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THE FROST OF JANUARY AND FEBRUARY, 1917.

By L. C. W. BONACINA.

THE mild weather which commenced on December 28th, 1916 did not last very long, and by January 8th frost had definitely returned, and continued with increasing intensity till mid-February, the cold period having proved the most protracted severe frost over Europe as a whole since 1895.

During the second half of January the cold weather was of that pronounced easterly type, which, in the depth of winter, is usually indicative of intense cold on the Continent. But as regards the British Isles the cold in January, continuous though it was, could not be called severe—as judged by the standard of the climate—and in some recent winters decidedly lower minima over the country generally have occurred during spells of frost like that which characterized November, 1915, and intermittently the winter of 1908-1909. Nevertheless the stinging easterly wind from off the frozen continent was keenly felt, especially as it at times rose to gale force.

The amount of snow which fell during the month of January was in many parts of the United Kingdom very great, and it would appear that the Pennines suffered a repetition of March, 1916. The High Peak of Derbyshire, however, gets snowed up with such unfailing regularity every year that perhaps the highest tribute one can pay to the genius of its climate is pass over the recent occurrence with the comment “as usual.” More special meteorological interest attached to the very heavy snowfalls which took place in most parts of Ireland, especially in the south, showing the special liability of the moister parts of the kingdom to snow whenever there prevails a suitable degree of cold. Essex and other parts of south-eastern England had some deep falls at times, but London escaped deep falls, although the number of days on which snow fell, for the most part in small quantities, was abnormally large, amounting, in fact, to 20. In *The Times* of February 2nd it was stated that snow fell in London on 11 days only, but this probably referred to a measurable quantity of moisture in the rain gauge and not to the visible occurrence of snow. On many days the dry flakes fell in perfect crystals of diverse patterns, and the snow on reaching the ground would be blown about like dust.

A letter from Milan in the middle of January informed me of 6 inches of snow on the ground followed on the day of writing by a renewal of the snowstorm of such intensity as to suggest it would "never leave off." Exactly ! The climate of the North Italian plain does things thoroughly. It knows no half-measures.

As in 1895 the January frost proved to be the prelude to intense European cold in February, zero temperatures having occurred in the English Midlands, whilst a noteworthy feature of the present hard winter from December on has been the intensity of the cold throughout Ireland. London, as usual, had a relatively mild experience in consequence of its reservoirs of artificial heat ; but a fall of 3 inches of snow on Sunday, February 4th, was followed by night frosts of 10 or 12 degrees in the more open parts, and skating commenced even on the Serpentine.

In Devon and Cornwall the cold was intense, and Dartmoor again this season appears to have been entirely snowbound. The *Illustrated Western Weekly News* for February 17th contained numerous photographs of skating on the Rivers Tamar and Exe—the first occasion since 1895. At some places up the Thames Valley minus temperatures occurred. A minimum of -6° was reported from Market Harborough, in Leicestershire, and the following air minima are quoted from the long list of stations in the Weekly Weather Report for the very cold week, February 4th to 10th :—in England, -4° at Wallingford, Berks., $+4^{\circ}$ at Hereford and Buxton, 5° at Geldeston, Norfolk, and at Wisley, Surrey, 8° at Nottingham, 9° at Norwich, 10° at Lincoln, 12° at Cullompton, Devon, 13° at Durham, 14° at Stonyhurst, Lancashire, and at Kew, 15° at Hampstead ; in Wales, 4° at Rhayader, 10° at Bettws-y-Coed, 13° at Aberystwyth ; in Scotland, 2° at West Linton, 4° at Balmoral, 10° at Eskdalemuir and Fort Augustus, 14° at Nairn, 15° at Crieff ; in Ireland, 7° at Markree Castle, 9° at Kilkenny, 12° at Birr Castle.

Altogether the figures indicate that the distribution of extreme cold showed little relation to the distribution of mean winter isotherms, except, of course, in the case of an altogether exceptional region like the Scilly Isles, where the minimum was only 30° . The reading of -4° at Wallingford (36° of frost) is exceptional for England ; the Irish figures are also rather unusual ; but the reading of 12° at Cullompton is not especially remarkable for a part of Devonshire (the Tiverton district) which is subject to severe frost in winter.

The Scottish temperatures were not, on the whole, so low as the English, and it is noteworthy that Scotland, whose climate is so conspicuous for brief local spells of intense cold in ordinary winters, is often milder during periods of general cold than the south of England and neighbouring parts of the Continent where Arctic spells occur less often.

The frost gradually gave way after the middle of February, but

though the general temperature rose decidedly above the freezing point it took a long time for the thick coating of ice on lakes and ponds to disappear, the reason being that the air has been very stagnant becoming consequently so much chilled in contact with the ice that melting has been greatly retarded.

ROYAL METEOROLOGICAL SOCIETY.

AN ordinary meeting of the Society was held at 70, Victoria Street, S.W., on February 21st, Major H. G. Lyons, F.R.S., President, in the Chair.

Owing to an unforeseen delay the manuscripts and proofs of the papers had not been received from the printer, and in the absence of Mr. W. H. Dines his paper on "The Heat Balance of the Atmosphere" was taken as read. We have subsequently received a copy and are able to give the following synopsis :—

The paper traces as far as may be the history of the solar radiation from the time it reaches the outer limit of the atmosphere until it is radiated back into space, assigning from the data available limits to the amounts absorbed, transmitted and reflected by the air, and to the amounts mutually radiated between the earth, the air and outer space.

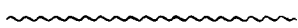
The following point is also of interest in connection with the solar radiation. Taking the temperature of the sun as 6200° A. the temperature of a "black" perfectly conducting sphere at the earth's distance should be 297° A. (75° F.) This requires the acceptance of the fourth power law, but not the value of the constant. The rotation of the earth and the convective effect of wind remove practically the condition of perfect conducting power, since they secure temperatures that do not differ by a large percentage from the mean, except for the comparatively small areas near the poles. The effect may be extended to a "grey" body, for if we suppose the earth's surface to consist of perfectly black and perfectly reflecting portions arranged in any small geometrical pattern, the reflecting parts will have no effect upon the temperature, but will take the temperature of 297° A. by conduction from the adjacent black parts, and the arrangement is equivalent to a "grey" surface. The effect may be extended to a small black or grey satellite revolving close to the earth in any plane that contains the sun, for the loss of solar radiation during the time of the sun's eclipse is just balanced by the earth's continual radiation. Under these circumstances the effective radiative temperature of the earth ought to be about 300° A. (81° F.), but is supposed to be about 255° A. (0° F.). Also the selective properties of the air are supposed to raise the mean temperature of the earth, the so-called greenhouse effect, in which case that temperature should be well over 300° A. (81° F.) instead of 288° A. (59° F.).

Mr. C. E. P. Brooks gave an account of his paper on "Continentality and Temperature." His summary is as follows :—

"The distribution of temperature over the surface of the earth is complex, being related to various factors, latitude, height, distance from the sea, etc. Further, since even smoothed isotherms reduced to sea-level often show very little relation to lines of latitude, it is evident that in some cases geographical conditions must exercise a predominant effect. This effect was investigated in the case of the distribution of temperature over Europe and Western Asia during January and July. Fifty-six representative stations were selected, and by the method of partial correlation regression equations were constructed, showing how the temperature of any place in the area may be built up from its height, its latitude, and the percentage of land in the area surrounding it. The function taken to represent latitude was the quantity of heat which would be received on a horizontal surface with a transmission coefficient of 0·7, on the shortest day and the longest day respectively (the last proviso allowed a lag of about three weeks in the thermal effect of the sun's radiation). That this gives a good measure of heat received is shown by the correlation coefficient of +·944 found between it and the temperature in January. From these regression equations the temperatures of the original stations were calculated, and over a range of 50° F. in January the average error was found to be about 4°; in July the error was much less. Finally the equations were applied to the altered geography of the early Neolithic period, and it was found that this entirely accounted for the altered climate of that period, and the various astronomical theories which have been brought in to explain it are quite unnecessary."

Sir Napier Shaw exhibited and described a number of extremely beautiful and instructive cloud-transparencies produced by Mr. G. A. Clarke, of Aberdeen. Of these, one of alto-cumulus lenticularis (ripple-cloud) was particularly worthy of mention, showing very well marked ripples in several directions.

The following were elected fellows of the Society :—Lieut. L. C. H. Cave, Major F. D. Scott Gethin, Lieut. S. A. M. Dobson, G. H. Kemp, Lt.-Col. M. O'Gorman, C.B., Com. G. Paine, C.B., M.V.O., Lieut. J. Forgan Potts, R.N.



Correspondence.

To the Editor of Symons's Meteorological Magazine.

WATER DROPS BELOW FREEZING POINT.

I AM much interested in Mr. Boys's description of the fog bow seen by him on November 28th, 1916.

The only bow which appears opposite the sun of the size of a rainbow and showing prismatic colours is a true rainbow formed by the *internal reflection of the sun's rays within a transparent sphere*. Mr. Boys speaks of the bow as being formed "upon a film of thin lofty cirrus," this is a strong support of the contention made in my paper on "Coronæ and Iridescent Clouds" * that cirrus clouds may be formed, under certain conditions, of drops of water and not of ice particles.

It may be contended that the cloud was not really cirrus; it is difficult, however, to imagine that such an experienced Observer as Mr. Boys cannot recognize cirrus cloud when he sees it. But even if he gave the cloud the wrong name we must allow him his adjective, "lofty." I have no means here of finding the temperature in England on the day in question, but I think I am justified in assuming that the temperature of a "lofty" cloud in England in November must have been below the freezing point. We can, therefore, at least say that Mr. Boys's observations prove that on November 28th, 1916, over England there was a cloud of water drops at a temperature below the freezing point.

The question of the possibility of water existing as spherical drops at very low temperatures is one of great importance in physics as well as in meteorology. The discussion on my paper referred to above showed that meteorologists had great difficulty in accepting the idea of liquid water at temperatures well below zero Fahrenheit, and Dr. Mill especially expressed the difficulties he experienced. I must admit that at the time, while I was absolutely convinced of the proof of the existence of transparent spheres of water, I was not satisfied with the explanation that these were supercooled water drops. During the last year or two I have become more familiar with the literature of colloidal chemistry, and it now appears to me that this branch of science is able to help us.

What is a cloud but a colloidal solution of water in air? It is also a solution in which the "disperse phase" may be either gas, liquid or crystal. Now the way in which crystalline colloid particles are formed has given much difficulty to physical-chemists. From observations made on sulphur in 1870 Vogelsang arrived at the conclusion that the small sphere is always the first stage in the formation of a crystal; this conclusion has been confirmed by

* Quar. Jour. Roy. Met. Soc., Vol. 38, No. 164, Oct., 1912.

Garnett in the case of gold, silver, and copper, and other workers have extended it to other substances. These minute spheres which ultimately develop into crystals are in an unstable state, but a state which, in favourable circumstances, might exist for a considerable time. Here, then, is the solution of our problem. The transparent spheres which give rise to fog bows, coronæ and iridescent clouds when the temperature is far below the freezing point are preliminary droplets in the process of the formation of water crystals in the air.

It is almost inconceivable that it would ever be possible to produce in the laboratory this intermediate stage in the formation of a water crystal, therefore our meteorological observation is of direct use to the physical-chemist in adding one more method by which he can study the evolution of a crystal.

G. C. SIMPSON.

India Meteorological Department, Simla, 26th January, 1917.

UNDERGROUND WATER AND THE BOURNE FLOW IN THE WANDLE GATHERING GROUND.

THE date of the appearance of the Bourne flow in the Kenley Valley has been foretold for many years past with great accuracy by observation of the depth to the line of saturation as indicated by the water level in wells between the point where the Bourne first appears, near the Rose and Crown Inn, and the springs at the head of the River Wandle in Croydon. As is now well known the gradient of the line of saturation is a measure of the resistance of the strata to the passage of the water so that in dry seasons the gradient is flat. As the quantity of water to be discharged at the springs increases in wet seasons, so the gradient becomes steeper until it becomes in "Bourne" years so steep as to cut the surface of the ground when the released water passes down the surface channel.

The Bourne in the Kenley Valley always first appears at the same spot from which it is clear that the gradient of the line of saturation must be nearly uniform in the valley below, thus enabling very accurate forecasts to be made of the time when it will break out. This is, however, by no means the case in the valley above the point where the Bourne first appears, and it is interesting that observations of water levels in the upper part of the valley afford little guide to the date of the appearance of the Bourne.

The Bourne has broken out now for three winter seasons in succession, viz., February 2nd, 1915, January 26th, 1916, and December 20th, 1916, and the height of the water above O.D. in a well three miles up the Valley on these dates was 395, 388 and 370 feet respectively. It is evident, therefore, that the gradient of the line of saturation in the upper part of the valley depends more upon the incidence of the rainfall than is the case lower down.

5, Queen Anne's Gate, S.W., Feb 28th, 1917.

W. VAUX GRAHAM.

JANUARY, 1917.

THERE is one feature of this month which seems worth notice, viz., the extremely small mean range of temperature.

In my record, commencing October, 1878, I have only two months with a mean range less than $7^{\circ}0$; it was $6^{\circ}6$ in February, 1879, and $6^{\circ}5$ in January, 1897; in January of this year I have:—

Mean Max. $35^{\circ}8$ Mean Min. $31^{\circ}2$ Range $4^{\circ}6$

or $2^{\circ}0$ less than any other month in 38 years. The above seems to be confirmed by Mr. Dover's letter on page 7 of the February number, where as far south as the Isle of Wight the mean range is given as $4^{\circ}9$. In the Edinburgh record, 1840-1900, the smallest is $5^{\circ}8$, in January, 1856, and in the Greenwich record the smallest is $6^{\circ}5$, in December, 1844. It seems probable that there is no precedent for so small a range. CHARLES LEWIS BROOK.

Harewood Lodge, Meltham, Yorks, March 3rd, 1917.

SPECIMEN WEATHER FORECASTS.

As a specimen of my system of Weather Forecasting, I have pleasure in submitting herewith the following, and I shall esteem it a favour if you will check these forecasts by official reports, and by those communicated to the Press by Shipmasters.

Forecasts, January 1st to April 6th, 1917.

These apply particularly to the British Isles, and to the North Atlantic but I am unable to give the track of a depression.

Between any two of the given dates (*e.g.*, January 1st to 11th), depressions more or less marked may be expected to occur. In some cases, two or more will occur between those dates, and the weather will then be very stormy; but, of course, this does not mean that every day will be so. The depression will attain to a maximum, and then die away again.

January 1st to 11th.	February 19th to March 5th
„ 15th to 24th.	March 8th to 18th
„ 26th to Feb. 2nd.	„ 20th to 27th.
February 3rd to 16th.	„ 28th to April 6th.

In January the weather will be bitterly cold: there will be fierce storms and heavy falls of snow. In February there will be bitter local storms, particularly along the West Coasts, with rough seas; and this kind of weather may be expected right up to April 6th, during which time, the North Atlantic Ocean will feel the full force of terrific gales.

The British Isles will suffer severely, as they lie right in the track these storms may be expected to follow.

EDWARD M. DARKEN.

327 West 22nd Street, New York, U.S.A., December 26th, 1916.

REVIEW.

Climate of the South Orkneys. Anales de la Oficina Meteorológica. Argentina Tomo XVII. 2 parts. Pp. viii + 1034. Plates, 22. Size, $12\frac{1}{2} \times 10$. Buenos Aires, 1912-1913.

THIS station was established in March, 1903, by the Scottish Antarctic Expedition which wintered in these islands. Mr. W. G. Davis, until recently Director of the Argentine Meteorological Service, has embodied the results in two large volumes, in which the data are discussed in great detail, for the eight years, 1903-1910. At the South Orkneys there are really only two seasons, a short summer and a long winter, and, except for the comparatively ice-free seas in the summer there is little to distinguish the general appearance of the landscape in that season from midwinter. The maximum temperature was $47^{\circ}\cdot 8$, which occurred during a Föhn on February 14th, 1907, and the lowest— $40^{\circ}\cdot 1$ on August 3rd, 1904. Föhn is comparatively common and has occurred during every month of the year, so that while the absolute monthly minima have varied from $21^{\circ}\cdot 1$ in February to -40° in August, a range of $61^{\circ}\cdot 1$, the absolute maxima show a range of only $10^{\circ}\cdot 3$ between the months of February and July. The mean daily range of temperature is lowest, $6^{\circ}\cdot 0$ in January, and highest, $17^{\circ}\cdot 0$ in July, showing a marked difference between the oceanic climate of the summer and the continental climate of the winter months.

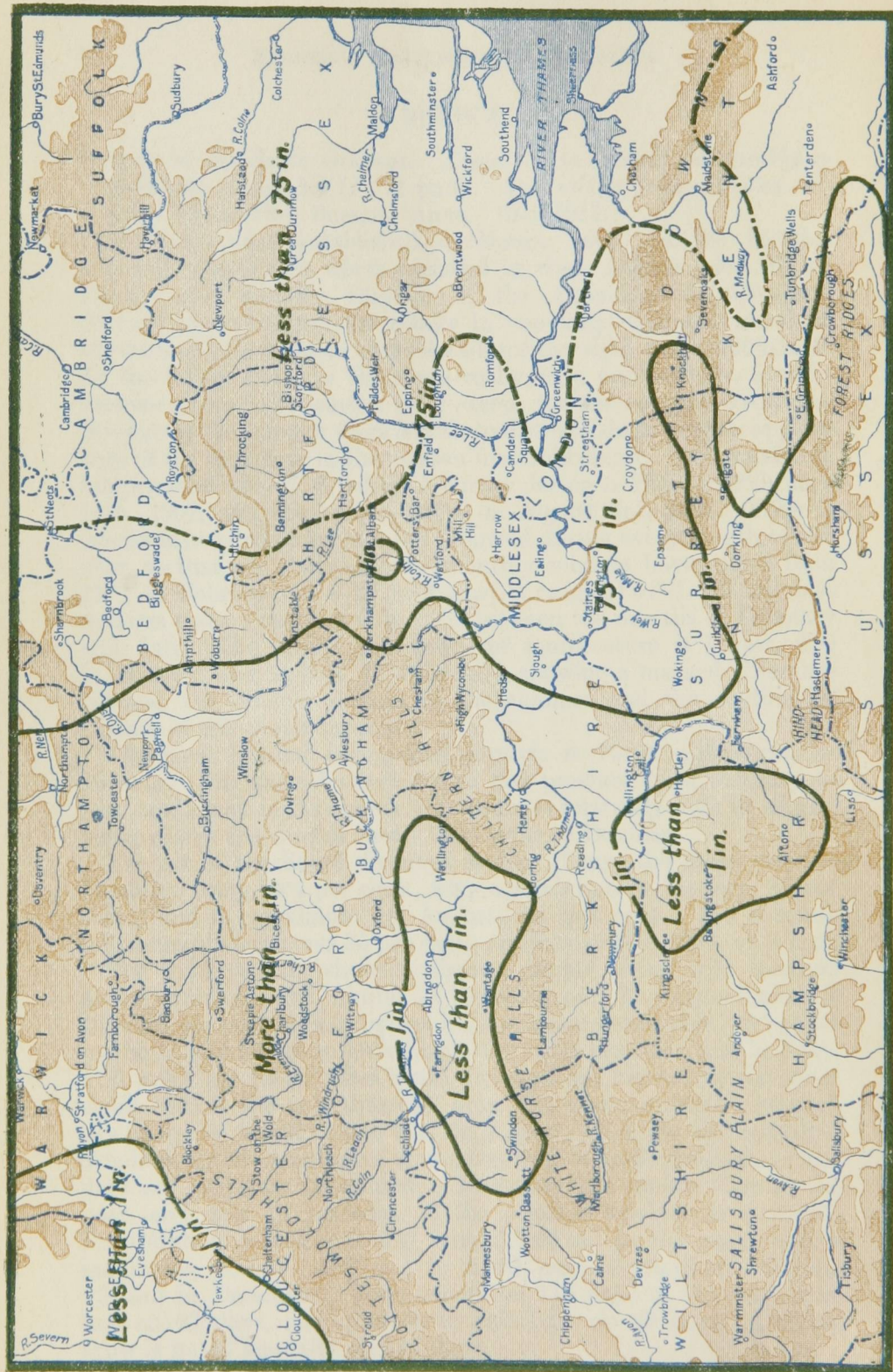
The mean annual barometric pressure is 744·2 millimetres, or 29·30 in. The annual curve shows low pressure from January to May, and again in November. Pressure is relatively high in winter, being above the annual mean from June to October.

The air of the South Orkneys is very damp, the mean relative humidity being $90^{\circ}\cdot 4$ per cent., with a minimum in January, 87 per cent., and a maximum in August, 94 per cent. The absolute minimum observed was 35 per cent., on October 3rd, 1909, at 9 a.m.

The wind velocity shows a distinct double period with maxima at the equinoxes and minima at the solstices. The annual mean is 13 miles per hour, being highest in March and September, $14^{\circ}\cdot 7$ miles per hour, and lowest in December, $10^{\circ}\cdot 6$ miles per hour, and in June, $11^{\circ}\cdot 8$ miles per hour. The South Orkneys are located in the great cloud belt of the sub-Antarctic area, the mean amount (overcast sky or fog = to 100) being 85. In August, 1904, the sky remained cloudless for 61 consecutive hours, the longest spell observed. Clear days are very rare in summer. There are 188 sunless days in the year, and only 14 per cent. of the possible sunshine is recorded. Precipitation amounts to 447 mm. (17·60 in.) in the year, with a maximum, 58 mm. (2·28 in.) in April, and a minimum, 23 mm. (·91 in.) in December. Rain occurs on 113 days in the year, true hail on 27 days, and graupel, or soft hail, on 59 days. Drifting snow is noted annually on 185 days.

R.C.M.

THAMES VALLEY RAINFALL, FEBRUARY, 1917.



SUMMER TIME AGAIN.

A COMMITTEE appointed by the Home Secretary has enquired into the social and economic results of the Summer Time Act, 1916, has reported recommending that summer time should be renewed in 1917 and subsequent years. Evidence as to the effect of the Act was taken by the Committee, and Sir Napier Shaw told them that "a great deal of confusion arose with the Observers and the continuity of many series of observations had been interrupted." This we can fully endorse; but all we and the Observers can do by way of remedy is to follow the rule we gave last year—**While the clock shows summer time observe if possible at 10.0 a.m. (9 a.m. true time), but if it is not possible to do so observe at 9 a.m. (clock time) and mark the return from April 8th to September 16th, "9 a.m. S.T."** Recording instruments should be kept running to true time. The dates are those recommended by the Committee and are not to be followed unless Parliament so decrees.

THE WEATHER OF FEBRUARY.

THE characteristic features of the weather of February were a low mean temperature, scanty precipitation, and in general a deficiency of bright sunshine. The temperature, which forms the subject of a special article (see ante pp. 13-15) was 4° F. below the average, the deficit varying from about $1^{\circ}\cdot5$ in the north of Scotland to $5^{\circ}\cdot5$ in the south of England and the Midlands.

Bright sunshine varied from about one hour and a half per day in the Midlands to double this amount in such widely separated districts as the east of Scotland and the Channel Islands. In the latter area, and also over Scotland, there was a slight excess, but in the east of England, including the Midlands, the average daily deficiency was an hour. Ireland received the average amount.

Precipitation was everywhere light, the whole of the east of Great Britain had less than an inch, and in the west of England less than two inches fell, except in the very heart of the Lake District and the centre of Wales, the south and east of Ireland had rather less than two inches, the maximum fall hardly reaching three inches, except very locally as in Connemara. The widespread deficiency is shown by an inspection of the regular rain table every station there given having less than the average. In England and Wales 48 per cent. of the average fell, in Scotland 33 per cent., and in Ireland 60 per cent., the whole country showing a value of 46 per cent.

In London (Camden Square) the mean temperature was $35^{\circ}\cdot4$, being $4^{\circ}\cdot3$ below the average. Duration of rainfall, 20.5 hours. Bright sunshine, 38 hours. Evaporation, .17 in.

RAINFALL TABLE FOR FEBRUARY, 1917.

STATION.	COUNTY.	RAINFALL.						
		Aver. 1875— 1909. in.	1917. in.	Diff. from Av. in.	Per cent. of Av.	Max. in 24 hours.		No. of Days
						in.	Date.	
Camden Square.....	London	1·66	·93	— ·73	56	·20	20	10
Tenterden.....	Kent	1·90	·85	— 1·05	45	·21	20	9
Arundel (Patching).....	Sussex	2·17	1·84	— ·33	85	·45	19	10
Fordingbridge (Oaklands)...	Hampshire	2·34	1·15	— 1·19	49	·30	19	12
Oxford (Magdalen College)...	Oxfordshire	1·62	1·21	— ·41	75	·29	16, 19	11
Wellingborough (Swanspool)...	Northampton	1·70	·86	— ·84	51	·20	20	13
Bury St. Edmunds (Westley)...	Suffolk	1·59	·58	— 1·01	36	·16	4	9
Geldeston [Beccles].....	Norfolk.....	1·41	1·02	— ·39	72	·22	4, 20	15
Polapit Tamar [Launceston]...	Devon	2·95	1·21	— 1·74	41	·37	20	10
Rousdon [Lyme Regis]	"	2·50	1·47	— 1·03	59	·78	19	9
Stroud (Field Place)	Gloucester ..	2·12	1·06	— 1·06	50	·30	19	10
Church Stretton (Wolstaston)...	Shropshire ..	2·17	·98	— 1·19	45	·36	23	8
Boston	Lincoln	1·53	·90	— ·63	59	·27	20	14
Worksop (Hodsock Priory)...	Nottingham ..	1·64	·58	— 1·06	35	·26	20	8
Mickleover Manor	Derbyshire ..	1·71	1·13	— ·58	66	·45	21	10
Buxton	"	4·01	·97	— 3·04	24	·24	19	9
Southport (Hesketh Park)...	Lancashire ..	2·07	1·10	— ·97	53	·29	19	12
Arncliffe Vicarage	York, W.R. ..	4·88	...	...	...	...	...	...
Goldsborough Hall.....	"	1·75	·67	— 1·08	38	·27	20	7
Hull (Pearson Park)	" E.R.	1·78	·78	— 1·00	44	·32	20	12
Newcastle (Town Moor)	Northland ..	1·63	·83	— ·80	51	·27	20	11
Borrowdale (Seathwaite) ...	Cumberland ..	10·96	2·06	— 8·90	19	·54	19	19
Cardiff (Ely).....	Glamorgan ..	3·07	1·56	— 1·51	51	·63	19	14
Haverfordwest.....	Pembroke ...	3·42	2·17	— 1·25	63	1·12	19	12
Aberystwyth (Gogerddan)...	Cardigan ...	3·09	2·70	— ·39	87	·82	19	12
Llandudno	Carnarvon ..	2·11	1·30	— ·81	62	·45	19	9
Cargen [Dumfries]	Kirkcudbrt. ..	3·42	1·29	— 2·13	38	·30	19	10
Marchmont House	Berwick.....	2·15	·96	— 1·19	45	·38	20	11
Girvan (Pinmore)	Ayr	3·87	1·48	— 2·39	38	·36	19	13
Glasgow (Queen's Park) ...	Renfrew ...	2·70	...	...	...	...	...	...
Islay (Eallabus)	Argyll	3·91	1·43	— 2·48	37	·44	19	14
Mull (Quinish).....	"	4·45	1·19	— 3·26	27	·22	20	18
Balquhiddar (Stronvar).....	Perth.....	6·33	1·12	— 5·21	18	·40	1, 28	6
Dundee (Eastern Necropolis)...	Forfar	1·91	1·31	— ·60	69	1·08	20	6
Braemar	Aberdeen ...	2·55	·59	— 1·96	23	·20	20	6
Aberdeen (Cranford)	"	2·36	·91	— 1·45	39	·41	20	9
Gordon Castle	Moray	1·95	·76	— 1·19	39	...	...	...
Drumadrochit	Inverness ...	2·89	1·14	— 1·75	39	·46	4	13
Fort William	"	6·85	1·68	— 5·17	25	·51	27	18
Loch Torridon (Bendamph)...	Ross	7·53	2·42	— 5·11	32	·36	27	16
Dunrobin Castle	Sutherland ..	2·58	·98	— 1·60	38	·24	11	8
Killarney (District Asylum)...	Kerry	4·99	1·61	— 3·38	30	·62	19	14
Waterford (Brook Lodge)...	Waterford ..	3·18	1·45	— 1·73	46	·60	19	14
Nenagh (Castle Lough).....	Tipperary ...	2·89	1·48	— 1·41	51	·98	19	12
Ennistymon House	Clare	3·44	1·70	— 1·74	49	1·13	19	11
Gorey (Courtown House)	Wexford ...	2·75	1·07	— 1·68	39	·70	19	11
Abbey Leix (Blandsfort)...	Queen's Co. ..	2·55	1·62	— ·93	64	·85	19	10
Dublin (Fitz William Square)...	Dublin	1·93	1·70	— ·23	88	·94	19	11
Mullingar (Belvedere)	Westmeath ..	2·67	2·36	— ·31	88	·84	21	9
Crossmolina (Enniscoe).....	Mayo	4·20	1·92	— 2·28	46	·36	2	14
Cong (The Glebe)	"	3·72	1·89	— 1·83	51	·62	19	13
Collooney (Markree Obsy.)...	Sligo	3·20	1·70	— 1·50	53	·52	19	17
Seaforde	Down.....	2·81	2·36	— ·45	84	1·16	20	13
Ballymena (Harryville).....	Antrim	2·99	2·10	— ·89	70	·60	19	17
Omagh (Edenfel).....	Tyrone	2·68	2·20	— ·48	82	1·12	19	13

SUPPLEMENTARY RAINFALL, FEBRUARY, 1917.

Div.	STATION.	Rain inches.	Div.	STATION.	Rain inches
II.	Warlingham, Redvers Road..	1·11	XI.	Lligwy	1·21
„	Ramsgate	·47	„	Douglas, Isle of Man .....	...
„	Hailsham	·95	XII.	Stoneykirk, Ardwell House...	2·02
„	Totland Bay, Aston House...	1·36	„	Carsphairn, Shiel	1·76
„	Stockbridge, Ashley	·77	„	Langholm, Drove Road	1·17
„	Grayshott	1·17	„	Selkirk, The Hangingshaw..	·76
III.	Harrow Weald, Hill House...	·90	XIII.	North Berwick Reservoir....	·50
„	Pitsford, Sedgbrook.....	1·20	„	Edinburgh, Royal Observaty.	·58
„	Woburn, Milton Bryant.....	1·00	„	Biggar	1·15
„	Chatteris, The Priory.....	·66	XIV.	Maybole, Knockdon Farm ..	1·51
IV.	Elsenham, Gaunts End	·64	XV.	Buchlyvie, The Manse .....	...
„	Shoeburyness	·48	„	Ballachulish House	1·18
„	Colchester, Hill Ho., Lexden	·55	„	Oban.....	1·01
„	Ipswich, Rookwood, Copdock	·59	„	Campbeltown, Witchburn ..	1·39
„	Aylsham, Rippon Hall	1·15	„	Holy Loch, Ardnadam.....	1·43
„	Swaffham	·72	„	Tiree, Cornaigmore	·99
V.	Bishops Cannings	1·30	XVI.	Dollar Academy .....	...
„	Wimborne, St. John's Hill ...	1·17	„	Glenlyon, Meggernie Castle..	1·01
„	Ashburton, Druid House.....	1·01	„	Blair Atholl	·44
„	Cullompton	1·71	„	Coupar Angus	·62
„	Lynmouth, Rock House	1·16	„	Montrose, Sunnyside Asylum.	1·02
„	Okehampton, Oaklands.....	1·07	XVII.	Alford, Lynturk Mansef.....	...
„	Hartland Abbey.....	1·70	„	Fyvie Castle	1·48
„	St. Austell, Trevarna	1·82	„	Keith Station	·77
„	North Cadbury Rectory.....	1·40	XVIII.	Rothiemurchus	·66
VI.	Clifton, Stoke Bishop	1·31	„	Loch Quoich, Loan	5·60
„	Ledbury, Underdown.....	1·73	„	Skye, Dunvegan	1·79
„	Shifnal, Hatton Grange.....	1·08	„	Lochmaddy, Bayhead .....	...
„	Droitwich	·87	„	Fortrose.....	·74
„	Blockley, Upton Wold.....	1·34	„	Glencarron Lodge	1·99
VII.	Grantham, Saltersford.....	·72	XIX.	Altnaharra .....	...
„	Market Rasen	·71	„	Melvich	1·07
„	Bawtry, Hesley Hall	·57	„	Loch More, Achfary	2·99
„	Whaley Bridge, Mosley Hall	1·13	XX.	Dunmanway, The Rectory ..	2·72
„	Derby, Midland Railway.....	·83	„	Glanmire, Lota Lodge.....	1·69
VIII.	Nantwich, Dorfold Hall	1·40	„	Mitchelstown Castle.....	1·92
„	Chatburn, Middlewood .....	...	„	Darrynane Abbey.....	...
„	Lancaster, Strathspey	1·26	„	Clonmel, Bruce Villa	1·22
IX.	Langsett Moor, Up. Midhope	·68	„	Broadford, Hurdlestown.....	1·84
„	Scarborough, Scalby	1·45	XXI.	Enniscorthy, Ballyhyland...	1·58
„	Ingleby Greenhow	·54	„	Rathnew, Clonmannon	·92
„	Mickleton	1·00	„	Ballycumber, Moorock Lodge	2·24
X.	Bellingham, High Green Manor	1·36	„	Balbriggan, Ardgillan	1·82
„	Ilderton, Lilburn Cottage ..	1·32	„	Castle Forbes Gardens.....	1·72
„	Keswick, The Bank.....	1·22	XXII.	Ballynahinch Castle.....	3·48
XI.	Llanfrechfa Grange	1·10	„	Woodlawn	1·60
„	Treherbert, Tyn-y-waun	2·23	„	Westport, St. Helens	·99
„	Carmarthen, The Friary	1·86	„	Dugort, Slievemore Hotel ..	2·38
„	Fishguard, Goodwick Station.	1·58	XXIII.	Enniskillen, Portora.....	2·12
„	Crickhowell, Tal-y-maes.....	1·60	„	Dartrey [Cootehill]	2·76
„	New Radnor, Ednol	1·43	„	Warrenpoint, Manor House ..	1·82
„	Birmingham WW., Tynynydd	1·12	„	Belfast, Cave Hill Road	2·15
„	Lake Vyrnwy	1·25	„	Glenarm Castle	1·73
„	Llangynhafal, Plas Drâw.....	1·12	„	Londonderry, Creggan Res...	2·83
„	Dolgelly, Bryntirion.....	3·19	„	Dunfanaghy, Horn Head ...	2·46
„	Bettws-y-Coed, Tyn-y-bryn...	1·07	„	Killybegs	1·98

Climatological Table for the British Empire, September, 1916.

STATIONS. (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	72·3	7	37·8	15	66·1	49·7	50·9	84	118·9	36·1	1·48	13	6·9
Malta	85·1	1	61·8	25	77·9	69·0	...	64	136·5	...	1·57	4	0·4
Lagos	87·0	*25	70·0	5	84·6	72·6	72·2	78	154·0	68·0	4·07	9	8·0
Cape Town	80·6	24	43·9	17	66·1	49·7	51·0	76	...	...	1·82	12	5·7
Johannesburg	80·4	27	35·4	21	72·9	48·1	35·4	47	...	32·0	·00	0	0·8
Mauritius	79·7	23	57·9	8	75·7	63·9	60·3	74	...	50·2	2·60	22	6·4
Bloemfontein	86·0	27	29·1	4	75·2	42·2	34·0	42	..	...	·03	2	1·5
Calcutta... ..	92·7	6	75·7	16	88·8	78·5	77·7	85	...	74·3	17·90	18	8·5
Bombay... ..	89·8	2	75·5	6	84·8	77·6	76·4	86	130·0	71·3	14·59	25	7·7
Madras ... ..	...	...	...	...	...	...	...	...	...	...	...	...	...
Colombo, Ceylon	85·9	25	72·0	2	84·6	76·3	73·8	83	155·2	68·5	3·82	13	7·8
Hongkong	89·8	5	72·6	26	84·7	76·6	73·1	78	...	...	10·52	15	6·3
Sydney	83·1	16	46·3	+11	67·4	53·1	49·8	68	135·0	31·9	4·51	12	5·0
Melbourne	81·6	20	38·0	18	62·2	48·9	47·0	70	132·4	30·0	7·93	18	6·6
Adelaide	87·9	19	39·8	30	66·9	50·4	47·1	62	139·0	30·6	1·68	11	5·4
Perth ... ..	...	...	...	...	...	...	...	...	...	...	...	...	...
Coolgardie	90·0	6	41·6	23	72·5	52·2	43·7	46	145·4	36·0	1·38	6	4·6
Hobart, Tasmania .. ..	...	...	...	..	...	...	...	...	...	...	...	...	...
Wellington	63·5	5	36·5	16	58·2	46·7	45·4	76	123·0	25·7	2·92	11	5·7
Auckland ... ..	...	...	...	...	...	...	...	...	...	...	...	...	...
Jamaica, Kingston	92·3	15	70·0	2	89·6	73·1	72·6	79	...	...	·97	12	...
Grenada	90·0	13	70·0	8	86·0	74·0	...	89	135·0	...	11·32	21	3·0
Toronto	89·8	7	34·7	30	71·2	51·1	50·4	76	123·0	25·3	1·66	12	4·2
Fredericton	83·0	28	34·0	4	69·0	45·0	55·4	81	...	...	3·16	9	4·8
St. John, N.B.	79·6	14	40·0	20	63·3	48·7	51·0	81	132·7	32·5	1·82	12	5·2
Victoria, B.C.	79·7	15	43·0	30	64·4	48·9	48·0	78	130·0	29·5	·35	5	3·8

* 30, + 12.

Malta.—Thunderstorm on the 14th.*Johannesburg*.—Bright sunshine, 328·3 hours.*Mauritius*.—Mean temp. 1°·0 below, average. Mean hourly velocity of wind 10°·7 miles.

COLOMBO, CEYLON.—Mean temp. 80°·5, or 0°·4 below, dew point 0°·2 above, and R ·20 in. above, averages. Mean hourly velocity of wind 6·0 miles. TS on 5th.

HONGKONG.—Mean temp. 80°·5; mean hourly velocity of wind 15·3 miles. Bright sunshine 200·9 hours.

Melbourne.—The month's rainfall the largest during 61 years, the previous being 7·61 in October, 1869, continuous steady R for 63 hours, and for 9 days almost continuous. Rivers flooded and were over the lands, many cattle lost and a few cases of drowning.*Adelaide*.—Mean temp. 1°·6 above, and R ·26 in. below, averages.*Coolgardie*.—Temperature 3°·9 above.*Wellington*.—Mean temp. 1°·3 above, and R 1·32 in., below, averages. Bright sunshine 168·7 hours. A mild spring month.