

Symons's Meteorological Magazine.

No. 646.

NOVEMBER, 1919.

VOL. LIV.

BRITISH ASSOCIATION AT BOURNEMOUTH. METEOROLOGICAL LUNCHEON.

METEOROLOGISTS and others interested in weather science gathered together on Thursday, September 11th, at a luncheon held in Linden Hall, Bournemouth. Sir Napier Shaw was in the chair, and among those present were Lady Shaw, Prof. H. H. and Mrs. Turner, Prof. and Mrs. Schuster, Mr. Acland, Mr. P. Y. Alexander, Mr. Wilson Fox and Sir R. Gregory. The Overseas Dominions were represented by Sir Frederick Stupart, Director of the Canadian Meteorological Service, and Lt.-Col. D. C. Bates, Director of the Meteorological Service of New Zealand.

After the usual loyal and patriotic toasts, Mr. Wilson Fox proposed the toast of "Meteorology" coupled with the name of Sir Napier Shaw, who responded.

Mr. J. J. Shaw proposed the toast of "Seismology" drawing attention to the difficulties that had been encountered owing to the war, in that many stations were either inoperative or cut off from communication. The chief station, Shide, was just closed owing to Mrs. Milne's return to Japan, but by a very timely benefaction from Dr. J. E. Crombie, of Aberdeen, in recognition of the unceasing enthusiasm of Prof. Turner, it was now practicable to make a start at Oxford, where Prof. Turner would be able to continue his supervision.

Reference was also made to the help which both Sir Napier Shaw and Dr. A. Schuster had given to Seismology in the past. It was appropriate that meteorology and seismology should be joined at the lunch, since it was of frequent occurrence both here and abroad that seismology had become a protégé of meteorology. The speaker pointed out the need for good observers and co-ordination and believed that the British Dominions alone owing to their geographical distribution could provide the whole of the observation required for a complete investigation of seismology and he specially appealed to their guest, Sir Frederick Stupart, of the Weather

Bureau of Canada, to do what he could in this direction. In conclusion, were it only for the injunction given him by Prof. John Milne, three days before he died, "to carry on with seismology," it gave him much pleasure to propose that toast.

Prof. Schuster responded.

Prof. H. H. Turner proposed "The Guests," coupled with the names of Sir Frederick Stupart (Canada) and Lt.-Col. Bates, (New Zealand). Sir F. Stupart, in replying, expressed his great pleasure in being present. As a Canadian he felt that it was well that those who dwelt in the Overseas Dominions should rub shoulders with their colleagues of the Mother Country. While the Meteorological Services of the British Dominions were autonomous an intimate knowledge of the service of Great Britain was desirable, and this could only be obtained in England. As conditions were to-day, this knowledge could only lead to a very high degree of respect for any opinions and suggestions which might come from the Office presided over by Sir Napier Shaw. The speaker also referred to the increased knowledge of Canada and its people brought about by the war, and in concluding spoke with appreciation of the presence of the Prince of Wales in the Dominions.

Lt.-Col. D. C. Bates also responded to the toast, and remarked that a voyage of fifty-one nights and days separated him from home on the other side of the world, but unity of purpose had drawn them together at this juncture to secure the scientific results won at the cost of so much effort and sacrifice in the great war. Men of science had to safeguard public services at this period of financial stress and political strife. They must stand together to safeguard the treasures won from the past and hand on to the future all that was good, useful and true. There was, of course, great need for economy in the aftermath of war, but it was to be hoped that the best in civilization would not be sacrificed to the cry for money. Ideals were more precious than gold, and scientific men who sacrificed time, pleasure and wealth, must now be ready to join together to carry on their work with even greater energy and zeal. He paid a tribute to the Chairman, Sir Napier Shaw, the doyen of the world's meteorology, who greeted them with open heart and mind, and he trusted British meteorology would always continue to be in the forefront of the world's advance. He regretted the absence of Dr. H. R. Mill from the gathering.

Previous to the luncheon Sir Frederick Stupart read a paper before Section A, on "Some Unsolved Problems in Canadian Weather," making special reference to the climatic peculiarities of the province of Alberta. He referred to the pressure and temperature conditions of two recent consecutive Januaries in which the mean temperatures at Calgary were 16° F. and 17° F. respectively. During the cold January the mean pressure of the month in the north-west of Canada was as high as 30.75 in., but

in the mild January only 29.97 in. In the cold January there was intense terrestrial radiation and light northerly winds prevailed, but in the mild January with the low pressure, Föhn (Chinook) winds persisted, and the temperature in Alberta was high continuously. The Föhn effect was due to the winds from the Pacific having to traverse four mountain chains so that they were dynamically warmed winds. In the discussion that followed Sir Napier Shaw pointed out certain objections that applied to the conventional explanation of Föhn effects.

ON THE DESIGNATIONS: RAIN, SNOW AND HAIL.

By L. C. W. BONACINA.

OF each of the three primary kinds of precipitation falling to the ground from a height, namely: rain, snow and hail, there are numerous varieties, and there are also various transition forms between them. In the case of hail, three of its varieties are so very distinct and characteristic as almost to be entitled to be called sub-species. Thus we have (1) hard or true hail, a complex structure often, though not only, associated with thunderstorms; (2) soft hail, *graüpel* or *grésil*, a type of precipitation of which there are endless varieties, common in cold weather, tending towards snow, and often associated with it; (3) ice-rain, which takes the form of more or less clear spherules of ice formed generally during temperature inversions when rain-drops fall through a cold surface stratum of air giving rise to glazed frost. A few years ago I used to regard *graüpel* as a distinct species of precipitation from hail, and object to the official practice of forecasting it as "hail." But I have since come to the conclusion that it is philosophically correct to regard *graüpel* merely as a variety or sub-species of hail, and for this reason. If we take the concepts "rain," "snow" and "hail," words belonging to the bed-rock of common language, what do we find to be the specific character of each? The physical criterion of "rain" is the spherical drop of water; of "snow" the separately formed crystal of ice whether it falls alone, in contact with others as a flake, or broken up into dust-like fragments by wind; and of hail the stone or pellet of compact ice. It is clear that ordinary hail, *graüpel* and frozen rain, however much they may differ in minor respects, have each the fundamental character of being agglomerations of compact ice, and I therefore think they should all be regarded as "hail"—a fundamental species of precipitation on the same footing with "rain" and "snow."

ROYAL METEOROLOGICAL SOCIETY.

At a special meeting of the Society on November 7th at 70, Victoria Street, Prof. V. Bjerknes, of the Norwegian Meteorological Service, Bergen, delivered a lecture on "The Structure of the Atmosphere when Rain is Falling." The President, Sir Napier Shaw, was in the chair.

Owing to the restriction of meteorological data during the war, opportunity was taken largely to increase the number of telegraphic reporting stations in Norway, and to develop Prof. Bjerknes's method of studying atmospheric movements on an intensive scale. The process of mapping air stream lines was described and these were associated by means of a series of extremely instructive lantern slides, with the areas of rainfall. The various types of rainfall were found to be, the orographical, caused by the impinging of lines of air-flow on rising land, setting up ascending currents; secondly, the interaction of drifts of different temperature by means of which (a) the warmer current was forced over the flank of the colder which operated similarly to a mountain side, or (b) the colder mass of air forced its way as a wedge under the warmer, lifting the latter bodily into the upper strata; thirdly, the development and flow of convection currents giving rise to local showers. The second type of rain, viz., that caused by the meeting of two drifts of air, was that associated with cyclones, and the conception of the cyclone as a spirally moving system was no longer tenable. The lecturer figured the construction of the system in the light of a warm south-westerly wind, striking the flank of cold easterly wind and rising over it, causing rain of a widespread nature without much rise of temperature; the easterly wind passing round the centre of low pressure, subsequently attacked the south-westerly wind on its north-western flank and forcing its way below it gave rise to the squall line in the rear of the system, with the characteristic fall of temperature. This explanation was quite in accord with the conclusions arrived at from different premises by Sir Napier Shaw. Convection effects were described in great detail and the accumulative effect of converging air-drifts as influenced by temperature changes from day to day was vividly set out in a series of maps showing the development of thunderstorms over a considerable area. It was possible to detect the effect of physical features, such as the fiords, glaciers and great lakes, on the air movements. In conclusion the lecturer appealed for a more extensive use of his methods, particularly in the British Isles.

Sir Napier Shaw congratulated Prof. Bjerknes on having carried out in a detailed manner in Norway the work which he had formerly done on a general scale for the United States. Mr. Richardson, of Benson Observatory, Lt.-Col. E. Gold, and Mr. M. A. Giblett, took part in the discussion.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

ROYAL METEOROLOGICAL SOCIETY PHENOLOGICAL RETURNS.

WITH 1920 the phenological records collected by the Royal Meteorological Society complete the period of thirty years, a recognised critical epoch in Meteorological records.

In consequence of the war, our observing stations had fallen to 110 last year, against the high-water mark of 132, in 1914. We are most anxious now to recover lost ground, and would like to make 1920 preparatory in this respect to the years that follow.

A reasonable total would be at least 220 stations, an average of twenty only for the eleven Meteorological Office districts. At present we are short of this in all districts except England S.E. and the Midlands. The six districts forming Scotland, Ireland and England, N.E. average only three and a half stations each. Wales has two stations only, both in the south-west.

The observations asked for refer to the blooming of thirteen common flowers, and appearance of six birds and six insects. Other migrant records and notes are also invited, but these are of secondary importance.

A copy of the observing form and of a recent report will be sent with pleasure (the reports so far as available) to any of the readers of *Symons's Meteorological Magazine*, who would be interested in helping. We especially suggest the value of these observations to all interested in Nature Study or Regional Survey classes.

Enquiries should be addressed to one of the undersigned, or to the Assistant Secretary, Royal Meteorological Society, 70, Victoria Street, S.W. 1.

23, Holcombe Road, Ilford, Essex.

H. B. ADAMES.

"Asgarth," Purley, Surrey.

J. EDMUND CLARK.

THE SNOWFALL OF SEPTEMBER, 1919.

THE snowfall of September on the Snowdonian range, extended down to 1,200 feet O.D. to the depth of 6 inches. Above 2,500 feet the snow drifted and remained unmelted in a few places for a week, being only some 10 weeks after the disappearance of last winter's drifts. This snowfall extended to a lower elevation than any known to me for the month of September.

J. R. GETHIN JONES.

Bryn Awel, St. Mary's Road, Llandudno, October 13th, 1919.

SEPTEMBER TEMPERATURES.

IN the October number the Rev. R. P. Dansey calls attention to the severe frost which occurred at the end of September. At Greenwich the shade reading on the morning of the 29th was 31° , which was 3° colder than any previous record on the corresponding day since 1841, and the reading of 32° on the 30th was 2° below any reading on that day. On September 11th the thermometer registered 87° in the shade at Greenwich, which is 4° higher than any previous temperature on the corresponding day for at least 78 years. The reading of $30^{\circ}\cdot9$ at Greenwich on September 29th, is the only September reading below the freezing point in the screen registered since 1841, with the single exception of $30^{\circ}\cdot6$ on September 27th, 1885. The grass temperatures were respectively $19^{\circ}\cdot1$ last September and $22^{\circ}\cdot3$ in 1835.

Mr. Dansey in the letter which you publish says, "September, 1919, closed with severe frost, the exposed thermometer 4 feet above ground on the morning of the 29th registering a minimum of 21° , the lowest September reading recorded in 33 years observations . . ." Is "the exposed thermometer 4 feet above ground" a slip? It is not a recognised meteorological exposure.

I have before me a letter by Mr. Dansey, printed in the *Standard* of October 3rd, 1898, on "a month of contrasts," dealing with exceptionally high and low temperatures in the previous September. September this year also had very divergent temperatures.

CHAS. HARDING.

Meteorological Office, S.W. 7, 31st October, 1919.

WIND IN RELATION TO TIDE.

MR. TWIST's letter, on p. 105, on his experiences in the Bristol Channel, recalls to me my own, which I mentioned in a note in my translation of "Theophrastus on Winds and Weather Signs," p. 35. The author there referred to tidal phenomena and reversal of winds in the Euripus; and in my note I wrote: "the tidal phenomena in question may have had a connection, unsuspected by Theophrastus, with the reversal of the wind. Often in past years have I watched at Chepstow the cessation of a storm, the clearing of the weather, or the shift of the wind coincidently with the beginning of the ebb of the great (though generally misrepresented and exaggerated) tides in the Wye."

Thus my observations at a point some thirty miles further up the same tideway than Minehead, agree in the main with Mr. Twist's: with this variation, that with him the change was generally noticed at the beginning of flood; with me at the beginning of ebb. Many a time, in weather which threatened to interfere with some outing, we said "we will wait till the tide turns." JAMES G WOOD.

115, Sutherland Avenue, W. 9, November, 2nd 1919.

AN aunt who lived in this town for sixty years, used to say, when the sea ebbed, "The wind will fall when the tide turns."

Another old lady in Mid-Devon steadily consulted the tide table for Exmouth to know when the weather would change. My aunt died at 92 years; the other at about 96. They had time for experience!

L.J.B.G.

Charlton House, Dawlish, October 17th, 1919.

TETRAHEDRAL HAILSTONES ON OCTOBER 13th, 1919.

On the afternoon of Monday, October 13th, there passed over the Chiltern district of South Bucks a somewhat violent squall accompanied by heavy hail, and showing the long dark roll of black cloud typical of the true line-squall structure. At 2.50 p.m. the disturbance struck the town of Amersham, where I happened to be, and just prior to the veering of the wind a point or two from west, a dense mass of hail literally swooped out of the squall cloud. I was out at the time and avoided immediately seeking shelter in order to examine the shape and texture of the hailstones. I found that all those which I caught on the sleeve of my overcoat were white and opaque, and in shape tetrahedral, showing four triangular faces roughly between $\frac{1}{8}$ and $\frac{1}{4}$ of an inch in length from base to vertex. I believe it is rather unusual for hail to form in regular geometric figures, and it would have been interesting to examine the structure of the stones microscopically to see if they exhibited the usual alternate structure of snow and clear ice. It may be noted, on the other hand, that at 4 p.m. on the following day I observed near the village of Stokenchurch, higher up towards the Chiltern escarpment, transparent spheroids of clear ice, which I took to be frozen rain, a species of frozen precipitation which would appear to be genetically and structurally different from hail, and also from those little snowballs called graupel so common in an English winter. It might be added that the squall of October 13th, which struck Amersham at 2.50 p.m. was observed at Beaconsfield at 3.5 p.m., so that it may be estimated that the disturbance was not travelling at a greater rate than about fifteen miles an hour. An hour or so later the line of cumuloform squall cloud surmounted by much anvil-shaped false cirrus was still above the horizon. No thunder was heard on the 13th, nor on the 14th, but during a similar type of shower on the afternoon of the 15th I noted two peals while walking along the Chiltern escarpment above Chinnor.

The whole period, 13th—16th, was bleak and wintry.

L. C. W. BONACINA.

27, Tanza Road, Hampstead, N.W., 3, October 20th, 1919.

Lieut.-Col. B. E. F. Keeling, M.C., R.E.

THE death of Col. B. E. F. Keeling on September 20th, only shortly after his appointment as Director-General of the Survey Department of the Egyptian Government, cuts short a career of great promise in connection with meteorology in north-east Africa, the development of which is so largely owing to Col. H. G. Lyons. Before joining the Survey Department, in 1904, Col. Keeling was attached to the Royal Arsenal, Woolwich, and later to the Meteorological Department of the National Physical Laboratory, Teddington. In Egypt, although primarily engaged on duties in connection with surveying and metrology, he was closely associated with the meteorological and magnetic work at the Helwan Observatory, and carried out kite and pilot balloon observations as well as special investigations of the upper air conditions during the monsoon season.

He later took charge of the Physical Service as distinct from the Survey Department, but during the war carried out survey duties in England, France and the Eastern Mediterranean, being severely wounded in France.

His meteorological publications include, besides the annual meteorological report of the Helwan Observatory, reports on the "Climate of Abbassia," "Evaporation in Egypt," and "Terrestrial Magnetism in North-east Africa."

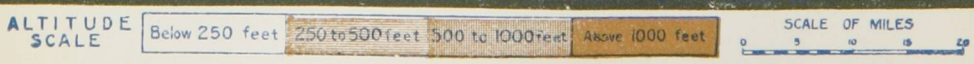
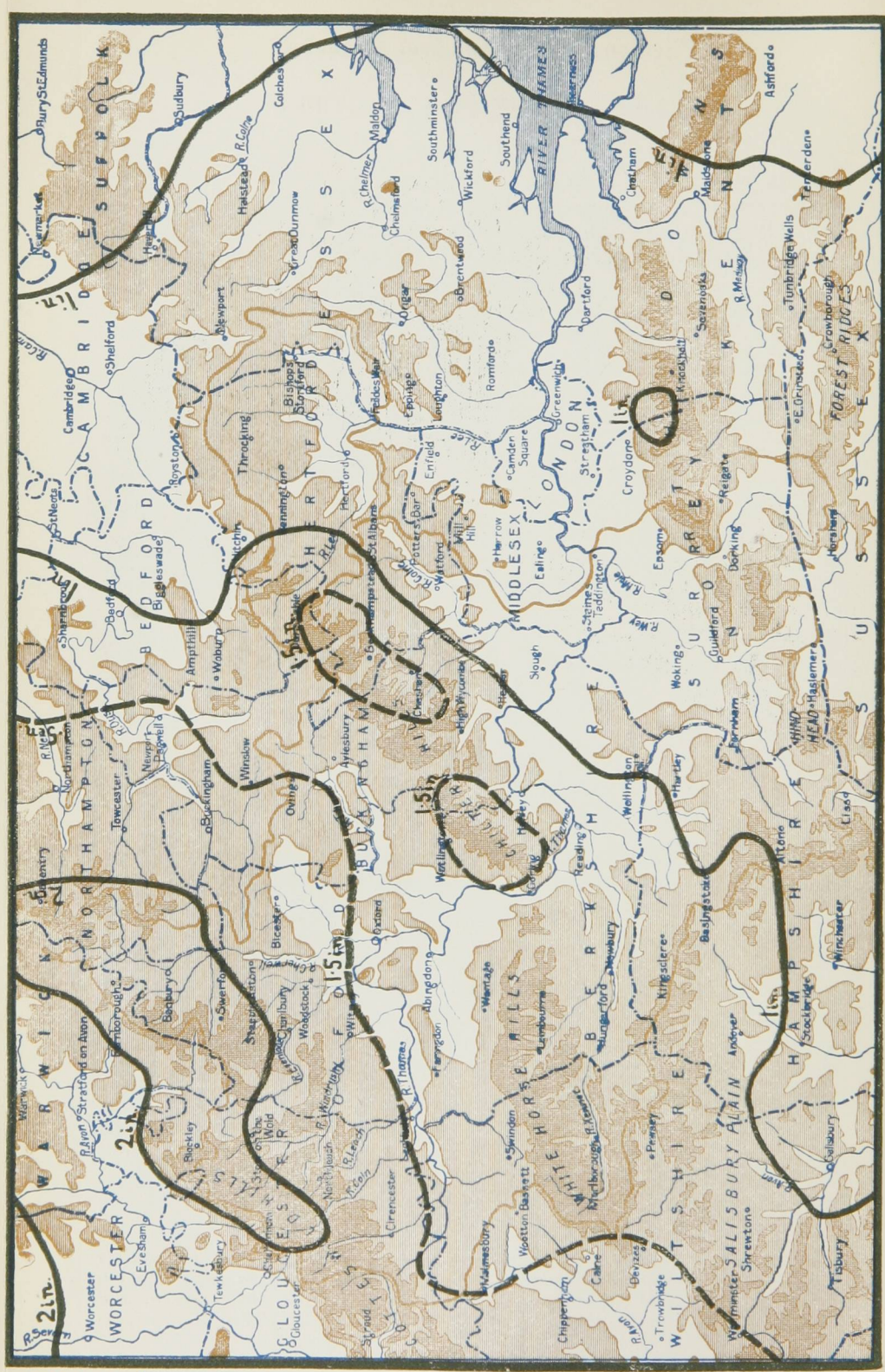
METEOROLOGICAL NEWS AND NOTES.

AN AMERICAN METEOROLOGICAL SOCIETY is being formed and it is proposed that its inauguration shall be definitely taken in hand at the meeting of the American Academy of Arts and Sciences in St. Louis in December, 1919.

MR. R. LAMPORT retired from the staff of the British Rainfall Organization on October 25th after thirty-one years' service, successively under the late Mr. G. J. Symons, Mr. H. Sowerby Wallis, Dr. H. R. Mill and the Meteorological Office. Miss D. K. Lamport has been appointed as a temporary assistant on the staff as from October 27th.

GENERAL TABLE OF "BRITISH RAINFALL, 1918."—Owing to the great demand for this reprint, the stock is already exhausted. Any Observers who do not wish to retain their copies are requested to return them to the Superintendent, British Rainfall Organization, 62, Camden Square, N.W. 1.

THAMES VALLEY RAINFALL OCTOBER, 1919.



THE WEATHER OF OCTOBER.

ONE of the chief features (one might perhaps describe it as the ruling factor) in the weather of a very remarkable month, was the almost complete absence of the mild and humid south-westerly winds which prevail with so much energy in an ordinary October.

Between the 3rd and 8th of the month, and again from about the 16th to the 22nd, when the distribution of pressure was anticyclonic, the winds were light and rather variable, the days being often bright and sunny, but the nights cold and foggy. These conditions prevailed more especially over England; in Ireland and Scotland the air was milder and clearer, and between the 4th and 6th the thermometer rose slightly over 70° in some parts of North Britain, as well as in the south of Ireland, and touched 73° at Gordon Castle. The sharpest night frosts occurred between the 7th and 14th, when the sheltered thermometer fell in many places, and on at least two or three occasions to 5° or more below the freezing point. On the surface of the grass the lowest readings were observed on the night of the 14th, the exposed thermometer falling to a minimum of 17° at Newton Rigg (Cumberland) and Phoenix Park (Dublin), and to 18° at Blackpool, Rounton, Workop and Cambridge. Around the middle of the month, and in the closing week, the conditions were cyclonic, but the wind blew mainly from some polar quarter (between N.W. and N.E.), and the weather was therefore cold and inclement, with local falls of snow or sleet and further touches of sharp night frost. The harsh and stormy weather which prevailed between the 27th and 30th was due to a well marked barometric depression which moved in the first place eastward from Iceland, and afterwards southward across the North Sea and France to the western Mediterranean. On the 27th to 29th the northerly winds on the western edge of this disturbance increased to the force of a gale in many parts of Great Britain, snow or sleet fell in places, and a heavy downpour of rain occurred over northern England, the total amount at Rounton (N. Yorkshire) for three days being 2.86 inches. In the English midland and south-eastern counties the unusual coldness of the nights is attested by the fact that at Kew and Nottingham the mean of all the minimum temperatures was the lowest recorded in October for at least 50 years past. At Kew an average of 12 years' observations shews that ground frost does not occur in October on more than 7 occasions; last month it was reported on 19 nights, and at Benson on 23 nights.

Nearly all places experienced more than the average duration of bright sunshine; at Glasgow the total, 104 hours, was 37 in excess of the normal.

A brilliant display of aurora was seen on the night of the 31st as far south as the Isle of Wight.

The rainfall of the month was deficient over the whole of the British Isles with the exception of certain areas in the east, including part of Norfolk, a strip of the coast from the Humber to Berwick, and a portion of north-east Aberdeenshire. More than 5 inches fell locally in these districts. A considerable portion of the south-east of England and small areas in the south-east of Ireland and the centre of Scotland had less than an inch of rain during the month. Apart from the east coast more than 3 inches was confined to the normally rainy districts of the west, but over a large part of the Lake District less than that amount fell. The general rainfall expressed as a percentage of the average was:—England and Wales, 59; Scotland, 57; Ireland, 42; British Isles, 55. Taken generally the month was probably one of the driest Octobers of which there is any record.

In London (Camden Square) the month was dull and cold. The rainfall was the lowest for October in the 62 years record with the single exception of October, 1897. Mean temperature, $45^{\circ}7$, or $4^{\circ}4$ below the average, and the lowest for October since 1892. Duration of rain, 22.4 hours. Evaporation, .61 inch.

RAINFALL TABLE FOR OCTOBER, 1919.

STATION.	COUNTY.	RAINFALL.						
		Aver. 1875— 1909. in.	1919. in.	Diff. from Av. in.	Per cent. of Av.	Max. in 24 hours.		No. of Days
						in.	Date.	
Camden Square.....	London	2.72	.69	-2.03	25	.26	29	9
Tenterden.....	Kent	3.48	1.17	-2.31	34	.37	31	10
Arundel (Patching).....	Sussex	4.01	.48	-3.53	12	.20	24	5
Fordingbridge (Oaklands)...	Hampshire	3.97	.70	-3.27	18	.38	24	8
Oxford (Magdalen College)...	Oxfordshire	2.82	1.37	-1.45	49	.66	24	12
Wellingborough	Northampton	2.60	1.52	-1.08	58	.46	23	13
Bury St. Edmunds (Westley)...	Suffolk	2.72	1.17	-1.55	43	.24	27. 29	12
Geldeston [Beccles].....	Norfolk.....	2.84	2.75	-.09	97	.44	28	19
Polapit Tamar [Launceston]...	Devon	4.84	1.94	-2.90	40	.27	14. 23	16
Rousdon [Lyme Regis]	"	3.81	2.03	-1.78	53	1.00	24	11
Ross (Birchlea).....	Herefordsh.	3.21	2.39	-.82	74	1.00	23	13
Church Stretton (Wolstaston)	Shropshire	3.77	3.25	-.52	86	1.15	23	14
Boston	Lincoln	2.75	1.86	-.89	78	.52	27	17
Workshop (Hodsock Priory)...	Northampton	2.77	2.27	-.50	82	.76	29	16
Mickleover Manor	Derbyshire	2.81	2.46	-.35	88	1.16	23	10
Congleton (Buglawton Vic.)...	Cheshire	3.10	2.35	-.75	76	.66	23	16
Southport (Hesketh Park)...	Lancashire	3.74	2.87	-.87	77	1.28	23	12
Wetherby (Ribston Hall)	York, W. R.	3.18	3.28	+.10	103	.91	23	12
Hull (Pearson Park)	" E. R.	3.19	4.31	+1.12	135	.79	23	17
Newcastle (Town Moor)	Northland	3.20	5.63	+2.43	176	1.15	23	17
Borrowdale (Seathwaite)	Cumberland	12.71	2.30	-10.41	18	...	...	...
Cardiff (Ely).....	Glamorgan	4.87	2.47	-2.40	51	1.25	23	12
Haverfordwest.....	Pembroke	5.51	1.95	-3.56	35	.75	23	15
Aberystwyth (Gogerddan)...	Cardigan	5.38	3.83	-1.55	71	1.86	23	11
Llandudno	Carnarvon	3.78	2.98	-.80	79	1.10	23	12
Cargen [Dumfries]	Kirkcudbrt.	4.45	1.51	-2.94	34	.78	23	13
Marchmont House	Berwick.....	3.83	3.32	-.51	87	1.10	23	14
Girvan (Pinmore)	Ayr	5.38	1.70	-3.68	32	.60	22	13
Glasgow (Queen's Park)	Renfrew	3.36	.82	-2.54	24	.31	23	8
Islay (Eallabus)	Argyll	4.95	2.63	-2.32	53	.65	22	18
Mull (Quinish).....	"	5.87	3.89	-1.98	66	.82	3	23
Loch Dhu	Perth.....	7.53	1.60	-5.93	21	.40	1	11
Dundee (Eastern Necropolis)...	Forfar	2.81	1.62	-1.19	58	.40	22	15
Braemar	Aberdeen	3.88	2.63	-1.25	68	.95	26	17
Aberdeen (Cranford)	"	3.23	3.12	-.11	97	.48	22	23
Gordon Castle	Moray	3.38	3.74	+.36	111	...	...	...
Drumnadrochit	Inverness	3.49	1.98	-1.51	57	.40	13	19
Fort William	"	7.32	3.22	-4.10	44	.86	22	19
Loch Torridon (Bendamph)...	Ross	8.38	5.56	-2.82	66	.96	26	20
Dunrobin Castle	Sutherland	3.15	3.00	-.15	95	.60	12	12
Glanmire (Lota Lodge)	Cork	4.35	.65	-3.70	15	.30	22	12
Killarney (District Asylum)...	Kerry	5.59	...	...	...	...	...	...
Waterford (Brook Lodge)...	Waterford	4.00	.39	-3.61	10	.11	23	5
Nenagh (Castle Lough).....	Tipperary....	3.48	.62	-2.86	18	.41	22	9
Ennistymon House.....	Clare	4.40	1.07	-3.33	24	.43	22	9
Gorey (Courtown House)	Wexford	3.75	1.51	-2.24	40	.83	23	8
Abbey Leix (Blandsfort)....	Queen's Co.	3.53	1.11	-2.42	31	.50	23	11
Dublin (Fitz William Square)...	Dublin	2.88	2.37	-.51	82	1.25	23	15
Mullingar (Belvedere)	Westmeath	3.19	1.50	-1.69	47	.38	23	13
Crossmolina (Enniscoe).....	Mayo.....	5.27	2.46	-2.81	47	.39	19	22
Cong (The Glebe).....	"	4.60	...	...	...	...	...	...
Collooney (Markree Obsy.)...	Sligo	4.21	1.83	-2.38	43	.27	14	15
Seaforde	Down.....	3.65	1.99	-1.66	54	.58	22	14
Ballymena (Harryville).....	Antrim	3.78	3.41	-.37	90	.66	13	20
Omagh (Edenfel)	Tyrone	3.76	2.25	-1.51	60	.58	22	19

SUPPLEMENTARY RAINFALL, OCTOBER, 1919.

Div.	STATION.	Rain inches.	Div.	STATION.	Rain inches
II.	Sevenoaks, Speldhurst Close.	·75	XI.	Lligwy	3·21
„	Ramsgate	1·74	„	Douglas, Isle of Man .....	...
„	Hailsham	·82	XII.	Stoneykirk, Ardwell House...	2·10
„	Totland Bay, Aston House...	·91	„	Carsphairn, Shiel	1·47
„	Stockbridge, Ashley	·97	„	Langholm, Drove Road	2·67
„	Grayshott	·50	XIII.	Selkirk, The Hangingshaw..	3·01
„	Upton Nervet	1·17	„	North Berwick Reservoir.....	2·17
III.	Harrow Weald, Hill House...	·64	„	Edinburgh, Royal Observaty.	2·37
„	Pitsford, Sedgebrook.....	1·59	XIV.	Biggar.....	2·05
„	Woburn, Milton Bryant.....	...	„	Maybole, Knockdon Farm ...	·61
„	Chatteris, The Priory.....	·66	XV.	Shiskine	1·99
IV.	Elsenham, Gaunts End	·73	„	Ardgour House	4·82
„	Rayleigh	·68	„	Oban.....	2·15
„	Colchester, Hill Ho., Lexden	1·09	„	Holy Loch, Ardnadam.....	2·16
„	Aylsham, Rippon Hall	3·71	„	Loch Venachar	1·30
„	Swaffham	2·12	XVI.	Glenquey	1·90
V.	Bishops Cannings	1·45	„	Loch Rannoch, Dall	·77
„	Weymouth.....	1·85	„	Blair Atholl .....	...
„	Ashburton, Druid House.....	2·09	„	Coupar Angus	·88
„	Cullompton	2·75	„	Montrose, Sunnyside Asylum.	2·18
„	Lynmouth, Rock House	1·87	XVII.	Balmoral	2·76
„	Okehampton, Oaklands.....	...	„	Fyvie Castle	5·36
„	Hartland Abbey.....	1·81	„	Keith Station ..	5·25
„	St. Austell, Trevarna	1·98	XVIII.	Rothiemurchus .....	...
„	North Cadbury Rectory.....	2·01	„	Loch Quoich, Loan .....	...
VI.	Clifton, Stoke Bishop	2·88	„	Skye, Dunvegan	4·29
„	Ledbury, Underdown.....	2·58	„	Fortrose.....	1·82
„	Shifnal, Hatton Grange.....	3·23	„	Glencarron Lodge .....	...
„	Droitwich.....	2·24	XIX.	Tongue Manse	3·85
„	Blockley, Upton Wold.....	2·16	„	Melvich	2·51
VII.	Grantham, Saltersford.....	1·91	„	Loch More, Achfary	6·86
„	Louth, Westgate	3·00	XX.	Dunmanway, The Rectory ..	1·18
„	Bawtry, Hesley Hall	2·38	„	Mitchelstown Castle.....	1·30
„	Derby, Midland Railway	2·42	„	Gearahameen	3·20
VIII.	Nantwich, Dorfold Hall	3·73	„	Darrynane Abbey.....	2·76
„	Bolton, Queen's Park	1·06	„	Clonmel, Bruce Villa	·46
„	Lancaster, Strathspey	2·73	„	Roscrea, Timoney Park	1·16
IX.	Langsett Moor, Up. Midhope	...	„	Broadford, Hurdlestown.....	·93
„	West Witton ..	4·85	XXI.	Enniscorthy, Ballyhyland...	·78
„	Scarborough, Scalby	6·36	„	Rathnew, Clonmannon	1·89
„	Ingleby Greenhow	6·87	„	Hacketstown Rectory	·89
„	Mickleton	3·40	„	Ballycumber, Moorock Lodge	1·00
X.	Bellingham, High Green Manor	3·87	„	Balbriggan, Ardgillan	2·29
„	Ilderton, Lilburn Cottage ...	4·09	„	Castle Forbes Gardens.....	1·81
„	Keswick, The Bank.....	2·01	XXII.	Ballynahinch Castle.....	2·36
„	Orton	3·03	„	Woodlawn	1·31
XI.	Llanfrehfa Grange	2·65	„	Westport House	·90
„	Treherbert, Tyn-y-waun	2·62	„	Dugort, Slievemore Hotel ...	...
„	Carmarthen, The Friary	1·93	XXIII.	Enniskillen, Portora	1·52
„	Fishguard, Goodwick Station.	2·01	„	Dartrey [Cootehill]	1·51
„	Crickhowell, Tal-y-maes	2·00	„	Warrenpoint, Manor House ..	1·40
„	Birmingham WW., Tyrmynydd	3·12	„	Belfast, Cave Hill Road	2·07
„	Lake Vyrnwy .....	...	„	Glenarm Castle	2·21
„	Llangynhafal, Plas Drâw.....	4·60	„	Londonderry, Creggan Res...	1·83
„	Rhiwbryfdir	4·18	„	Milford Manse	2·53
„	Dolgelly, Bryntirion.....	4·22	„	Killybegs	2·79

Climatological Table for the British Empire, May, 1919.

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	82.0	23	41.6	3	70.8	47.5	48.4	70	125.8	38.0	.33	4	4.5
Malta	77.0	21	49.0	2	67.4	57.3	...	82	134.0	...	.57	6	5.0
Lagos	88.4	24	69.0	9	86.1	75.3	73.8	79	163.5	63.3	8.58	22	8.2
Cape Town	92.2	13	38.0	3	73.2	49.8	49.5	66	...	...	1.51	8	3.2
Johannesburg	71.3	11	31.6	7	64.8	43.3	38.1	66	...	29.2	.07	3	1.8
Mauritius	82.4	3, 9	56.1	22	79.2	65.3	63.3	74	..	49.5	.96	9	5.3
Bloemfontein	73.5	26	30.9	3	67.9	37.7	37.4	66	...	...	.37	1	2.6
Calcutta... ..	104.6	21	68.4	5	95.7	77.9	75.6	74	...	63.2	4.18	7	3.6
Bombay	93.4	31	78.2	3	91.5	81.3	76.2	74	138.0	.2.0	.00	0	2.9
Madras	108.2	21	76.5	...	99.3	81.3	73.2	65	165.6	75.2	.03	2	3.3
Colombo, Ceylon	89.9	9	72.2	26	87.7	76.8	75.2	82	157.6	71.0	20.01	24	7.9
Hongkong	88.6	21	69.0	24	80.6	73.6	70.7	82	...	...	6.95	13	8.2
Sydney	86.0	1	48.0	31	68.6	56.9	55.6	81	127.4	41.1	23.03	25	7.3
Melbourne	77.8	5	36.8	17*	62.3	46.8	46.8	74	128.5	30.8	1.66	15	5.7
Adelaide	80.7	5	41.7	16	66.1	51.0	49.0	72	140.2	29.8	2.28	13	5.6
Perth	77.1	2	39.7	9	69.0	51.8	49.3	67	136.3	31.7	2.03	8	3.4
Coolgardie	80.2	4	38.0	9	67.1	46.7	44.1	60	138.2	35.8	1.87	4	4.5
Brisbane	76.6	1	51.9	24	72.4	58.9	56.8	76	137.6	43.6	5.47	18	5.4
Hobart, Tasmania ..	71.8	5	35.9	26	57.9	43.5	41.9	70	113.5	30.3	.76	10	5.6
Wellington	63.4	4	33.6	29	57.0	46.2	45.1	79	114.0	...	1.92	9	6.5
Jamaica, Kingston ...	91.5	6	71.1	1	87.0	73.8	72.4	80	...	...	7.04	10	5.5
Grenade	88.0	1†	74.0	3	85.0	75.0	...	78	135.0	...	5.92	21	5.0
Toronto	91.8	29	38.8	8‡	64.6	45.8	43.3	71	126.0	33.9	5.15	14	5.8
Fredericton	78.5	22	26.0	10	63.1	38.5	39.1	61	...	...	5.28	12	5.1
St. John, N.B.	73.9	22	34.7	1	57.5	41.3	39.4	71	135.1	28.0	3.94	11	5.0
Victoria, B.C.	68.5	14	39.8	3	59.4	44.9	41.0	69	137.0	31.8	.79	11	5.2
Brisbane April	84.3	8	56.9	13	77.7	62.6	60.1	72	147.7	51.6	1.99	14	5.5
Wellington February	81.1	24	44.9	26	69.6	56.9	54.9	75	152.0	...	2.02	3	5.4

* and 27. † and 26. ‡ and 11.

COLOMBO, CEYLON.—Mean temp. 0°·2 below, dew point 0°·2 below, and R 6.87 in. above, averages. Mean hourly velocity of wind 5.1 miles, prevailing direction S.W. TSS on 8 days.

HONGKONG.—Bright sunshine, 137.5 hours. Mean hourly velocity of wind 11.6 miles, prevailing direction E. Mean temperature 76°·6.

Sydney.—R record for month of May, previous highest 20.87 in. in 1889. Only exceeded on three occasions in any month, the highest being 25.43 in April, 1841. Mean temp. 62°·7, highest on record for May.

Adelaide.—Mean temp. 0°·8 above, R .44 in. below, averages.

Perth.—R 2.74 in. below normal.

Brisbane.—R above normal, third highest for month in 39 years.