

SYMONS'S METEOROLOGICAL MAGAZINE.

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ON THE USE OF OUR RAINFALL TABLES.

NEWSPAPERS, both daily and weekly, frequently contain complaints of the lack of authoritative information as to rainfall; and sometimes the Meteorological Office is blamed most unjustly for neglecting to furnish information which it was not founded to supply, nor provided with the means of obtaining.

Rainfall by its very nature occupies a place apart from the other elements of climate. It is of greater practical importance to all who live on land than either wind or warmth, and it is in many ways more necessary to ascertain its average distribution in successive months and years than it is to follow the temperature of the seasons or the variations in the direction and force of the wind. There are two problems presented by rainfall which it is well to distinguish. One is the prediction of rain, depending on observations of pressure and temperature, and with this the Meteorological Office grapples very successfully as an incident in the general weather forecasts. The other problem is the distribution of rain over the country, and the relation of the actual fall to the average for various periods. This has been the special study of the British Rainfall Organization for more than forty years, thousands of voluntary workers giving their time ungrudgingly to the unending task, and the directors and their staff subjecting every return to critical examination before accepting it for publication. Some time necessarily elapses before the whole information collected for each year can appear in the annual volume of *British Rainfall*; but each monthly number of *Symons's Meteorological Magazine* contains a set of Tables embodying the figures for 156 selected stations, so distributed as to give a true picture of the state of the British Islands as regards rainfall in the previous month.

The general public unfortunately does not know of the existence of these tables, and to the general public tables afford distasteful reading. Still the facts can be presented better in tables than in any other way, except perhaps in maps, which we could not undertake to prepare in time for the prompt publication that is essential.

A few words as to the meaning and use of the tables may not be unwelcome to new readers. For 45 of the stations quoted in the first general table we have averages for the ten years 1890-99, as ex-

plained in Vol. 36, p. 16. The average value is not printed ; but the second column of the table gives the difference in inches of the actual fall of the month from the average, the sign + signifying that the actual fall is greater than the average, the sign — that the actual fall is less than the average. The meaning of a fall of 1.50 in. and a difference from the average of —1.50, for example, is that only half the average amount of rain for the month fell ; the meaning of a fall of 3.00 in. and a difference of + 1.50 in. is that twice the average amount of rain for the month fell.

On comparing the four monthly tables for the present year it will be seen that the — sign preponderates greatly in the column of difference from the average ; but to exhibit the actual condition of the country we give on p. 59 a new table of aggregate rainfall for the current year. It consists of 51 stations distributed as uniformly as possible over the country, including the 45 stations from the ordinary table for which averages are given, together with one station from that table for which an average has been computed, and five stations from the supplementary table for which averages are available. The first column shows the difference between the total amount of rain which has fallen at each station since January 1st, 1902, and the average of the same four months for ten years (an average which for Scotland and Ireland is practically the same as the true average ; but for the greater part of England is from 5 to 10 per cent. less), the — sign signifying a deficiency, the + sign an excess of rainfall. The second column gives the amount of the total rainfall for the four months expressed as percentage of the ten years' average for the same period. Thus for each station the average value is assumed to be 100 ; when there is a deficiency of rainfall the figure is less than 100, and when there is an excess it is greater than 100. A brief summary of the state of the whole country as regards rain, such as should be found useful by the farmer, horticulturist, and everyone dependent on a fluctuating water supply, is added in order to call attention to the most important circumstances.

Correspondence.

SOLAR HALOS IN MARCH AND APRIL.

To the Editor of Symons's Meteorological Magazine.

FROM March 28th to April 25th (29 days) I noted halos, here or about Ashdown Forest, on at least 16 days, namely 28th (+ mock suns), 31st (ditto), 2nd (+ upper tangential arc, concave, seen in London), 4th (+ mock suns), 7th, 8th, 14th, 16th to 22nd (daily), 24th and 25th. The number seems to me unusual even for this time of year.

J. EDMUND CLARK.

Lile Garth, Ashburton Road, Croydon, 3rd May, 1902.

THIS morning, about 9 o'clock, from the terrace of my garden, looking east, I observed a splendid halo round the sun. The upper half appeared iridescent, the lower half became lost in the haze which grew denser a few degrees above the physical horizon—which was formed by the hill which overlooks the city on the N.E.

Not having instruments at hand I was not able to make more than an approximate calculation of the dimensions of the circle, which cannot have been very far from 20° in radius. At the extremities of the horizontal diameter two intensely luminous images of the sun were observable, their light being decomposed into all the primary colours except blue. An appendage like the tail of a comet was seen attached to both the mock suns, on the sides opposite to the real sun. The phenomenon lasted about a quarter of an hour with varying intensity.

FRANCESCO PORRO.

Genoa, March 29th, 1902.

A NEW KITE FOR METEOROLOGICAL PURPOSES.

To the Editor of Symons's Meteorological Magazine.

SOME brief description of a modified form of the Hargreave kite, which I hope may be found suitable for raising meteorological instruments, will perhaps be of interest to your readers.

The kites used at Blue Hill seem to possess everything that can be desired in the way of stability and lifting power, but unfortunately they are tedious and expensive to make, and are not readily portable, and hence I have been trying various other forms in the hope of getting a cheap and portable kite, equally powerful and stable. So far as my limited experience goes the following form seems to meet

all requirements. The kite is of the cellular form, but the section of the cells is a rhombus (diamond-shaped) instead of a rectangle, the shorter diagonal being of the same length as each side (Fig. 1). Each kite has four longitudinal sticks of triangular section (Fig. 2), and 7 ft. 6 in. long. The two opposite sticks which lie at the ends of the shorter diagonal are connected by three cross pieces of the same material, and form the frame of the kite (Fig. 3), the ends of the cross pieces being carefully spliced to the sticks. This is accordingly the size to which the kite will fold up,

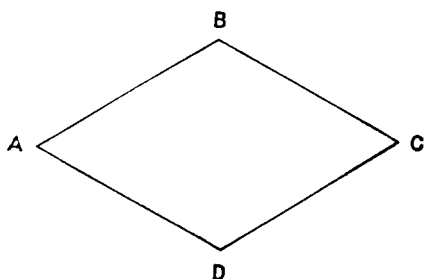


Fig. 1. SECTION OF KITE.
AB=BC=CD=DA=BD=3 ft. 6 in.

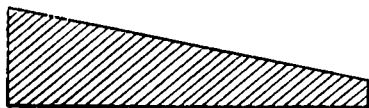


Fig. 2. SECTION OF STICK (actual size).

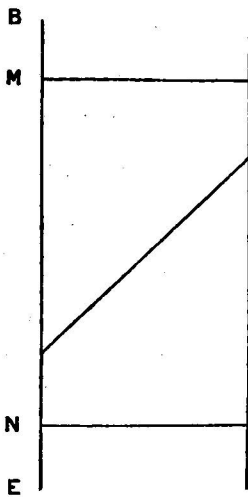


Fig. 3. FRAME OF THE KITE.
 BD=3ft. 6in. BM=NE=1ft.
 BE=7ft. 6in.

viz., 7 ft. 6 in. by 3 ft. 6 in. by 1 or 2 inches.

Two pieces of cloth are then prepared, both being 14 feet long, one 28 and the other 31 inches wide. (This difference of width is in accordance with Mr. Rotch's recommendation). The ends are sewn together, and a hem, inside which strong twine is placed, is run round each edge. The narrower of these pieces forms the upper, and the wider the lower cell of the kite. The pieces are now marked out by four lines drawn with a coloured pencil on the material, at equal distances of 3 ft. 6 in. apart, and the material is secured to the sticks along these lines. This is done by laying it over the sticks and placing on it a strip of thin wood, which is then nailed on with light brass tacks. To spread out the kite it is only

necessary to separate to the greatest possible extent the two loose longitudinal sticks. This is done by means of two bamboos. The bamboos when in place are secured by string to the cross pieces of the frame, over which they lie at right angles.

The bridle can now be secured, and the kite (Fig. 4) is ready for use, having taken, apart from the sewing, only a few hours to make. It should be added that the part of the front stick where the bridle is fastened is stiffened by splicing to it a piece of wood about 18 in. long, and also the edges of the cloth cells are kept apart midway between the sticks by light pieces of wood of about $\frac{3}{8}$ in. square

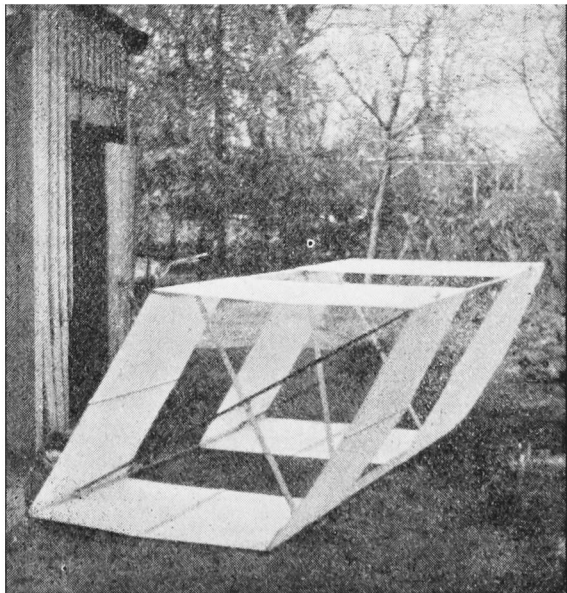


Fig. 4. RHOMBOIDAL KITE.
 section, and of lengths equal to the width of the cloth. The ends of these pieces slip into small pockets sewn on for the purpose.

A kite of the dimensions given above will weigh about $6\frac{1}{2}$ or 7-lbs. It will fly at an elevation of from 55° to 60° , and exert a pull of from 10 to 80-lbs. in a suitable breeze. It can be got up in a wind of from 8 to 10 miles per hour, but no opportunity of determining the greatest wind velocity at which it will fly has occurred as yet. Indeed the wind a few hundred feet high is, here at all events, very different to that prevailing at 50 feet, and without an anemometer attached to the kite it is impossible to estimate its velocity.

It may be mentioned incidentally that flying these kites at a height of 500 feet has shewn the existence of alternating upward and downward currents at that height, for a kite will fly at an elevation of 50° to 55° , and then without any change in the steadiness or pull on the wire fly at an angle of 70° , or even 75° , for some minutes, a change that can only be produced by the varying angle of the air motion.

The steadiness and angle of these kites is very dependent upon the arrangement of the bridle, and point of attachment of the line; $14\frac{1}{2}$ inches downwards from the top and 5 inches outwards in front of the stick seems to be the most suitable place, but this may be modified by subsequent trials.

W. H. DINES.

Oxshott, April 24th, 1902.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on April 16th, at the Institution of Civil Engineers, Great George Street, Westminster, Mr. W. H. Dines, B.A., President, in the chair.

The following gentlemen were elected Fellows: Mr. S. B. Apostoloff, Mr. H. Bourhill, Surgeon-Major C. L. Cunningham, Mr. C. H. Jolliffe, F.R.M.S., and Mr. J. H. Tripe, M.R.C.S.

This being the "popular" meeting of the session, Capt. D. Wilson-Barker, F.R.S.E., at the request of the Council, gave a lecture on "Clouds," illustrated by lantern slides.

After some remarks on the composition, height and weight of the atmosphere, the lecturer said that the tradition of cloud-lore has come to us from ancient times. We mentally associate it with eastern shepherds of old, tending their flocks, and anxiously scanning the heavens for good or bad weather portents. Many old doggrels are extant, such as—

"A red sky at night is the shepherd's delight,
A red sky in the morning is the shepherd's warning."

In all that concerns the practical application of cloud observation to the science of weather forecasting, we are but little ahead of those ancient shepherds. Our backwardness must no doubt be in part attributed to the impossibility of making collections of cloud specimens, and the consequent difficulty in arriving at a simple practical classification of clouds, analogous to those available in

geology, zoology, or botany. Cloud photography has, however, done much of late years to minimize this difficulty. If we cannot have actual specimens, we can get accurate representations of every form and variety of cloud; and by studying them we learn that in spite of their constantly varying aspects, there still exists in clouds a uniformity of nature sufficiently marked to guide us to a serviceable classification. Several classifications exist. The French naturalist, Lamarck, was probably the first to formulate one; but Luke Howard, a London merchant, about the year 1802 introduced the first practical classification, which is still in use by many observers.

Since the late Rev. W. Clement Ley drew attention to the value of cloud observations in weather forecasting, some progress has been made in different parts of the world in the art of measuring the height of clouds, and in noting their formation and character. The result of these studies has been most satisfactory, but we cannot be said, so far, to have more than skimmed the surface of a deep and complex subject.

Clouds are formed by two causes: (i.) the mixing of two masses of air of unequal temperature; and (ii.) through changes occurring in the atmosphere, where expansion and consequent loss of heat takes place, causing condensation of moisture.

Capt. Wilson-Barker said that a simple primary classification is best arrived at by a two-fold division of cloud types as follows:—

(1.) "Stratus," or sheet clouds.

(2.) "Cumulus," or heap clouds.

The former may be roughly considered the cloud of a settled, and the latter of an unsettled, state of the atmosphere.

The lecturer then showed by means of the lantern a large number of beautiful cloud pictures, taken by himself, illustrating certain varieties of both main types. Under "Stratus," or sheet clouds, he included fog, stratus, high stratus, cirro-cumulus, cirro-macula, cirrus, cirro-stratus, nimbus, and scud; and under "Cumulus," or heap clouds, he included the ordinary cumulus, the shower cumulus, the squall cumulus, pillar cumulus, and roll cumulus.

The lecturer concluded by referring to various optical phenomena associated with clouds, such as coronæ, halos, sun-pillars, rainbows, auroræ, and the colour of the sky.

On the motion of Dr. H. R. Mill, seconded by Mr. W. N. Shaw, F.R.S., a hearty vote of thanks was accorded to Capt. Wilson-Barker for his interesting and beautifully illustrated lecture.

METEOROLOGICAL NEWS AND NOTES.

THE TERRIBLE VOLCANIC ERUPTION which overwhelmed the town of St. Pierre, Martinique, in the West Indies on May 8th, may produce atmospheric effects similar to those which followed the explosion of Krakatoa in 1883. It would be well for rainfall

observers to be on the alert to notice any sediment resembling volcanic dust in their rain gauges. The transport of desert dust, in January last, from the latitude of Madeira to Wales, a distance exceeding 1,500 miles, over the sea, makes the transport of volcanic dust by the prevailing southwest winds for a distance of 4,000 miles appear by no means improbable.

THE PILOT CHARTS of the Meteorological Office have, from April onwards, introduced a new and important feature in the form of a small inset chart, showing the actual distribution of temperature in the surface water of the North Atlantic. Captain Campbell Hepworth published the temperatures for January in the Pilot Chart for April, and they continue to appear with the same promptitude. Remembering that the April chart is published on March 15th, and that the January returns cannot all reach the Meteorological Office before February 15th at the earliest, we see that no time is lost in placing the material before the public. The 2500 figures are combined so as to give the monthly mean for areas measuring 2° of lat. by 2° of long., and this value is printed on the map in bold type, while the difference from the average value for each square for the month in question is added in small type. A line on the chart separates the part of the sea surface which is above the average temperature from that which is below.

RAIN-MAKING SUPERSTITIONS are fairly numerous, but an Edinburgh evening paper of April 1st in an editorial on "Church Bells" creates a new one. "As for the ringing in the afternoon and evening," it says, "it is a mere disturbance of the air, and, as bad men have noticed, a kind of rain-maker, usefully intended, doubtless, to drive people within the shelter of the kirk."

REVIEWS.

Cape of Good Hope. Report of the Meteorological Commission for the year 1900. Cape Town: The Government Printers, 1901. Size 13×8 . Pp. xvi. + 196.

THE meteorology of Cape Colony in 1900 was carried on under exceptional difficulties on account of "the almost universal proclamation of martial law and the general call-to-arms consequent on the irruption of hostile bands into the Cape Colony, rendering it in some cases impossible to communicate with the observers." Hence the appearance of the volume and the fulness of the records it contains are extremely creditable to all concerned. In addition to the official returns, brief extracts are given of papers communicated to the South African Philosophical Society by Professor J. T. Morrison on periodical rainfall variations at the Cape of Good Hope since 1841; by Mr. T. Stewart on the rainfall of the Cape Peninsula; by Mr. J. R. Sutton on some temperature and pressure results for the great plateau of South Africa; and by Dr. Gilchrist on the currents in the sea round the Cape Peninsula.

Conference on Water Supply and River Pollution. Journal of the Sanitary Institute. January, 1902, pp. 453—569.

AT this conference, which was held in October, 1901, fifteen papers were discussed at a representative gathering of the public authorities concerned in the regulation of water supply and the care of public health in all parts of the country. The papers are published in full, with an abstract of the discussion. The subjects dealt with comprised rainfall, river-regulation, the protection and utilization of underground water supplies, river pollution, water purification, and the special problems of water supply in villages.

Versuch über die Hygrometrie. II. Heft. [Essay on Hygrometry, Part II.] Von HORACE BÉNÉDICTE DE SAUSSURE. Neuchâtel, 1783. Leipzig, W. Engelmann, 1900. Size 8 × 5. Pp. 170. Price 2m. 40.

THE German translation of H. B. de Saussure's famous Hygrometrical studies is No. 119 of the invaluable series of Ostwald's "Classics of the Exact Sciences," which brings to the hand of German students and men of science literal reprints or translations of the epoch-making scientific works of all ages. It gives one cause for thought to find this series offering, for a shilling or two, some of the greatest works of Clerk Maxwell, Faraday, Dalton and Sir Isaac Newton, which the English student could not procure in their original language for ten times the money.

Meteorological Observations at Stations of the Second Order for the Year 1898. Published by direction of the Meteorological Council. Edinburgh, 1901. Printed for His Majesty's Stationery Office. Size 12 × 10. Pp. xiv. + 184. Price 22s. 6d.

THE complete daily observations are printed for 21 selected stations, and the monthly values for 60 other stations, the whole number of 81 being made up as follows:—Scotland 25, England 44, Wales 3, and Ireland 9. The introductory statement explains very clearly everything which it is necessary to know in order to make use of the observations recorded in the volume. We trust that an effort will be made to publish succeeding annual volumes a little nearer the date to which they refer.

Jahrbuch des k.k. hydrographischen Central-Bureaus [Yearbook of the Imperial Austrian Hydrographic Office]. VII. Jahrgang, 1899. Vienna, 1901. Size 14½ × 10½. Fifteen separately-paged parts.

THIS immense report deals comprehensively with the rainfall, variations of water-level, and water-temperature of each of the great river systems of Austria. Its magnitude may be guessed at from the fact that it contains the daily values of rainfall at 1375 stations, and the monthly values of 1444 more, together with observations of water-level at 1271 stations. The mass of figures is accompanied by

explanatory maps on a large scale, numerous diagrams and discussions of the principal meteorological occurrences of the year, with special reference to floods. Although the data are published long after they have ceased to be of immediate interest to the public, it is to be remembered that they are utilized from day to day as they are collected for the purpose of issuing warnings of floods, a vital matter in a country where the bulk of the population lives on valley floors, or flat plains, watered by torrential rivers descending from snow-clad mountains.

Current Papers, No. 5. By H. C. RUSSELL, B.A., C.M.G., F.R.S.
(From "Journ. and Proc. Royal Society of N.S.W. Vol. 35.)
Size 9 x 6. Pp. 12. Charts.

MR. RUSSELL continues his important investigations of the oceanic currents of the Southern Hemisphere by the aid of floats, a research of importance to meteorology as well as to oceanography, if indeed the two sciences can be separated. This paper gives a very interesting chart showing the drift of the disabled steamer *Waikato*, in the "roaring forties," from June 5th, when she broke down off Cape Agulhas, to September 15th, 1899, when she was picked up in the longitude of Kerguelen. The rate of drift varied from 4 to 110 miles per day, and the total drift was 4450 miles, although the distance on a straight course was only 2000 miles.

Bathymetrical Survey of Grasmere Lake, by T. A. GREEN, Grasmere.
Ambleside, George Middleton, 1902. Scale (apparently) 25 inches to 1 mile. Price 3s.

WE welcome this extremely careful map of soundings made in Grasmere (which, by the way, it is tautology to call "Grasmere Lake"), and if we were disposed to be hypercritical the only fault we could point out is that the soundings are closer and more numerous than is necessary. We doubt whether any other lake has been so minutely surveyed, and the exact knowledge of its depths may some day be of advantage to engineers, while it will always be of scientific importance to physical geographers. To meteorologists lakes are perhaps most interesting as natural rain-gauges; but until the variations of their level and of the volume of their outflow are accurately and continuously recorded, they are from this point of view merely receivers without a measuring glass.

The State of the Ice in the Arctic Seas, 1901. Prepared by V. GARDE.
(From the Nautical Meteorological Annual of the Danish Meteorological Institute). Copenhagen, 1902. Size 12 x 9½. Pp. 24.

THIS important annual summary is printed in Danish and English, in parallel columns, and illustrated by six maps, representing the position and amount of ice in the Arctic seas for each month of the navigable season, April to September. The information is collected

by the Danish Meteorological Institute from explorers, whalers and other navigators of the polar seas, and while of primary importance to them it is none the less interesting to meteorologists, who are recognising more and more how closely air and sea are interrelated in the production of weather.

BOOKS RECEIVED.

- Nineteenth Report (Third Series) of the Committee on the Climate of Devon. [1900]. Edited by Alfred Chandler and W. Ingham, A.M.I.C.E. (Reprinted from *Trans. Devonshire Assoc.* 1901. Pp. 77-91). Size $1\frac{1}{2} \times 5\frac{1}{2}$. Pp. 16.
- Annual Report upon the Meteorology of Cheltenham [for 1901]. By Richard Tyrer, B.A., F.R.Met.Soc., Borough Meteorologist, Cheltenham, 1902. Size 10×6 . Pp. 8.
- Meteorological Report for the year 1901. Borough of Torquay, by Fredk. March, F.R.Met.Soc., Borough Meteorologist, Torquay. 1902. Size $8\frac{1}{2} \times 5\frac{1}{2}$. Pp. 20.
- Meteorology. Oxford Road, Redhill, Surrey. For the year 1901. By William Henry Tyndall, F.R.Met.Soc. 1902. Size $8\frac{1}{2} \times 5\frac{1}{2}$. Pp. 6.
- Observatoire St. Louis, Jersey (Iles de la Manche). Bulletin des Observations Magnétiques et Météorologiques. VIII^{me} Année 1901. Par Marc Dechevrens, S.J. Jersey, St. Hélier, 1901 [should be 1902]. Size $11 \times 8\frac{1}{2}$. Pp. 32.
- Results of Rain, River and Evaporation Observations made in New South Wales during 1899. With maps and diagrams. By H. C. Russell, B.A., C.M.G., F.R.S., Government Astronomer, Sydney, 1901. Size $9\frac{1}{2} \times 6$. Pp. lx. + 252.

Emilien Jean Renou.

VENDÔME, MARCH 8TH, 1815.

PARIS, APRIL 6TH, 1902.

FOR the last thirty years M. Renou had been the Director of the Meteorological Observatory at Parc St. Maur, in Paris, the observations of which are officially accepted as representing the climate of the French capital. M. Renou had a scientific education both in France and Germany. At first he devoted his attention mainly to geology; afterwards the fascination of African travel laid hold of him and he made two important journeys in Morocco. But for the last fifty years meteorology absorbed almost his whole attention. He was one of the founders of the French Meteorological Society in 1853, and frequently served it as Secretary and President, contributing also many papers to its annual publication. Possessing "the glorious privilege of being independent" he was able to bestow not only time but money on his travels and researches.

Precision in observation was a passion with him: as he expressed it in his presidential address in 1888:—"naturally disinclined to accept anything which was not proved, simply because it had always been, and having a natural antipathy to 'about,' I devoted all my care to the improvement of observations, and I have demonstrated that meteorology is capable of the same precision as other sciences." M. Renou's work on the Climate of Paris will stand as a monument which he reared to himself by patient observation and scientific discussion.

THE FOUR MONTHS' RAINFALL OF 1902.

Aggregate Rainfall for January—April, 1902.

Stations.	Diff. from aver.	Per cent. of aver.	Stations.	Diff. from aver.	Per cent. of aver.	Stations.	Diff. from aver.	Per cent. of aver.
	in.			in.			in.	
London	-1·91	69	Arnccliffe	-7·61	61	Aberdeen	-1·63	82
Tenterden	-2·82	61	Hull	-1·87	72	Cawdor	-2·14	73
Hartley Wintney	-2·28	66	Newcastle	-2·46	64	Strathconan	+1·31	108
Hitchin	-2·41	61	Seathwaite	-12·36	72	Glencarron	+1·01	104
Winslow	-2·29	63	Cardiff	-2·01	82	Dunrobin	-1·75	81
Westley	-1·10	83	Haverfordwest	-2·11	84	Darrynane	-5·30	67
Brundall	-1·98	69	Aberystwyth	-3·89	70	Waterford	-·37	97
Blandford	-2·26	78	Llandudno	-·04	100	Broadford	+1·17	112
Polapit Tamar	-1·26	88	Dumfries	-2·98	78	Carlow	-·20	98
Stroud	-2·37	69	Lilliesleaf	-2·00	77	Dublin	-·71	91
Woolstaston	-1·41	83	Colmonell	-1·05	92	Mullingar	-1·02	90
Worcester	-·19	97	Glasgow	-2·14	80	Ballinasloe	+·96	109
Boston	-1·04	80	Islay	-1·41	90	Clifden	-2·11	91
Hesley Hall	-·19	97	Mull	-·19	99	Crossmolina	-·08	100
Derby	+·11	102	Loch Leven	-4·32	59	Seaforde	+·35	103
Manchester .....	...	...	Dundee	-3·23	60	Londonderry	-2·34	80
Wetherby	-1·61	75	Braemar	-1·36	86	Omagh	+1·19	111

The above table shows that Ireland alone is in the happy position of having no cause of complaint regarding the rainfall of the first four months of 1902. There the extreme south-west is somewhat deficient, but over more than three-quarters of the island the fall has varied only from 10 per cent. less to 12 per cent. more than the average, as satisfactory a state of matters as the farmer could wish for.

Crossing the Irish Sea, we find a belt of central England from the north coast of Wales to the Trent in which the rainfall has just reached the average; but over all the rest of England there has been a deficiency. Over the greater part of Wales, Cornwall, and Devon the deficiency is less than 20 per cent., in other words more than four-fifths of the average supply has fallen. The south-eastern section has been much drier. Within a radius of fifty miles from London the fall has only exceeded 66 per cent. or two-thirds of the average at London itself, while at Hitchin on the north and Tenterden on the south-east the rainfall has only amounted to 61 per cent. of the average, in other words at these stations the seventeen weeks have only yielded the rain which ought, normally, to have fallen in ten weeks and a half. The whole of England north of the Humber and the Ribble has had less than three-quarters of its normal rainfall, and along the east coast the amount was probably less than two-thirds.

As far as the data enable us to judge, the east of Scotland is in even a worse case than the east of England, the lowest percentages being those of Loch Leven 59 and Dundee 60. On the other hand the western half of Scotland is, like Ireland, well provided for, and has enjoyed the ample fall to which its position entitles it.

APRIL, 1902.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which -01 or more fell.	TEMPERATURE.				No. of Nights below 32°.
		Total Fall.	Differ- ence from average 1890-9.	Greatest Fall in 24 hours.		Max.		Min.				
				Dpth	Date			Deg.	Date	Deg.	Date	
		inches.	inches.	in.								In shade. On grass.
I.	London (Camden Square) ...	·49	— 1·33	·13	5	10	69·5	19	29·7	7	1 11	
II.	Tenterden	·70	— 1·07	·25	22	10	66·0	24	29·0	7	2 14	
„	Hartley Wintuey	1·05	— ·59	·25	22	12	67·0	26	27·0	14d	7 18	
III.	Hitchin	·86	— ·66	·22	5	13	66·0	19	27·0	9	6...	
„	Winslow (Addington)	·94	— ·62	·31	15	11	67·0	19	28·0	14	9 11	
IV.	Bury St. Edmunds (Westley) ..	1·30	— ·23	·82	5	11	67·0	18	27·0	9	8...	
„	Norwich (Brundall)	1·31	...	·80	5	13	65·2	19	29·2	9	2 16	
V.	Winterborne Steepleton	2·43	...	·88	21	13	60·8	25	25·2	7	6 19	
„	Torquay	2·05	...	·84	22	13	59·1	30	34·4	13	0 8	
„	Polapit Tamar [Launceston]..	1·97	— ·19	·89	21	9	60·5	16	24·4	13	10 15	
VI.	Stroud (Upfield)	1·85	+ ·01	·84	15	11	64·0	21	32·0	6	1...	
„	Church Stretton (Woolstaston) ..	2·74	+ ·86	·70	23	12	63·5	25	28·0	11	10 16	
„	Worcester (Diglis Lock)	2·34	+ ·91	·89	15	10	...	...	...	...	...
VII.	Boston	1·32	— ·06	·70	5	11	68·0	25	28·0	8	6...	
„	Hesley Hall [Tickhill].....	1·96	+ ·62	·75	15	11	66·0	25	27·0	9, 10	9...	
„	Derby (Midland Railway).....	2·25	+ ·70	·99	15	10	65·0	25	26·0	13	6...	
VIII.	Manchester (Plymouth Grove) ..	...	...	...	...	...	...	...	...	...	...
IX.	Wetherby (Ribston Hall) ...	1·70	— ·04	·86	15	8	...	...	...	...	...
„	Skipton (Arnccliffe)	2·41	— ·95	·60	15	12	...	...	...	...	...
„	Hull (Pearson Park)	1·42	— ·17	·62	5	12	64·0	20	28·0	9	6 15	
X.	Newcastle (Town Moor)	1·40	— ·26	·53	15	11	...	...	...	...	...
„	Borrowdale (Seathwaite).....	6·38	+ ·04	1·62	22	14	62·0	25	29·1	8	4...	
XI.	Cardiff (Ely).....	2·26	+ ·08	·56	22	12	...	...	...	...	...
„	Haverfordwest	2·36	— ·06	1·25	21	12	57·7	25	30·4	12	4 18	
„	Aberystwith (Gogerddan) ...	1·09	— 1·48	·45	4	8	69·0	25	22·0	9,	17...	
„	Llandudno.....	2·02	+ ·24	·49	4	16	63·0	25	32·0	...	1...	
XII.	Cargen [Dumfries]	2·40	+ ·07	·73	22	10	64·0	25	26·0	8	7...	
XIII.	Edinburgh (Royal Observatory) ..	1·05	...	·24	15	14	58·4	20	29·9	4	1 12	
XIV.	Colmonell	1·94	— ·23	·68	22	11	65·0	3	25·0	6, 7	9...	
XV.	Tighnabruaich	1·95	...	·45	21	14	59·0	25	28·0	7	9...	
„	Mull (Quinish)	3·33	+ ·54	1·10	9	16	...	...	...	...	...
XVI.	Loch Leven Sluices	1·51	— ·48	·25	12a	12	...	...	...	...	...
„	Dundee (Eastern Necropolis) ..	1·65	+ ·11	·40	11	12	62·2	29	27·0	7	6...	
XVII.	Braemar	3·37	+ 1·28	·89	22	15	55·2	17	21·2	7	15 24	
„	Aberdeen (Cranford)	2·88	+ 1·04	·83	15	18	58·0	26	27·0	3, 6e	13...	
„	Cawdor (Budgate)	1·03	— ·54	·24	11	9	...	...	...	...	...
XVIII.	Strathconan [Beaully]	2·05	— 1·00	·75	6	4	...	...	...	...	...
„	Glencarron Lodge.....	3·30	— 1·36	·98	2	15	59·8	25	27·0	7	11...	
XIX.	Dunrobin	1·81	+ ·04	·45	12	11	58·0	2	28·0	7	10...	
„	S. Ronaldshay (Roeberry) ...	1·61	— ·31	·42	12	14	57·0	25	30·0	10	3...	
XX.	Darrynane Abbey.....	2·59	— ·91	·50	8	16	...	...	...	...	...
„	Waterford (Brook Lodge) ...	3·47	+ ·85	1·90	21	11	59·0	29b	29·0	6	5...	
„	Broadford (Hurdlestown) ..	2·00	+ ·08	·35	21	18	...	...	...	...	...
XXI.	Carlow (Browne's Hill)	2·73	+ ·44	·86	21	12	...	...	...	...	...
„	Dublin (Fitz William Square) ..	2·06	+ ·09	·60	4	16	61·7	24	33·0	10	0 7	
XXII.	Ballinasloe	3·12	+ ·83	·51	20	19	70·0	25c	25·0	6	11...	
„	Clifden (Kylemore)	3·85	— 1·42	1·55	21	14	...	...	...	...	...
XXIII.	Seaforde	3·36	+ ·93	·99	21	16	58·0	29	29·0	5	9 15	
„	Londonderry (Creggan Res.) ..	2·07	— ·39	·37	3, 22	18	...	...	...	...	...
„	Omagh (Edenfel)	3·48	+ 1·12	·56	21	17	62·0	25	25·0	11	7 17	

+ Shows that the fall was above the average ; — that it was below it.
a—and 23. b—and 30. c—and 26. d—and 15. e—and 10.

SUPPLEMENTARY TABLE OF RAINFALL,
 APRIL, 1902.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	·90	XI.	Castle Malgwyn	2·60
II.	Dorking, Abinger Hall.	1·20	„	Builth, Abergwesyn Vic.	2·75
„	Sheppey, Leysdown	·39	„	Rhayader, Nantgwillt...	2·48
„	Hailsham	·85	„	Lake Vyrnwy	1·49
„	Crowborough	1·28	„	Ruthin, Plás Dráw	1·88
„	Ryde, Beldornie Tower..	1·49	„	Criccieth, Talarvor	1·40
„	Emsworth, Redlands ...	1·02	„	I. of Anglesey, Lligwy..	·97
„	Alton, Ashdell	1·54	„	Douglas, Woodville.....	1·93
„	Newbury, Welford Park	1·53	XII.	Stoneykirk, Ardwell Ho.	1·82
III.	Oxford, Magdalen Coll..	1·23	„	Dalry, Old Garroch	3·28
„	Banbury, Bloxham	1·47	„	Moniaive, Maxwelton Ho.	2·91
„	Pitsford, Sedgebrook ...	1·33	„	Lilliesleaf, Riddell	1·86
„	Huntingdon, Bampton.	·97	XIII.	N. Esk Res. [Penicuik]	1·90
„	Wisbech, Bank House...	1·19	XIV.	Glasgow, Queen's Park..	·86
IV.	Southend	·27	XV.	Inveraray, Newtown ...	2·79
„	Colchester, Lexden	·60	„	Ballachulish, Ardsheal...	2·99
„	Saffron Waldon, Newport	·62	„	Islay, Eallabus	2·95
„	Rendlesham Hall	·76	XVI.	Dollar	1·39
„	Swaffham	1·06	„	Balquhider, Stronvar...	5·40
V.	Salisbury, Alderbury ...	1·83	„	Coupar Angus Station...	1·52
„	Bishop's Cannings	1·38	„	Blair Atholl	2·44
„	Blandford, Whatcombe .	2·23	„	Montrose, Sunnyside ...	2·38
„	Ashburton, Druid House	2·81	XVII.	Keith H.R.S.	2·07
„	Okehampton, Oaklands.	1·61	XVIII.	Fearn, Lower Pitkerrie..	·73
„	Hartland Abbey	1·63	„	S. Uist, Askernish	2·75
„	Lynmouth, Rock House	1·46	„	Invergarry	·80
„	Probus, Lamellyn	2·31	„	Aviemore, Alvie Manse.	1·30
„	Wellington, The Avenue	1·59	„	Loch Ness, Drumnadrochit	1·45
„	North Cadbury Rectory	1·90	XIX.	Invershin	1·92
VI.	Clifton, Pembroke Road	1·60	„	Bettyhill	·74
„	Ross, The Graig	2·32	„	Watten H.R.S.	1·28
„	Shifnal, Hatton Grange	2·02	XX.	Dunmanway, Coolkelure	5·15
„	Wem, Clive Vicarage ...	1·92	„	Cork, Wellesley Terrace	2·92
„	Cheadle, The Heath Ho.	1·77	„	Killarney, District Asyl.	2·19
„	Coventry, Priory Row ...	2·41	„	Caher, Duneske .....	...
VII.	Market Overton	1·36	„	Ballingarry, Hazelfort...	2·07
„	Grantham, Stainby	1·87	„	Miltown Malbay	1·69
„	Horncastle, Bucknall ...	...	XXI.	Gorey, Courtown House	2·84
„	Workshop, Hodsck Priory	2·27	„	Moynalty, Westland ...	2·75
VIII.	Neston, Hinderton	2·28	„	Athlone, Twyford	2·91
„	Southport, Hesketh Park	1·56	„	Mullingar, Belvedere ...	2·10
„	Chatburn, Middlewood.	1·50	XXII.	Woodlawn	2·58
„	Duddon Val., Seathwaite Vic.	3·55	„	Westport, Murrisk Abbey	2·72
IX.	Baldersby	1·59	„	Crossmolina, Enniscoe ..	2·76
„	Scalby, Silverdale	1·01	„	Collooney, Markree Obs.	2·90
„	Ingleby Greenhow Vic..	2·14	XXIII.	Enniskillen, Model Sch.	...
„	Middleton, Mickleton ...	1·57	„	Warrenpoint	2·77
X.	Beltingham	1·44	„	Banbridge, Miltown.....	2·64
„	Bamburgh	1·86	„	Belfast, Springfield	2·94
„	Keswick, The Bank .....	...	„	Bushmills, Dundarave..	1·82
XI.	Llanfrechfa Grange	2·40	„	Stewartstown	2·77
„	Treherbert, Tyn-y-waun	4·18	„	Killybegs	2·56
„	Llandovery	2·61	„	Horn Head	2·29

METEOROLOGICAL NOTES ON APRIL, 1902.

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.

LONDON, CAMDEN SQUARE.—Although one of the driest Aprils on record unsettled conditions prevailed generally, whilst northerly and easterly winds considerably retarded foliage. Mean temp. $47^{\circ}\cdot 2$ or $0^{\circ}\cdot 1$ above the average.

ABINGER HALL.—Rather dry but good for all garden and farm operations. Fruit prospects seemed favourable but the fierce gale of cold E. and N.E. winds on 26th did some damage. Cuckoo first heard on 13th and nightingale on 14th. First swallow seen on 26th.

TENTERDEN.—Dry, cold and windy till 11th, generally warmer from 12th to 25th, then cold E. winds again. Duration of sunshine 195 hours. Four months' R $4\cdot 33$ in., the least in 39 years.

CROWBOROUGH.—The first 12 days were unprecedentedly cold. Afterwards the weather was pleasant with several warm days. The last days were again cold with very keen E. winds up to 29th.

HARTLEY WINTNEY.—Dry and cold with slight frosts on many mornings and bitter N.E. and E. winds from 6th to 13th and 26th to 29th. Four months' R the smallest on record. Ozone on 10 days with a mean of $4\cdot 2$. Cuckoo heard on 12th.

PITSFORD, SEDGEBROOK.—The greater part of the month was very pleasant, but some days were very cold.

COLCHESTER, LEXDEN.—Cold winds from 5th to 14th and from 25th to 29th. Some warm days between. Sharp TS at 3 p.m. on 17th with large H.

BURY ST. EDMUNDS, WESTLEY.—Cold and dry. T on 5th and 17th.

BISHOPS CANNINGS.—R 40 in. and rainy days 2 below the average. Since January 1st R $2\cdot 68$ in. and rainy days 14 below the average.

TORQUAY, CARY GREEN.—R 37 in. below the average. Mean temp. $0^{\circ}\cdot 3$ below the average. Duration of sunshine $152\cdot 9$ hours with 3 sunless days. Mean amount of ozone $5\cdot 9$; max. $8\cdot 5$ on 18th with S.W. wind; min. $3\cdot 0$ on 27th with N.E. wind.

POLAPIT TAMAR [LAUNCESTON].—Dry and unseasonably cold.

WELLINGTON, THE AVENUE.—A period more in keeping with the proverbial March as regards winds, which were very violent at times both from southerly and northerly points.

NORTH CADBURY RECTORY.—An ungenial April after a very mild March. The driest and coldest for 6 years. Vegetation backward and ponds and springs very low.

ROSS, THE GRAIG.—R slightly above the average falling on 4 or 5 days only. There was much sunshine but many very cold days. The first half was very cold and this was more noticeable after the warm weather in March. Nevertheless vegetation made great progress and was not much behind the average at the close. TS on the afternoon of 20th.

SEATHWAITE VICARAGE.—A cold and ungenial month with small R and one fairly heavy S.

HULL, PEARSON PARK.—The early part was noticeable for cold E. and N.E. winds. Fogs were generally slight except on 15th and 17th which were dense.

BELTINGHAM.—Fine in early part but frost on 10 days out of the first 12. Then fine and warm till about 23rd when it became colder and frost occurred on one or two nights.

WALES AND THE ISLANDS.

LLANFRECHFA GRANGE.—Vegetation backward till the latter part. T and L to S.E. at 8.30 p.m. on 20th.

HAVERFORDWEST.—The first 17 days were bright and sunny but with cold winds and grass frosts. From 19th to 24th broken weather set in with strong S. winds. Spring flowers abundant. Chestnut trees in full leaf but foliage generally backward. Oak much in advance of the ash. Duration of sunshine 165·4 hours.

DOUGLAS, WOODVILLE.—Fine with slight excess of bright sunshine and R below the average. Temp. usually below the mean and Spring, which promised at the end of March to be early, hardly made much progress till after 15th. E. and N.E. winds of considerable force prevailed on 15 days reaching the force of a gale on 6. Fruit blossom unusually abundant.

SCOTLAND.

CARGEN [DUMFRIES].—Cold and unsettled. Vegetation much retarded by cold E. winds.

LILLIESLEAF, RIDDELL.—R, though little, is rather above the average. On May 1st larches and plane trees were slightly green and all other trees as leafless as in mid-winter.

COUPAR ANGUS.—The nights were cold and the days dry till 10th when there was a wet cold period of several days followed by an improvement of night temp. which started vegetation though frost checked it again on 28th.

DRUMNADROCHIT.—R for the first four months only 7·87 in., being the lowest since the record commenced in 1886, and 3·19 in. below the average of 16 years.

BETTYHILL.—Dry and somewhat cold in the early part; fine bright spring weather during the remainder.

WATTEN.—Dry, with cold easterly winds and many frosty nights. Vegetation backward.

IRELAND.

CORK, WELLESLEY TERRACE.—The coldest April for 19 years and probably for a longer period. Mean temp. 3°·6 below the average.

MILTOWN MALBAY.—Cold, ungenial and damp with little sunshine and no vegetation, winding up a spring during which, in this district, the soil never dried or became properly fit for the plough or harrow. H on 9 days, cubes of ice larger than marbles falling on 19th.

DUBLIN, FITZWILLIAM SQUARE.—The mean temp. 47°·1 only fell short of the average by 0°·6 but this was due to comparatively high day temp. Winds from polar quarters predominated. Fog occurred on 5 days. High winds on 12 days reaching the force of a gale on 3rd and 22nd. H on 3 days, S and sleet on one. On the afternoon of 28th a splendid display of solar halos and parhelia was seen.

COLLOONEY, MARKREE OBSERVATORY.—A very fine month on the whole; 211·9 hours of bright sunshine. H on 5 days.

OMAGH, EDENFEL.—Vegetation was backward and pastures as bare as in March. Tillage has however proceeded under favourable conditions and the corn brairds did not seem to have suffered much from the 17 nights of frost.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, NOVEMBER, 1901.

STATIONS. <i>(Those in italics are South of the Equator.)</i>	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
London, Camden Square	54·7	11	24·0	16	46·8	35·7	36·6	84	79·6	22·7	5·59	7	6·4
Malta.....	76·6	17	46·5	25	68·2	53·7	53·9	79	125·2	40·9	5·16	11	4·4
Lagos, W. Africa	93·1	6	73·1	3	87·6	81·3	75·2	76	145·0	69·0	4·10	3	5·0
Cape Town	94·8	14	50·1	21	73·6	56·6	54·8	66	...	...	2·24	6	4·8
Mauritius.....	87·2	14	63·1	4	82·9	67·4	64·0	70	153·6	55·7	5·06	13	6·0
Calcutta.....	90·3	1	56·9	30	81·8	65·0	63·4	72	145·2	50·7	2·87	4	3·7
Bombay.....	93·9	2	70·1	27	89·4	75·1	68·5	66	141·4	56·5	·00	0	1·6
Colombo, Ceylon	90·2	5	68·8	28	86·2	74·1	72·7	84	159·8	63·8	19·84	25	6·3
Melbourne.....	97·0	24	39·3	7	76·1	53·8	51·0	63	154·1	31·8	1·91	8	5·5
Adelaide	104·9	24	48·8	21	83·0	59·5	49·4	47	159·4	40·1	·87	8	4·7
Sydney	98·0	26	52·7	7	76·3	59·8	57·3	65	155·0	45·2	1·22	12	4·5
Auckland	70·0	24	43·0	11	64·1	52·6	44·7	60	142·0	40·0	1·44	11	5·4
Jamaica, Halfway Tree	88·0	7	66·0	18	85·1	70·1	68·8	79	...	...	1·40	4	4·0
Trinidad	91·0	16	68·0	22a	87·2	71·6	73·8	83	159·0	63·0	7·93	13	...
Grenada.....	85·4	23	72·4	9	83·5	74·8	72·7	77	150·2	...	10·26	22	3·7
Toronto	60·8	1	14·5	27	41·0	28·5	28·7	77	75·0	12·8	1·65	16	7·4
Fredericton, N.B.	64·7	1	4·6	24	39·9	23·7	24·0	66	...	...	2·71	10	6·8
Winnipeg, Manitoba ...	47·0	28	-6·0	22	32·7	12·5	...	...	...	...	·06	2	4·7
Victoria, B.C.	63·1	28	40·0	9	51·9	45·1	...	...	...	...	6·44	21	8·9
Dawson, Yukon	31·6	7	-36·6	19	9·9	-4·3	...	...	...	...	1·10	6	4·4

a—and 23.

REMARKS.

MALTA.—Mean temp. of air 61°·0, or 1°·3 below the average. Mean hourly velocity of wind 9·5 miles, or 0·2 above the average. Mean temp. of sea 68°·7. TSS on 2nd and 3rd. H on 2nd and 3rd. L on 1st and 28th. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·5 below, of dew point equal to and R 3·15 in. above, their respective averages. Mean hourly velocity of wind 9·8 miles, or 0·8 miles below the average; prevailing direction E. by N. to S.E. by E. Sun spots, none from 2nd to 13th, and from 26th to 30th. T. F. CLAXTON.

COLOMBO, CEYLON.—Mean temp. of air 79°·2 or 3°·1 below, of dew point 0°·5 above and R 7·29 in. above, their respective averages. Mean hourly velocity of wind 5·2 miles; prevailing direction S.W. and N.W. TSS on the 3rd, and L only was seen on the 8th. W. C. S. INGLES.

Adelaide.—Mean temp. of air 71°·2 (which has only once been higher in previous Novembers), was 4°·2 above the average. R under the average. C. TODD, F.R.S.

Sydney.—Mean temp. of air 2°·3 above, R 1·98 in. below, and humidity 3·3 below, their respective averages. H. C. RUSSELL, F.R.S.

Auckland.—Cool and dry, the mean temp. of air being 2° below the average of the previous 33 years, and R much less than one-half the average. T. F. CHEESEMAN.

TRINIDAD.—R 1·07 in. above the 30 years' average.

J. H. HART.