days 3 above, 18 years' average.

WATTEN.—The first half was stormy, with R and S; then ten days of fresh, open, calm and mild weather, and at the close stormy with heavy R and gale.

CASTLETOWN.—The first part was very wet, with S from 6th to 11th. The latter part was damp and overcast. Strong northerly gale on 30th.

IRELAND.

CORK.—R 1·69 in. below the average. Gales on 4th and 8th, and a storm on 16th and 17th. Prevailing winds S.E. and E. Dense fog on 2nd.

DARRYNANE.—Very mild, with some fine spring-like days. The last 10 days were foggy. R 73 per cent. of the average of 20 years.

WATERFORD.—A long spell of easterly winds at the end, and a good deal of fog. Mean temp. 43°·1.

MILTOWN MALBAY.—The first half was cold, with much R and H and some S, with squalls and boisterous winds. Mild and dry in the second half.

MARKREE OBSERVATORY.—On the whole exceptionally fine and mild, though the first part was rather wet.

BELFAST.—Frost in the first half, followed by very dull foggy weather. The finest December since 1890.

OMAGH.—Rainy and unsetiled up to 19th. Remainder mild, stagnant and hazy with but little rain except on the last three days.

THE TWELVE MONTHS' RAINFALL OF 1904.

Aggregate Rainfall for January—December, 1904. (*See* p. 221.)

Stations.	Total Rain.	Per cent. of Aver.	Stations.	Total Rain.	Per cent. of Aver.	Stations.	Total Rain.	Per cent. of Aver.
	in.			in.			in.	
London	20·65	91	Arncliffe	56·31	91	Braemar	25·00	72
Tenterden	25·22	96	Hull	21·25	85	Aberdeen	26·13	82
Hartley Wintney	23·88	95	Newcastle.....	23·43	90	Cawdor	22·68	75
Hitchin	21·65	93	Seathwaite ...	130·04	97	Glencarron ...	89·55	95
Winslow	22·36	94	Cardiff	43·26	109	Dunrobin	27·56	89
Westley	20·69	82	Haverfordwest	42·96	99	Killarney ...	51·12	93
Brundall.....	21·50	86	Gogerddan ...	44·83	100	Waterford ...	41·12	107
Alderbury	27·53	100	Llandudno ...	25·98	85	Broadford.....	38·74	116
Ashburton	50·26	101	Dumfries	38·91	89	Carlow	32·06	95
Polapit Tamar ...	43·35	118	Lilliesleaf	27·75	92	Dublin	22·19	81
Stroud	26·79	100	Colmonell	43·22	99	Mullingar.....	33·90	107
Woolstaston	26·66	92	Glasgow	34·65	95	Ballinasloe ...	39·27	107
Boston	20·32	101	Inveraray	70·65	98	Clifden	..	...
Hesley Hall	19·37	91	Islay	51·73	111	Crossmolina ...	59·72	114
Derby.....	19·91	88	Mull	57·95	103	Seaforde	33·97	94
Bolton	34·74	84	Loch Leven ...	31·88	89	Londonderry..	41·74	101
Wetherby	25·61	108	Dundee	24·70	90	Omagh	42·89	108

Climatological Table for the British Empire, July, 1904.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	88·9	17	49·7	4	77·7	56·4	57·9	76	133·2	45·2	2·41	10	5·0
Malta	...	...	...	...	...	...	...	...	...	...	...	...	...
Cape Town	81·2	31	36·9	21	64·3	48·9	49·6	79	...	...	2·47	9	4·6
Durban, Natal	80·3	14	49·3	23	74·0	54·5	...	...	127·3	...	1·89	7	2·0
Johannesburg	67·0	10	34·0	26	60·2	42·4	31·4	50	...	28·5	·02	1	6·0
Mauritius	76·2	22	51·3	30	74·1	59·4	59·0	77	138·6	43·4	2·09	18	5·2
Calcutta	93·2	12	75·0	7	87·1	78·3	77·1	87	153·8	73·9	20·62	17	8·7
Bombay	87·3	1	75·3	5	85·4	78·1	76·4	83	134·2	74·0	10·14	25	8·5
Madras	101·0	7	73·3	25	96·0	77·9	70·9	67	144·6	72·0	6·18	18	6·5
Kodaikanal	65·6	27	49·6	19*a*	61·7	51·7	51·0	84	146·2	45·2	4·27	21	2·4
Colombo, Ceylon	85·2	24	71·8	5	83·6	76·2	72·9	83	146·0	70·0	8·94	19	8·1
Hongkong	90·0	29	74·2	2	85·9	77·9	75·2	82	149·6	...	7·23	17	7·6
Melbourne	64·4	23	31·5	23	63·1	31·5	42·8	83	117·8	26·6	1·57	12	6·4
Adelaide	62·6	25	36·9	29	58·1	44·8	44·9	81	120·3	30·8	2·73	15	5·8
Coolgardie	67·2	4	32·0	14	58·6	41·2	40·4	70	136·9	23·5	1·90	8	5·8
Sydney	67·7	14	40·7	19	58·2	47·6	44·1	82	99·0	32·9	11·06	21	5·9
Wellington	57·9	20	32·0	3	51·7	41·5	40·6	79	97·0	29·0	4·29	15	7·6
Auckland	61·0	11	37·0	23	56·7	49·9	44·9	80	115·0	33·0	2·24	11	5·0
Jamaica, Negril Point	89·9	8	69·7	25	86·7	72·2	72·7	77	...	...	6·91	9	...
Trinidad	...	...	...	...	...	...	...	...	...	...	...	..	...
Grenada	85·8	25	68·8	11	82·0	74·3	70·1	75	147·2	...	8·71	28	4·5
Toronto	92·0	18	48·1	3	76·4	58·2	59·2	76	121·7	41·5	5·13	11	5·2
Fredericton	86·1	20	45·0	4	79·2	56·5	60·3	61	...	...	1·48	7	6·2
Winnipeg	85·2	16	42·5	1	74·4	52·2	...	...	...	...	5·55	15	5·0
Victoria, B.C.	82·3	21	49·0	14	68·9	52·7	...	...	...	...	·48	5	3·8
Dawson	75·0	18	39·0	25	69·0	46·2	...	...	...	...	2·14	10	5·1

a and 26.

Mauritius.—Mean temp. of air 1°·2, dew point 0°·4, and rainfall ·11 in., below averages. Mean hourly velocity of wind 9·8 miles, or 2·1 miles below average.

MADRAS.—Bright sunshine 136·7 hours, or 34·6 per cent. of possible. TS on 5 days.

KODAIKANAL.—Bright sunshine 116 hours.

COLOMBO.—Mean temp. of air 79°·2, or 1°·5 below, of dew point 0°·4 below, R 4·46 in. above, averages. Mean hourly velocity of wind 9·9 miles; prevailing direction S.W.

HONGKONG.—Mean temp. of air 81°·1. Sunshine 147·4 hours. Mean hourly velocity of wind 10·9 miles; direction S.S.W.

Adelaide.—Mean temp. of air 51°·4. R ·19 in. above average.

Sydney.—Mean temp. of air 0°·6 above, R 6·31 in. above, and humidity 5·2 per cent. above, averages.

Wellington.—Mean temp. of air 1°·0 below, and R 1·57 in. below, averages.

Auckland.—Mean temp. of air close to average, and R less than half the average of previous 36 years.

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