

# Symons's Meteorological Magazine.

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## THE RAINFALL OF THE SUMMER HALF YEAR, 1906.

THE summer of 1906 will be remembered for the great duration of sunshine, the moderate and in many places seriously deficient rainfall, and the remarkable period of great heat at the end of August and beginning of September. September was on this occasion undoubtedly a continuation of summer, and at its close it is appropriate to look back at the weather of the past half year viewed as a whole. To do so for the whole range of meteorological phenomena is at the moment impracticable, and we must content ourselves with one of the elements—rainfall.

Detailed Tables have been published in these pages every month, from which it is easy to see how the rainfall varies from place to place, and in what relation it stands to the average. Though the number of stations utilized is only 52, they are so well distributed that when meaned in groups they afford something more than an indication, if something less than an absolute measure, of the general fall for the larger regions of the British Isles. Derived from the published figures the general rainfall of the six months of the summer half year appears as follows, in percentages of the average :—

1906.	April.	May.	June.	July.	August.	Sept.	Six months.
England and Wales.....	54	132	101	36	74	39	69
Scotland .....	90	209	49	83	117	52	97
Ireland .....	90	147	66	81	89	40	82
British Isles .....	71	154	81	57	88	42	79

This little table shows that of the six months, only one had rainfall above the average over the whole country, viz.—May. England and Wales had also technically more than the average in June, and Scotland in August. The driest month was September, when the rainfall for the British Isles as a whole was less than half the average amount, and in England did not much exceed one-third of the average. The rainfall of September did not approach the average

at any station we have to consider, and only in the extreme west and north of Scotland, and in the extreme south-east of England, did it substantially exceed half the average. The driest area was in the south-east of Scotland and in the north-east of England, in a strip of country bordering the east coast from the Forth to the Humber. It was very dry also along the estuary of the Severn, and the Tables at the end of this number show several instances of extremely small falls. During September absolute droughts occurred at several stations, where no rain fell after the 16th; but neither absolute droughts nor partial droughts in the technical sense were so common as in many periods of six months with a greater total rainfall.

Each month of the six was characterized by patches of country which were relatively dry, and by patches which were relatively wet. In June, Scotland as a whole was dry, Ireland less dry, and England and Wales wet; but in every other month of the six the deficiency of rainfall was greatest in the south and east, while there was usually an excess in the north and west. Thus it happens that on taking the average of the six months, there was a distinct excess of rainfall in the extreme north of Scotland, and also in the south-west of Scotland, and in the extreme north of England. All the remainder of the British Isles was dry, but the west and north of Ireland, and the greater part of Wales, and the north of England, had not much less than the average fall. A marked deficiency was apparent only in the south-east of Ireland, and in the Midlands and south of England.

The result of this arrangement is that the area seriously affected by the reduced rainfall was practically confined to the centre and south of England. The following Table gives the total rainfall for the six months at each of the stations for which an average is available, the difference from the average in inches, and the ratio of the actual fall to the average, expressed as 100. The extremes shown are at Cargen, near Dumfries, where there was an excess of 3·70 in., the total fall being 120 per cent. of the average, and Torquay, where there was a deficiency of 7·25 in., the total fall being only 52 per cent. of the average, or scarcely more than one-half. At Derby the deficiency was 7·03 in., and as it has normally a somewhat lower rainfall than Torquay, the actual fall was only 49 per cent. of the average. Both these extreme cases were, fortunately for the country, not typical of any large area. A prolonged deficiency of rainfall in any place is one of the most serious misfortunes which can befall it, despite the vulgar error that labels rainless weather "fine." Great distress was occasioned in some parts of England, chiefly in the south-east, pasture being dried up to such an extent that cattle in many cases had to be fed by hand, as in a hard winter, and the supply of milk was seriously curtailed. At Basildon, near Billericay, in Essex, the shortage of water led to a terrible tragedy, a man and his wife having trespassed on a neighbour's land to obtain water

*Rainfall of April—September, 1906.*

STATION.	COUNTY.	Total Rainfall.	Difference from average, 1870-1899.	Percentage of average, 1870-1899.
Camden Square .....	London .....	7.72	-4.89	61
Tenterden .....	Kent .....	7.40	-5.30	58
West Dean .....	Hampshire .....	7.64	-6.03	56
Hartley Wintney .....	" .....	7.40	-4.82	61
Hitchin .....	Hertfordshire .....	8.02	-4.43	64
Winslow (Addington) .....	Buckinghamshire .....	8.64	-4.92	64
Bury St. Edmunds (Westley) .....	Suffolk .....	8.15	-5.08	62
Brundall .....	Norfolk .....	10.13	-2.64	79
Winterbourne Steepleton .....	Dorset .....	10.48	-5.82	64
Torquay (Cary Green) .....	Devon .....	7.98	-7.25	52
Polapit Tamar [Launceston] .....	" .....	10.84	-5.24	67
Bath .....	Somerset .....	9.42	-5.71	62
Stroud (Uptfield) .....	Gloucestershire .....	8.18	-6.65	55
Church Stretton (Woolstaston) .....	Shropshire .....	9.70	-6.16	61
Bromsgrove (Stoke Reformatory) .....	Worcestershire .....	8.95	-3.88	70
Boston .....	Lincolnshire .....	7.77	-4.48	63
Worksop (Hodsock Priory) .....	Nottinghamshire .....	7.02	-5.92	54
Derby (Midland Railway) .....	Derbyshire .....	6.72	-7.03	49
Bolton (Queen's Park) .....	Lancashire .....	19.20	-1.48	93
Wetherby (Ribston Hall) .....	Yorkshire, W.R. .....	9.41	-4.58	67
Arncliffe Vicarage .....	" .....	21.98	-3.92	85
Hull (Pearson Park) .....	" E.R. .....	8.97	-4.53	66
Newcastle (Town Moor) .....	Northumberland .....	13.67	-45	97
Borrowdale (Seathwaite) .....	Cumberland .....	50.54	-3.32	94
Cardiff (Ely) .....	Glamorgan .....	14.41	-5.13	74
Haverfordwest (High Street) .....	Pembroke .....	18.17	-1.59	92
Aberystwyth (Gogerddan) .....	Cardigan .....	17.31	-3.52	83
Llandudno .....	Carnarvon .....	11.42	-2.64	81
Cargen [Dumfries] .....	Kirkcudbright .....	22.39	+3.70	120
Lilliesleaf (Riddell House) .....	Roxburgh .....	17.07	+1.15	107
Colmonell (Clachanton) .....	Ayr .....	15.77	-3.05	84
Glasgow (Queen's Park) .....	Renfrew .....	15.80	-1.52	91
Tighnabruach .....	Argyll .....	26.77	+1.92	108
Mull (Quinish) .....	" .....	21.13	-2.82	88
Dundee (Eastern Necropolis) .....	Forfar .....	13.65	-97	93
Braemar .....	Aberdeen .....	13.52	-3.38	80
Aberdeen (Cranford) .....	" .....	14.61	-1.18	93
Cawdor (Budgate) .....	Nairn .....	12.81	-2.37	84
Invergarry .....	E. Inverness .....	20.52	-94	96
Loch Torridon (Bendamph) .....	W. Ross .....	32.96	-2.83	92
Dunrobin Castle .....	Sutherland .....	16.00	+1.85	113
Killarney (District Asylum) .....	Kerry .....	17.35	-6.18	74
Waterford (Brook Lodge) .....	Waterford .....	12.30	-4.87	72
Broadford (Hurdlestown) .....	Clare .....	15.71	-74	95
Carlow (Browne's Hill) .....	Carlow .....	10.13	-6.21	62
Dublin (Fitz William Square) .....	Dublin .....	8.83	-4.86	64
Clifden (Kylemore House) .....	" .....	29.57	-5.88	83
Crossmolina (Enniscoe) .....	Mayo .....	20.08	-98	95
Seaforde .....	Down .....	14.73	-3.32	82
Londonderry (Creggan Res) .....	Londonderry .....	17.36	-1.54	92
Omagh (Edenfel) .....	Tyrone .....	17.67	-86	95

from a pond, when their own supply failed, were shot and killed, it is alleged, by the sons of the tenant of the farm, who had barely enough for his cattle.

From the beginning of the year the general rainfall for the nine months naturally shows a smaller deficiency than the six months considered above, because January was very wet everywhere. The approximate values for 1906 to the end of September are:—England and Wales 90 per cent. of the average, Ireland 92 per cent. of average, and Scotland 100 per cent. of average. It is obvious from these figures that it is too soon to say that 1906 is a dry year, for the three months to come may either increase or altogether wipe out the present deficiency.

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### THE METEOROLOGICAL OFFICE.

THE first Report of the Meteorological Committee for the year ending 31st March, 1906, has been published, and it contains a good deal that is new and interesting. The report occupies 40 pp., and the appendices fill about 100 pp. The Meteorological Committee it appears was appointed by a Treasury minute dated 20th May, 1905, and held five meetings during the year; but a decision as to the form of incorporation to be ultimately adopted was not arrived at, the arrangement being that pending the settlement of the question of permanent premises the property of the Office should be vested in trustees. Otherwise the new Committee has carried on the organisation of the Office generally on the lines followed by the old Meteorological Council; but various alterations, which we have noted from time to time, have been made, and others are foreshadowed.

Various economies have been effected by the abandonment of the Ben Nevis Observatories, the abolition of the paid Council, and by more favourable arrangements with the Admiralty, and out of the savings £500 per annum have been assigned to investigations in the upper atmosphere, the experiments being organized and controlled by Mr. Dines. The objects to be kept in view in this work are (1) the maintenance of a dépôt for the construction and testing of apparatus; (2) the investigation of the upper air over the British Isles by a series of simultaneous ascents with kites and unmanned balloons, at three stations if possible, on the days fixed for the international ascents; (3) the supply of apparatus for observations in the upper air for use at sea, and the instruction of the officers who may undertake such investigations.

The Committee has given attention to the question of collecting meteorological data from local authorities and private individuals, this being done not only to supply material for the official publications, but also to assist in forming a collection of meteorological data "for the purposes of scientific investigations, or the requirements of those interested in agriculture, sanitary science, or the

various industries which are affected by different conditions of weather."

Reference is made to the overlapping in the publication of monthly summaries by the various bodies concerned in collecting meteorological records in the British Isles. The Committee invited the Royal Meteorological Society and the Scottish Meteorological Society to send representatives to a Conference to endeavour to initiate a joint scheme for the collection and publication of results. One meeting of this Conference has been held and the Committee hopes that this will soon result in an agreement to the common advantage of all three institutions.

The report refers in guarded and diplomatic language to the difficulties and disabilities under which the Meteorological Office labours with regard to telegraphic service, but we who are untrammelled by the considerations which compel a public body to walk delicately in the presence of the Postmaster General, can say that the British public loses vastly more in the value of property damaged by storms—the warnings of which have been tied up and kept back by Post Office red tape—than it saves in preserving traditions of working which have grown dear to the official heart. The fishing interests in particular would do well in this matter to impress upon Parliament that the public is lord also of the Post Office. The humour of the situation is that the Post Office at present cheerfully receives and accepts payment for telegrams which it delivers after twelve, twenty-four, or even more hours; and we are told that "the representative of the Postmaster General, who went into this matter very carefully, was only able to suggest that the meteorological service should be fixed for such hours as to allow an adequate margin for the occasional pressure of ordinary business and other causes of telegraphic delay." Might he not have suggested with equal appropriateness that cyclonic storms approaching the British Isles should time their arrival so that the first indications of their proximity might be observed during the hours when it is convenient for telegraph operators to transmit and receive messages? A possible way of escape, which is not referred to in the Report, may ultimately be found through the telephone service, which curiously enough is not shut off like the telegraphs in most districts, at night or on Sundays.

A practical point of great importance is the question of the housing of the Meteorological Office. Negotiations are in progress for securing a new building on a site at South Kensington, belonging to the Government, or to the Commissioners for the Exhibition of 1851. The proximity of the University of London and the Museums is held, in the opinion of the Meteorological Committee, to outweigh the disadvantages of greater distance from "the lithographers, the city, and the docks," but the removal from Westminster, which has been a meteorological centre for many years, must cause inconvenience and regret to many other interests. There

is a tendency for the concentration of scientific as well as educational institutions in South Kensington, and the remoteness of the locality from the haunts of busy men will no doubt be counterbalanced by solid advantages.

The institution of monthly meteorological charts for the Indian Ocean and the Red Sea is announced, and a brief summary is given of the various scientific researches which have been promoted by the late Meteorological Council and the present Committee, researches all of them of great interest and likely to lead to practical results, and of a nature which certainly ought to be aided largely by public money.

The appendices contain correspondence with the Treasury on various points connected with the organization of the Meteorological Committee, and the work of the Meteorological Office, also lists of marine observers, and of observers at land stations, together with sundry other matters of routine. Space is saved, as compared with former reports, by the omission of the long list of additions to the Library, the more important of which are referred to in the body of the Report.

Altogether the record of the first year's work of the re-organized Office strikes us as extremely satisfactory, showing a spirit of progress, and a relaxation of the extreme formality which is so apt to impair the usefulness of public service.

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## RADIATION PHENOMENA IN SOUTH AFRICA.

By JAMES LYLE.

As the average height of the Orange River Colony is over 4000 ft., the surface practically bare, and the air excessively dry, all local phenomena dependent on radiation from the sun and from the ground must be striking, even if not novel. As your Magazine circulates throughout other parts of South Africa, where similar conditions prevail, a few notes on some such phenomena may interest some of your readers.

The sequence of the following phenomena is fairly constant, though relative intensities depend on the season of the year. As soon as the sun sets the temperature falls very rapidly, especially on the tops of the kopjes, which, as they are the remains of an old land surface, are often quite flat, with a slight dip. The cooled air flows down from them on to the present general surface of the land, by the same law as water flows. This is most noticeable when smoke is being produced on the top of the kopje. At Bloemfontein the military cantonments are on a kopje, and at sunset one can trace by the smoke a complete river system of cold air wending its way into the basin in which the city lies. Channel, tributaries, divides, are all distinctly marked. The hot air floats upward and in a few hours the air on the top of the kopje becomes several degrees

warmer than the air below. In consequence it is more comfortable to bivouac on a kopje than on the level. Young trees suffer more from frost in the valleys than on the kopjes. The transition is often quite marked, both vertically on ascending a kopje, and horizontally on passing through a river of cold air.

Recently it was my unfortunate experience to have to catch a train at 2.30 a.m., and to be roused again at sunrise. On looking to the west, towards a line of kopjes, I saw what on closer examination proved to be a mirage inverted. The text books give it another name but I think this is the best name for it. The kopjes were fully eight miles away and about 300 feet high. The light from them must have struck the base of the hot air which had risen the previous evening and being totally reflected gave us an inverted image of the kopjes, with the top of the kopje touching its own image. The phenomenon lasted about fifteen minutes.

By eight or nine o'clock when the sun has had time to heat the ground surface and the adjacent layer of air, often not so much as a foot in depth, we see the usual mirage where the images of kopjes and sky are seen under the real objects. On the field of Sannah's Post I have seen such a reflection of cattle only a few hundred yards distant. The reflecting layer seemed to be about the level of their knees as it was there that image and object touched. The movement of the hot air gave a quivering image such as one sees in pools whose surface is crossed by ripples. Later in the day, as this hot air gathers head, it bursts upward through the over-lying colder air in dust-whirls, rotating as accident decides, but always drifting up the slope of the heated land. The whirls vary in size from a few inches in diameter to a hundred feet, and in intensity from harmless spirals up to those which well merit the name of dust devils. They advance slowly at the rate of about six miles an hour as a maximum, but the speed of rotation is very great. Fifty or sixty miles an hour is quite common.

Near midday other ascending currents show themselves in the formation of Cumulus clouds, which, especially in summer, are a feature of the afternoons. As evening draws on the clouds settle down and disappear. This almost daily series of up and down currents seems by its rhythm to have a cumulative effect and at length to become unstable and to terminate in a violent afternoon squall of dust, thunder, lightning, rain and even hail.



## Correspondence.

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

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**PHOTOGRAPHIC SUNSHINE RECORDERS.**

I READ with concern the remarks on Photographic Sunshine Recorders which appear in your article, "Local Societies and Meteorology," on p. 142.

As I believe I am the originator of the photographic method, I may perhaps say that I think the remarks seem somewhat severe when applied to all photographic sunshine recorders.

The photographic method doubtless has defects, as also has the Campbell-Stokes burning method, but, I think, in all fairness both may claim to give faithful records of the duration of bright sunshine.

Referring more particularly to my own instrument, the official report of a comparison between it and the "Campbell-Stokes" recorder at the Kew Observatory in 1887 certified that, "after a month's trial, the results were practically identical, the difference between the two records being less than one per cent." These experiments were made when the "Jordan" recorder was first brought out, but since that date the instrument has been much improved, and the method of preparing the charts has likewise been modified so as to render them equally sensitive at all times and to ensure that only bright sunshine is recorded.

I may add that I have now no pecuniary interest in the instrument, the patent rights having long since lapsed.

JAMES B. JORDAN.

*"Hayfield," Hythe, Kent, October 4th, 1906.*

[We should be glad to have the opinions of our readers on the relative merits of the photographic and burning sunshine recorders. For our own part we feel that the action of the Meteorological Office in making the Campbell-Stokes instrument the standard for comparison between different stations renders it highly desirable that that form should be generally adopted. The ingenuity and simplicity of Mr. Jordan's recorder are beyond praise, and for comparing the sunshine of one day with another at the same station, so long as the sensitized paper retains its properties unimpaired no better instrument need be desired. The difficulty is that different supplies of the sensitized paper often differ in their degree of sensitiveness, so that the records vary in length for the same amount of sunshine. We are glad to learn that a method has been found for overcoming this difficulty, and suggest that a fresh series of comparisons between the Campbell-Stokes recorder and the Jordan recorder, furnished with cards prepared at different times and by different makers, should now be instituted.—ED. S.M.M.]



## UNBROKEN RUN OF DAYS WITH SUNSHINE.

As an illustration of the exceptional summer of 1906, I give below the longest continuous run of sunny days in the last nine summers at Slough, Bucks :—

1898	.....	53 days without a break.
1899	.....	70 „ „ „
1900	.....	64 „ „ „
1901	.....	105 „ „ „
1902	.....	34 „ „ „
1903	.....	71 „ „ „
1904	.....	80 „ „ „
1905	.....	60 „ „ „
1906	.....	119 „ „ „

RICHARD BENTLEY.

*Upton, Slough.*

[At Camden Square the number of consecutive days recording sunshine from June 16th to October 1st was 108.—ED. *S.M.M.*]

## THE DROUGHT.

IN case you think it worth publishing as a contrast to Mr. Horner's statistics of a remarkable drought in the south of England, I send you my rainfall return for the same three months in the same form :—

JUNE.	in	JULY.	in.	AUGUST.	in.
1 .....	·06	6 .....	·03	1 .....	·19
14 .....	·01	10 .....	·01	3 .....	·07
15 .....	·03	11 .....	·03	4 .....	·03
16 .....	·58	13 .....	·18	5 .....	·06
17 .....	·09	15 .....	·01	10 .....	·12
23 .....	·98	18 .....	·17	11 .....	·03
27 .....	·14	21 .....	·12	12 .....	·01
28 .....	1·40	22 .....	·02	13 .....	·02
		23 .....	·28	14 .....	·48
		26 .....	·20	15 .....	1·64
		28 .....	·47	16 .....	·28
				17 .....	·12
				20 .....	·01
				23 .....	·19
				24 .....	·67
				25 .....	·02
Totals	3·29		1·52		3·94
No. of days	8		11		16

Total for the 3 months, 8·75 in.

WALDEGRAVE.

*Chepton Priory, Bath, September 21st, 1906.*

### THE GREAT HEAT.

To compare with other readings that appear in the current number of your Magazine you may be interested in the following records of my thermometers here (they are Kew certificated).

		max.		min.
Aug. 31	.....	89·9	.....	58·0
Sept. 1	....	86·1	.....	56·8
„ 2	.....	88·9	.....	57·9
„ 3	.....	91·4	.....	59·0

I cannot help thinking the last maximum must constitute pretty well a record for this part of East Anglia where, however, my own observations have only covered 5 years; during this period my next highest reading was only 87·9 on August 4th, 1904. It is curious to observe that the heat did not culminate here until September 3rd, which was the hottest day. Generally, over England, this day seems to have been materially cooler than the preceding 3 days. Note also that the night minima were not excessively high.

*Rookwood, Copdock, Ipswich, 24th Sept., 1906.*

F. H. BLAND.

### A CONTRAST IN SUMMER RAIN.

I ENCLOSE the total rainfall registered here for the four hottest months of the year, also for comparison's sake, that of three years ago. The low summer rainfall following a dry spring (March, April and May only yielding 3·90 inches), has been rather severe on surface rooting trees and shrubs.

	1906		1903
	in.		in.
June	1·36	.....	6·36
July	1·03	.....	6·36
Aug.	·40	.....	3·64
Sept.	1·60	.....	2·19
	<hr/>		<hr/>
Totals	4·39		18·55

T. W. BACON.

*Ramsden Hall, Billericay, 1st October, 1906.*

### METEOROLOGICAL NEWS AND NOTES.

AN INTERNATIONAL POLAR CONGRESS was convened at Brussels by the Belgian Government in the beginning of September. Most of the countries of Europe (the United Kingdom, Austria-Hungary and Norway being the only prominent exceptions) were officially represented, and various resolutions were drawn up to favour the resumption of Arctic and Antarctic exploration. Meteorology, as one of the sciences which has most to learn from polar exploration, was well to the front. Prof. Rykatcheff of St. Petersburg, M. Angot of Paris, M. Lancaster and M. Lecoite of Brussels, Prof. E. Hermann of Hamburg, Dr. Meinardus of Berlin, Prof. Von der Stok of de Bilt, Dr. H. R. Mill of London (representing the Royal Meteorological Society), and Mr. R. C. Mossman of Edinburgh, were amongst the meteorologists present.

A SEVERE TYPHOON burst upon Hong Kong on September 18th, causing the loss of several ships and a great many lives as well as doing much damage on shore. It is stated that no warning of this storm was issued by the Hong Kong Observatory, and that the Governor has appointed a Committee to inquire into the matter. A telegraph agency announces that the typhoon had been foreseen at the Jesuit Observatory at Zi-ka-wei, and warnings were issued, though no warning was sent to Hong Kong "because for years the Hong Kong Observatory has refused to exchange warnings with the Jesuit Observatories at Shanghai and Manila." Rumours of such a state of affairs have been heard before, and it is to be hoped that the Governor's Committee of Inquiry will settle the matter definitely. It is difficult to understand any circumstances which could justify the suspension of a free exchange of observations and warnings, and we must hope that the statements which have been published are erroneous.

DR. G. C. SIMPSON Lecturer on Meteorology in the University of Manchester has been appointed, we learn from *The Times*, assistant to the Director of Observatories under the Indian Government. Dr. Simpson's work in the study of the upper air by means of kites in the North Sea will be remembered by our readers, and he has assisted in establishing the kite observations in Derbyshire now being conducted by the University of Manchester.

DR. H. R. MILL WILL LECTURE ON "RAIN," for the Gilchrist Trust, in the last week of November, at the following towns:—Alfreton, on November 26th; Mansfield, on the 27th; Mexborough, on the 28th; Denby Dale, on the 29th; and Glusburn, on the 30th. He hopes to meet a number of the rainfall observers in those neighbourhoods, and if time permits to inspect some of the rain gauges.

ELECTRICAL RESISTANCE THERMOMETERS for meteorological work are referred to in *Technical Thermometry*, the last catalogue of the Cambridge Scientific Instrument Company, and an interesting diagram is given showing the curve of an open-wound thermometer of this type connected with a Callandar recorder. This curve represents the fluctuations of air-temperature at Cambridge in the squall of February 8th, 1906, and indicates a drop of  $9^{\circ}$  in less than ten minutes.

A METEOROLOGICAL ADVERTISEMENT issued by a tradesman in Cape Colony takes the form of a calendar for 1906, the centre of which is occupied by a table of the monthly rainfall of the locality for the years of the 20th century, 1906 being left blank, to be filled up as the year proceeds. Above appears a statement of the average rainfall of the summer and of the winter months, and below "The time to buy ——'s pianos is winter or summer, wet or dry."

## REVIEWS.

*A First Report on the Relations between Climates and Crops. U.S. Department of Agriculture. Weather Bureau. By CLEVELAND ABBE. Washington: 1906. Size 9 x 6. Pp. 386. Price, \$1.50.*

THIS report is a summary of the results of the best experimentalists and observers upon agricultural physics and plant physiology so far as these results were published up to 1891, and presents a rapid review of the condition of our knowledge up to that year respecting the influence of climate upon wild and cultivated plants.

The author indicates that there are three methods generally recognised as advancing our knowledge of climatic influences upon vegetable life, viz., the physiological, experimental and statistical methods—the last the least satisfactory—and he has accordingly availed himself of a large number of data resulting from investigations carried out at the Botanical Institute, Würzburg, Germany, and at the agricultural experimental stations and biological laboratories in Europe and America, and from statistics compiled by the United States Department of Agriculture.

The results of investigations carried out with a view to determine the relations of special crops to special features of climate and other influences are quoted at length, together with those of experimental work in connection with the influence of low temperatures upon plant life. It appears that warm thaws act very injuriously upon many plants, including wheat, when they have been frozen at very low temperatures, whereas cold thaws effect little damage. The same applies to the germination of seeds.

Much space is given in the report to the results of phenological observations, and tables are reproduced giving for 889 species of plants studied by Karl Fritsch during the years 1857—1861, at the Botanical Garden, Vienna, the average dates for the appearance of flowers and ripened fruit and the thermal constants connected with the manifestation of these phases of plant life. The discussion by Angot of a system of phenological observations organized in 1880 by the Central Meteorological Bureau of France is also summarized. In his discussion Angot by laborious processes finds numbers showing the connection between the leafing and flowering of different species of plants with the mean daily temperatures, the mean daily maximum temperatures, and the sums of mean daily temperatures and maximum daily temperatures. The relationship, however, is not a simple one, and the numbers varied somewhat from year to year. Some species seem to be more dependent as regards their date of flowering, &c., upon the sums of mean daily temperature, others upon the sums of maximum daily temperatures reckoning from above a certain limit.

In the accumulation of data of this nature we take it that it is always the *average individuals* of each species that are selected for observation by phenologists, not the earliest ones. According to

Angot, for example, May 6th is the average date for the first appearance of leaves and flowers on the oak in the latest districts of the north of France; this is *about* the date for the south of England, but on the 30th of April in the south of England fully twenty-five per cent. of the oak trees in any given area are normally already leafing and flowering and a smaller percentage as early as the 20th, whilst as late as the 12th of May fully twenty-five per cent. remain with closed leaf and flower buds, and a smaller percentage are more backward still. We refer to this question as reports on phenological observations submitted to the public are not always clear as to what kind of individuals are selected for study. L.C.W.B.

*Memoirs of the Geological Survey. England and Wales. The Water Supply from underground sources of Lincolnshire, 1904.*

*Do. do. of Suffolk, 1906.*

*Do. do. of the East Riding of Yorkshire, 1906.*

London. Printed for H.M. Stationery Office by Wyman & Sons, and to be purchased from E. Stanford, London; John Menzies & Co., Edinburgh; Hodges, Figgis & Co., Dublin, or from any Agent for the sale of Ordnance Survey Maps.

FROM a meteorological point of view the chief interest of this new series of Water Supply Memoirs rests on the fact that each is accompanied by a map of the average annual rainfall of the district concerned. The maps, which were prepared by Dr. H. R. Mill from the data collected by the British Rainfall Organization, are published on the scale of 10 miles to an inch, and show the average rainfall for a period of 35 years from 1868 to 1902. There are not many records in any county which run unbroken through so long a period; but there are enough to enable the relative rainfall of each year to be deduced and thus furnish ratios by which the rainfall of short periods may be corrected to the long average. The counties in question exhibit no great range in rainfall, and it has been found possible to draw isohyets or lines of equal rainfall for successive intervals of  $2\frac{1}{2}$  inches. The relation to configuration is perfectly clear in all cases where observations exist, and where data are wanting it was possible to sketch the most probable distribution of rain by reference to the features of physical relief.

The following summaries may be placed on record as likely to be of general interest.

*Lincolnshire.*—Average general rainfall 25·25 in.

Zone. in.	Sq. miles.	Per cent. of Total Area.	General Rainfall of Zone. in.
Below 22·5	34	1·3	22·25
22·5 to 25·0	1409	53·6	24·0
25·0 „ 27·5	898	34·2	26·0
27·5 „ 30·0	236	9·0	28·5
Above 30·0	51	1·9	30·25
Total .....	2628	100·0	25·25

*Suffolk*.—Average general rainfall 24·50 in.

Zone. in.	Sq. miles.	Per cent. of Total Area.	General Rainfall of Zone. in.
Below 25·0	970	65·2	24·3
Above 25·0	518	34·8	25·3
Total .....	1488	100·0	24·5

*East Riding of Yorkshire*.—Average general rainfall 27·40 in.

Zone. in.	Sq. miles.	Per cent. of Total Area.	General Rainfall of Zone. in.
Below 25·0	305	25·7	24·5
25·0 to 27·5	395	33·3	26·2
27·5 „ 30·0	228	19·3	28·5
30·0 „ 32·5	183	15·5	31·1
Above 32·5	73	6·2	33·5
Total .....	1184	100·0	27·4

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*The Fernley Observatory, Southport. Report and Results of Observations for the year 1905.* By JOSEPH BAXENDALL, Meteorologist to the Southport Corporation. Southport: 1906. Size 10 × 7½. Pp. 30.

THIS report is a pattern which any town, desiring to establish a complete meteorological observatory, would do well to follow. The instruments are clearly described and the records carefully discussed. Special interest attaches to the underground temperatures which are measured at 1, 4, 10 and 20 ft. The annual mean of each of the four lay between 49°·4 and 49°·7. The minimum at 1 ft. and 4 ft. occurred in January, at 10 ft. in March and at 20 ft. in May; the maximum at 1 ft. and 4 ft. occurred in July, at 10 ft. in August and September, and at 20 ft. in October. The range of mean monthly temperature was 28°·8 at 1 ft., 20°·5 at 4 ft., 11°·2 at 10 ft., and 3°·3 at 20 ft. A valuable feature of the report is the series of tables giving the monthly means of the principal meteorological elements for each hour of the twenty-four. We congratulate Mr. Baxendell and the Corporation of Southport on a good report of an excellent year's work, the solid scientific value of which is assured by all the safeguards that could be applied.

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*The State of the Ice in the Arctic Seas, 1905.* Copenhagen, 1906. Size 12½ × 9½. Pp. xx.

THIS abstract from the annual report of the Danish Meteorological Institute records a unique achievement in Arctic navigation in the successful navigation of the North West Passage for the first time, by Captain Amundsen. The English of the bilingual report is hardly up to its usual standard this year, and might have been improved by revision.

*The National Physical Laboratory. Report of the Observatory Department for the year 1905.* Teddington : 1906. Size  $10\frac{1}{2} \times 7\frac{1}{2}$ . Pp. 44.

THE Report of the Observatory Department is issued separately this year as it "appeals to a different class of workers to that interested in the Engineering and Physics Department," and we welcome the change. The separate publication of the work of an observatory, a very large part of the work of which is the testing of Meteorological instruments, throws into relief the absence from the General Board of the National Physical Laboratory of any representative of any meteorological institution, or of any individual who is associated with meteorology. We have more than once had to refer to the contempt in which meteorology is held in this country by the bodies which control the nomination of such boards, and in particular to the tacit assumption that meteorology is an inferior branch of science. The subject is one on which we fear more must be said ; but not on this occasion.

The instruments tested in 1905 included 35 rain gauges, 54 rain measuring glasses, 3 sunshine recorders, 244 barometers, 3,626 meteorological thermometers and 44 solar radiation thermometers. The appendix to Dr. Chree's report includes tables of meteorological data including atmospheric electricity, and also of magnetic and seismological observations, the magnetic data referring to the observations at Falmouth and Valencia as well as to Kew.

*Gyroscopes and Cyclones.* By F. J. B. CORDEIRO. Reprinted from *American Journal of Mathematics*. Vol. 28. No. 3. [No place of publication or date.] Size  $12 \times 9\frac{1}{2}$ . Pp. 14.

IN this paper a cyclone is treated dynamically as a gyroscope, in other words as a rotating disc, moving on the surface of a rotating sphere. Some startling results follow, and the author suggests that moving cyclones tend to accelerate the Earth's rotation by the cumulative effect of their movement always in one direction, and that they may exercise a disturbing influence on the Earth's axis, accounting, in part at least, for the slight variations in latitude which have been detected by astronomers.

*Niederschlag, Abfluss und Verdunstung auf den Landflächen der Erde.* [Precipitation, Run-off and Evaporation on the land-surfaces of the Earth.] Von RICHARD FRITZSCHE. Halle : 1906. Size  $9\frac{1}{2} \times 6\frac{1}{2}$ . Pp. 56.

A THESIS written for the Doctors' degree in the University of Halle. It deals with data collected by a number of observers and contains references to a good deal of the literature of the subject, giving tables of the rainfall of the Earth's surface in all latitudes.

## TEMPERATURE FOR SEPTEMBER, 1906.

STATION.	COUNTY.	Lat. N.	Long. W. [° E.]	Height above Sea. ft.	TEMPERATURE.				No. of Nights ator below 32°	
					Max.		Min.		Shade.	Grass.
					°	Date.	°	Date.		
Camden Square.....	London .....	51 32	0 8	111	94.0	2	39.0	28	0	0
Tenterden.....	Kent .....	51 4	*0 41	190	92.0	2	41.5	26, 28	0	...
West Dean .....	Hampshire .....	51 3	1 38	137	87.0	1	29.0	28	4	11
Hartley Wintney .....	" .....	51 18	0 53	222	93.6	1	30.5	26†	5	7
Hitchin .....	Hertfordshire .....	51 57	0 17	238	92.0	1	35.0	26†	0	...
Winslow (Addington) .....	Buckinghamsh. ....	51 58	0 53	309	94.0	1, 2	32.0	26†	3	5
Bury St. Edmunds (Westley) ..	Suffolk .....	52 15	*0 40	226	93.5	3	38.0	29	0	...
Brundall .....	Norfolk .....	52 37	*1 26	66	93.0	3	34.4	27	0	1
Winterbourne Steepleton .....	Dorset .....	50 42	2 31	316	81.8	1	30.4	26	2	5
Torquay (Cary Green) .....	Devon .....	50 28	3 32	12	76.1	7	44.0	26	0	0
Polapit Tamar [Launceston] ..	" .....	50 40	4 22	315	81.4	1	28.8	26	1	4
Bath .....	Somerset .....	51 23	2 21	67	87.8	1	34.0	28	0	...
Stroud (U pfield) .....	Gloucestershire .....	51 44	2 13	226	86.0	1, 2	45.0	26	0	...
Church Stretton (Woolstaston) ..	Shropshire .....	52 35	2 48	800	86.5	1	36.0	25, 26	0	...
Bromsgrove (Stoke Reformatory) ..	Worcestershire .....	52 19	2 4	225	90.0	1, 2	30.0	25, 27	4	...
Boston .....	Lincolnshire .....	52 58	0 1	25	89.0	1, 2, 3	36.0	28, 29	0	...
Workshop (Hodsock Priory) ..	Nottinghamshire .....	53 22	1 5	56	93.0	1, 2	30.5	28	1	11
Derby (Midland Railway) ..	Derbyshire .....	52 55	1 28	156	94.0	2	31.0	27	1	...
Bolton (Queen's Park) .....	Lancashire .....	53 35	2 28	390	87.6	2	39.1	28	0	1
Wetherby (Ribston Hall) ..	Yorkshire, W. R. ....	53 59	1 24	130	...	...	...	...	...	...
Arncliffe Vicarage .....	" .....	54 8	2 6	732	...	...	...	...	...	...
Hull (Pearson Park) .....	" E. R. ....	53 45	0 20	6	87.0	1	36.0	29	0	4
Newcastle (Town Moor) ..	Northumberland .....	54 59	1 38	201	...	...	...	...	...	...
Borrowdale (Seathwaite) ..	Cumberland .....	54 30	3 10	423	88.0	1	37.1	29	0	...
Cardiff (Ely) .....	Glamorgan .....	51 29	3 13	53	...	...	...	...	...	...
Haverfordwest (High Street) ..	Pembroke .....	51 48	4 58	95	78.6	1	33.3	26	0	1
Aberystwyth (Gogerddan) ..	Cardigan .....	52 26	4 1	83	86.0	1	31.0	25	...	...
Llandudno .....	Carnarvon .....	53 20	3 50	72	87.0	1	44.0	23	0	...
Cargen [Dumfries] .....	Kirkcudbright .....	55 2	3 37	80	86.0	1	32.0	29	1	...
Lilliesleaf (Riddell House) ..	Roxburgh .....	55 31	2 46	550	86.0	1	30.0	23	4	7
Edinburgh (Royal Observatory) ..	Midlothian .....	55 55	3 11	442	85.3	1, 2	38.1	24	0	0
Colmonell (Clachanton) ..	Ayr .....	55 8	4 54	140	84.0	1	31.0	28	2	...
Glasgow (Queen's Park) ..	Renfrew .....	55 53	4 18	144	82.0	2	36.0	30	0	7
Tighnabruach .....	Argyll .....	55 55	5 14	50	...	...	37.0	16, 28	0	...
Mull (Quinish) .....	" .....	56 36	6 13	35	82.0	2	...	...	...	...
Dundee (Eastern Necropolis) ..	Forfar .....	56 28	2 57	199	83.5	2	37.9	17	0	...
Braemar .....	Aberdeen .....	57 0	3 24	1114	...	...	...	...	...	...
Aberdeen (Cranford) .....	" .....	57 8	2 7	120	82.0	1	32.0	23†	3	...
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	73.0	2	38.5	25	0	...
Castletown .....	Caithness .....	58 35	3 23	100	83.0	2	34.0	23, 25	0	1
Killarney (District Asylum) ..	Kerry .....	52 4	9 31	178	81.0	2	40.5	10	0	...
Waterford (Brook Lodge) ..	Waterford .....	52 15	7 7	104	74.0	6	34.0	26	0	...
Broadford (Hurdlestown) ..	Clare .....	52 48	8 38	167	72.0	1	40.0	15	0	...
Carlow (Browne's Hill) ..	Carlow .....	52 50	6 53	291	...	...	...	...	...	...
Dublin (Fitz William Square) ..	Dublin .....	53 21	6 14	54	77.8	2	41.0	26	0	0
Ballinasloe .....	Galway .....	53 20	8 15	160	...	...	...	...	...	...
Clifden (Kylemore House) ..	" .....	53 32	9 52	105	...	...	...	...	...	...
Crossmolina (Enniscoe) .....	Mayo .....	54 4	9 18	74	...	...	...	...	...	...
Seaforde .....	Down .....	54 19	5 50	180	72.0	1	37.0	27	0	1
Londonderry (Creggan Res.) ..	Londonderry .....	54 59	7 19	320	...	...	...	...	...	...
Omagh (Edenfel) .....	Tyrone .....	54 36	7 18	280	82.0	1	36.0	28	0	...



## RAINFALL FOR SEPTEMBER, 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. Date.		in.	in.			in.	
2.29	1.75	— .54	76	.81 4	8	17.74	14.71	— 3.03	83	25.16	Camden Square
2.62	1.70	— .92	65	.37 18	9	18.80	15.03	— 3.77	80	28.36	Tenterden
2.58	.79	— 1.79	31	.35 14	6	20.41	18.19	— 2.22	89	29.93	West Dean
2.38	.81	— 1.57	34	.27 14	9	18.44	15.19	— 3.25	82	27.10	Hartley Wintney
2.26	1.13	— 1.13	50	.39 14	10	17.33	15.02	— 2.31	87	24.66	Hitchin
2.38	1.06	— 1.32	45	.32 14	10	18.96	15.70	— 3.26	83	26.75	Addington
2.49	1.21	— 1.28	48	.41 13	9	18.12	16.30	— 1.82	90	25.39	Westley
2.57	1.25	— 1.32	49	.39 16	10	17.58	18.81	+ 1.23	107	25.40	Brundall
3.40	1.74	— 1.66	51	.59 14	6	25.72	25.08	— .64	98	39.00	Winterbourne Stpltn
3.05	.95	— 2.10	31	.60 14	6	23.74	19.00	— 4.74	80	35.00	Torquay
3.63	1.14	— 2.49	31	.43 14	7	25.20	25.66	+ .46	102	38.85	Polapit Tamar
2.89	.76	— 2.13	26	.23 14	6	21.71	17.46	— 4.25	80	30.75	Bath
2.72	.65	— 2.07	24	.25 14	6	21.28	16.23	— 5.05	76	29.85	Stroud
2.74	.91	— 1.83	33	.44 14	6	22.95	17.91	— 5.04	78	33.04	Woolstaston
2.32	.95	— 1.37	41	.24 14	5	17.73	14.82	— 2.91	84	24.50	Bromsgrove
2.30	.87	— 1.43	38	.35 14	9	16.75	14.43	— 2.32	86	23.30	Boston
2.18	.97	— 1.21	45	.32 14	6	17.81	13.17	— 4.64	74	24.70	Hodsock Priory
2.32	.96	— 1.36	41	.37 14	6	18.85	14.08	— 4.77	75	26.18	Derby
4.38	2.30	— 2.08	53	.54 14	10	29.61	33.54	+ 3.93	113	42.43	Bolton
2.53	.58	— 1.95	23	.20 14	7	19.36	16.94	— 2.42	87	26.96	Ribston Hall
5.13	1.84	— 3.29	36	.73 5	9	42.00	44.00	+ 2.00	105	60.96	Arneliffe Vic.
2.40	.73	— 1.67	30	.43 14	9	18.95	14.83	— 4.12	78	27.02	Hull
2.36	.58	— 1.78	25	.28 13	8	19.76	18.38	— 1.38	93	27.99	Newcastle
12.76	4.39	— 8.37	35	1.51 5	10	90.72	89.19	— 1.53	98	132.68	Seathwaite
4.08	1.20	— 2.88	29	.56 14	9	29.31	29.22	— .09	100	42.81	Cardiff
4.21	1.29	— 2.92	31	.53 15	5	31.62	32.54	+ .92	103	47.88	Haverfordwest
4.20	1.55	— 2.65	37	.65 13	9	30.66	32.51	+ 1.85	106	45.41	Gogerddan
2.92	.71	— 2.21	24	.21 11	9	20.57	21.39	+ .82	104	30.98	Llandudno
3.71	1.08	— 2.63	29	.29 13	6	29.86	32.25	+ 2.39	108	43.43	Cargen
2.77	.59	— 2.18	21	.20 14	7	23.33	23.09	— .24	99	33.04	Riddell House
...	.55	...	...	.13 14	8	...	20.35	...	...	...	Edinburgh
4.08	1.26	— 2.82	31	.38 11	9	30.19	26.12	— 4.07	87	44.85	Colmonell
3.34	1.41	— 1.93	42	.44 11	9	25.43	26.94	+ 1.51	106	35.80	Glasgow
5.53	4.87	— .66	88	1.67 11	11	39.64	45.51	+ 5.87	115	57.90	Tighnabruaich
5.47	4.44	— 1.03	81	.86 5	11	38.53	35.27	— 3.26	92	57.53	Quinish
2.55	1.05	— 1.50	41	.25 11, 13	11	20.75	17.45	— 3.29	84	28.95	Dundee
3.27	1.50	— 1.77	46	...	...	24.93	22.98	— 1.95	92	36.07	Braemar
3.04	.85	— 2.19	28	.25 13	11	22.97	20.90	— 2.07	91	33.01	Aberdeen
3.01	1.38	— 1.63	46	.68 11	9	21.34	20.67	— .67	97	29.37	Cawdor
5.12	3.62	— 1.50	71	1.80 5	8	37.81	38.77	+ .96	103	56.00	Invergarry
8.28	3.02	— 5.26	36	2.20 5	7	57.69	62.68	+ 4.99	109	86.50	Bendamp
2.71	2.08	— .63	77	1.02 11	7	21.63	27.09	+ 5.46	125	31.60	Dunrobin Castle
...	2.43	...	...	.70 11	14	...	25.66	...	...	...	Castletown
4.67	1.09	— 3.58	23	.21 12, 16	9	39.57	30.69	— 8.88	78	58.11	Killarney
3.08	1.65	— 1.43	54	.52 2	7	27.08	22.66	— 4.42	84	39.30	Waterford
2.94	1.35	— 1.59	46	.32 14	11	23.79	26.20	+ 2.41	110	33.47	Hurdlestown
2.80	.81	— 1.99	29	.31 2	8	24.36	19.17	— 5.19	79	34.44	Carlow
2.15	.70	— 1.45	33	.20 11	7	19.68	16.12	— 3.56	82	27.75	Dublin
3.17	...	...	...	...	...	26.36	...	...	...	37.04	Ballinasloe
6.72	3.31	— 3.41	49	1.02 14	11	55.06	50.16	— 4.90	91	80.23	Kylemore House
4.12	1.56	— 2.56	38	.32 13	15	34.02	35.53	+ 1.51	104	50.50	Ennisceoe
3.37	.94	— 2.43	28	.55 11	11	27.21	22.72	— 4.49	83	38.61	Seaforde
3.77	1.49	— 2.28	40	.43 14	12	28.25	30.46	+ 2.21	108	41.20	Londonderry
3.55	1.94	— 1.61	55	.55 14	10	26.83	29.61	+ 2.78	110	37.85	Omagh

## SUPPLEMENTARY RAINFALL, SEPTEMBER, 1906.

Div.	STATION.	Rain. inches	Div.	STATION.	Rain. inches
II.	Abinger Hall .....	1·85	XI.	Rhayader, Tyrmynydd .....	1·42
„	Ramsgate, West Cliff Villas .....	1·95	„	Lake Vyrnwy .....	1·28
„	Hailsham .....	1·36	„	Llangyhanfal, Plâs Draw....	·80
„	Crowborough, Uckfield Lodge .....	1·90	„	Criccieth, Talarvor.....	1·14
„	Osborne, Newbarn Cottage. ....	1·31	„	Llanberis, Pen-y-pass .....	3·20
„	Emsworth, Redlands.....	1·57	„	Lligwy .....	1·20
„	Alton, Ashdell .....	1·29	„	Douglas, Woodville .....	1·62
„	Newbury, Welford Park ...	1·05	XII.	Stoneykirk, Ardwell House .....	1·19
III.	Harrow Weald, Hill House. ....	1·34	„	Dalry, The Old Garroch ...	1·50
„	Oxford, Magdalen College..	·85	„	Langholm, Drove Road.....	1·44
„	Bloxham Grove .....	·99	„	Moniaive, Maxwellton House .....	·88
„	Pitsford, Sedgebrook .....	·91	XIII.	N. Esk Reservoir [Penicuik] .....	1·20
„	Huntingdon, Brampton.....	1·02	XIV.	Maybole, Knockdon Farm..	1·44
„	Wisbech, Bank House .....	·90	XV.	Campbeltown, Witchburn...	2·29
IV.	Southend Water Works.....	1·69	„	Inveraray, Newtown .....	5·22
„	Colchester, Lexden.....	1·57	„	Ballachulish House.....	6·28
„	Newport, The Vicarage.....	1·22	„	Islay, Eallabus .....	2·29
„	Rendlesham .....	1·43	XVI.	Dollar Academy .....	2·77
„	Swaffham .....	1·31	„	Loch Leven Sluice .....	1·35
„	Blakeney .....	·94	„	Balquhiddier, Stronvar .....	...
V.	Bishops Cannings .....	1·24	„	Perth, Pitcullen House.....	1·42
„	Ashburton, Druid House .....	1·09	„	Coupar Angus Station .....	1·20
„	Okehampton, Oaklands.....	1·35	„	Blair Atholl.....	1·79
„	Hartland Abbey .....	1·11	„	Montrose, Sunnyside Asylum .....	1·12
„	Lynmouth, Rock House ...	1·36	XVII.	Alford, Lynturk Manse ...	1·59
„	Probus, Lamellyn .....	·84	„	Keith Station .....	1·67
„	Wellington, The Avenue ...	·62	XVIII.	N. Uist, Lochmaddy .....	2·97
„	North Cadbury Rectory ...	1·04	„	Alvey Manse .....	1·83
VI.	Clifton, Pembroke Road .....	·82	„	Loch Ness, Drumnadrochit. ....	1·36
„	Moreton-in-Marsh, Longboro' .....	1·23	„	Glencarron Lodge .....	5·30
„	Ross, The Graig .....	·68	„	Fearn, Lower Pitkerrie.....	1·51
„	Shifnal, Hatton Grange.....	1·21	XIX.	Invershin .....	1·43
„	Cheadle, The Heath House. ....	1·65	„	Altnaharra .....	2·17
„	Coventry, Kingswood .....	·97	„	Bettyhill .....	1·97
VII.	Market Overton .....	1·25	„	Watten Station .....	1·93
„	Market Rasen .....	1·00	XX.	Dunmanway, The Rectory..	·95
„	Bawtry, Hesley Hall.....	·87	„	Cork .....	·84
VIII.	Neston, Hinderton .....	1·23	„	Darrynane Abbey .....	1·62
„	Southport, Hesketh Park... ..	1·68	„	Glenam [Clonmel] .....	1·65
„	Chatburn, Middlewood .....	1·30	„	Ballingarry, Gurteen .....	1·47
„	Cartmel, Flookburgh .....	1·71	„	Miltown Malbay .....	1·87
IX.	Langsett Moor, Up. Midhope .....	1·16	XXI.	Gorey, Courtown House ...	·82
„	Scarborough, Scalby .....	1·07	„	Moynalty, Westland .....	1·32
„	Ingleby Greenhow .....	·67	„	Athlone, Twyford .....	1·28
„	Mickleton.....	·52	„	Mullingar, Belvedere.....	1·44
X.	Bardon Mill, Beltingham ...	1·10	XXII.	Woodlawn .....	1·64
„	Ewesley, Fallowlees .....	·90	„	Westport, Murrisk Abbey..	1·70
„	Ilderton, Lilburn Cottage..	·38	„	Collooney, Markree Obsy..	2·09
„	Keswick, York Bank.....	1·56	XXIII.	Enniskillen, Portora .....	2·10
XI.	Llanfrechfa Grange.....	1·22	„	Warrenpoint, Summer Hill. ....	·67
„	Treherbert, Tyn-y-waun ...	2·80	„	Banbridge, Milltown .....	·94
„	Carmarthen, The Friary.....	1·31	„	Belfast, Springfield .....	1·45
„	Castle Malgwyn [Lechryd].	·95	„	Bushmills, Dundarave .....	1·74
„	Plynlimon .....	3·70	„	Stewartstown, The Square..	1·43
„	Tall-y-llyn.....	1·00	„	Killybegs .....	3·27
„	New Radnor, Ednol .....	1·19	„	Horn Head ... ..	1·98

## METEOROLOGICAL NOTES ON SEPTEMBER, 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.—Opening with a burst of extraordinarily high temp., during which the shade max. twice exceeded the previous record during September, the month's weather continued on the whole fine and warm. The third week was more broken and rainy, but subsequently anti-cyclonic conditions again prevailed, with lower temp. Duration of sunshine 154.1\* hours, and R 21.4 hours. Mean temp.  $59^{\circ}8$ , or  $2^{\circ}1$  above the average.

CROWBOROUGH.—The first two days were exceedingly warm, the max. temp.,  $90^{\circ}9$ , on 2nd, being the highest since July 15th, 1881. The month on the whole was pleasant, with considerable brilliant sunshine. Mean temp.  $58^{\circ}7$ .

HARTLEY WINTNEY.—Another beautiful month, very hot and dry for the first fortnight. Slight showers in the third week and cooler in the fourth, with E. winds and slight fogs. The great drought still continues with severity.

TORQUAY.—Duration of sunshine 229.0\* hours, or 65.1 hours above the average. Mean temp.  $60^{\circ}4$ , or  $2^{\circ}2$  above the average. Mean ozone 4.3.

CLIFTON.—Very fine with a large amount of sunshine, and only 5 rain days. The first 10 days were very hot, but from 18th the temp. was moderate, with cool nights and N. and N.E. anti-cyclonic winds.

ROSS.—The three months July, August and September produced only 2.09 in. of R, or 1.78 in. less than the previous smallest amount since 1818.

BOLTON.—Very sunny and dry, most of the R recorded falling during the night. The 2nd, when the mean temp. was  $75^{\circ}2$ , was the hottest day ever recorded in Bolton. Duration of sunshine 110.7\* hours, or 22.1 hours above the average. Mean temp.  $55^{\circ}2$ , or  $1^{\circ}2$  above the average.

SOUTHPORT.—The sunniest September in 16 years, and the least cloudy in 36 years. Mean temp.  $57^{\circ}0$ , or  $1^{\circ}1$  above the average, both the daily and monthly range being very great. Duration of sunshine 188.2\* hours, or 45.8 hours above the average of 15 years. Duration of R 20.5 hours.

HAVERFORDWEST.—Fine and dry, with bright, warm weather throughout and small R. Duration of sunshine 222.0 hours. Crops good except potatoes.

DOUGLAS.—A beautiful month on the whole, perhaps the finest since these observations began. A week of not unwelcome R, though somewhat cold and stormy, till 18th, was succeeded by brilliantly fine, calm and warm weather. Gardens were superb and harvest well gathered.

DUMFRIES.—Exceptionally dry, the R having been less in 1894 and 1895 only during 47 years. The temp. was also very high being seldom exceeded during the same period. Harvest good, but potato disease was prevalent.

LILLIESLEAF.—R and number of rain days unprecedentedly small. There was most lovely weather for harvest.

CASTLETOWN.—The first two days were very warm, then damp and changeable to 15th. From 15th to the end was dry and sunny, with steady high bar. and light southerly winds. Corn cutting was general after 18th.

MILTOWN MALBAY.—Most of the month was fine, warm and sunny, making amends for the two previous months. Most of the harvest was well secured.

DUBLIN.—A fine, quiet and warm month, with unusual heat at the beginning. A remarkably persistent anti-cyclone from 16th to the 30th coincided with a rainless spell of 14 days, with cold and foggy nights. Mean temp.  $57^{\circ}1$ , or  $1^{\circ}2$  above the average. Aurora borealis on the night of 22nd.

BELFAST.—The driest September since 1895, but foggy weather was prevalent especially in the latter days. Crops doing exceedingly well.

OMAGH.—For the first fortnight there was considerable R, thereby endangering the cereal harvest, but from 15th to 30th none whatever fell. It is long indeed since such a continuous and brilliant spell of settled weather occurred and a harvest was gathered under such perfect conditions.

\* Campbell-Stokes.

## Climatological Table for the British Empire, April, 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, Camden Square	73·0	12	30·1	15b	58·4	36·8	38·5	73 <sup>0-100</sup>	113·8	21·9	·51	9	...
Malta.....	79·0	16	47·0	1	65·7	53·8	51·6	78	...	44·0	·56	6	4·7
Lagos.....	93·0	3	72·0	20c	88·3	77·9	74·6	71	144·0	62·0	4·00	14	6·1
Cape Town .....	87·8	29	46·0	7	71·2	54·1	53·3	72	...	...	2·02	7	3·4
Durban, Natal .....	84·0	16	54·0	7	78·3	61·9	...	...	143·3	...	3·66	14	4·0
Johannesburg .....	76·4	14	37·0	7	68·6	50·2	44·7	64	143·8	33·8	·83	6	1·7
Mauritius.....	87·9	10	61·5	15	83·5	68·6	66·7	75	151·0	51·3	·16	4	5·9
Calcutta.....	104·9	11	71·4	3	97·5	77·3	72·0	65	163·0	67·4	·03	1	5·8
Bombay.....	91·5	27	72·3	3	88·0	75·5	72·8	76	136·2	64·9	·00	0	0·5
Madras .....	101·5	20	71·8	12	94·8	78·1	76·4	78	144·5	67·5	·00	0	1·9
Kodaikanal .....	77·3	17	50·8	1	73·8	54·8	46·5	55	145·0	30·9	2·73	6	3·4
Colombo, Ceylon.....	92·5	21	74·8	3	90·4	78·2	74·9	77	153·8	72·5	6·72	14	4·4
Hongkong.....	81·1	9	60·2	1	72·5	66·1	65·6	88	132·2	...	9·79	19	8·9
Melbourne.....	84·2	9	40·3	20	68·5	52·8	48·4	67	137·9	33·0	1·36	8	7·2
Adelaide .....	87·0	9	49·7	1	72·8	56·3	51·8	66	143·3	41·8	·88	12	6·3
Coolgardie .....	101·0	7	39·8	22	81·9	54·3	44·7	43	160·0	32·2	·00	0	2·6
Sydney .....	88·0	18	51·9	25	75·8	59·6	51·9	64	121·7	41·1	·93	14	4·3
Wellington .....	65·2	7	39·0	3	59·8	49·9	46·6	73	115·0	35·0	2·54	13	4·7
Auckland .....	71·0	1	46·5	22	65·1	52·7	52·3	81	130·0	42·0	3·10	17	5·5
Jamaica, Negril Point..	86·2	9, 13	63·9	6	84·5	70·0	69·1	72	...	...	6·45	10	...
Trinidad .....	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada.....	87·8	13a	71·0	4	85·7	74·4	68·1	67	149·6	...	·46	8	3·2
Toronto.....	69·2	18	27·3	7	52·2	35·8	33·8	69	91·5	18·0	1·61	9	4·9
Fredericton .....	62·7	30	10·2	3	48·4	27·3	24·0	54	...	...	3·56	11	5·6
Winnipeg .....	80·8	25	17·5	4	60·3	33·7	...	...	...	...	1·64	5	4·7
Victoria, B.C. ....	70·7	29	32·6	13	59·8	42·1	...	...	...	...	·46	10	5·5
Dawson .....	...	...	...	...	...	...	...	...	...	...	...	...	...

a and 17. b and 20, 26. c and 30.

MALTA.—Mean temp. of air 58°·5, or 1°·1 below the average. Mean hourly velocity of wind 10·2 miles, or 1·0 below average. Mean temp. of sea 62°·1.

MAURITIUS.—Mean temp. of air 0°·2 above, dew point 2°·1, and R 4·80 in. below averages. Mean hourly velocity of wind 8·6 miles, or 1·9 below average.

MADRAS.—Bright sunshine 239·7 hours.

KODAIKANAL.—Bright sunshine 233 hours.

COLOMBO.—Mean temp. of air 84°·3, or 1°·7 above, of dew point 0°·4 above, and R 4·06 in. below, averages. Mean hourly velocity of wind 7·0 miles.

HONGKONG.—Mean temp. of air 69°·0. Bright sunshine 53·3 hours or 55·8 below the average, mean hourly velocity of wind 17·4 miles, and R 4·23 in. above averages.

ADELAIDE.—R ·99 in. below average.

SYDNEY.—Mean temp. of air 3°·0 above, and R 4·61 in. below, averages.

WELLINGTON.—Mean temp. of air 2°·1 below, and R 1·28 in. below, averages.

AUCKLAND.—Mean temp. of air and R very close to average of previous 38 years.