

Symons's Meteorological Magazine.

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WEATHER FORECASTS FOR AIR AND SEA.

The Times announces over the signature of Admiral J. F. Parry, Hydrographer of the Navy, that in view of the extent to which aircraft will have to rely for information as to weather conditions upon data from ships at sea, the Admiralty have issued a notice to mariners making arrangements for a new and comprehensive scheme. This involves the collection by wireless of meteorological data from ships in all parts of the world and at the same time the organisation of free transmission of weather bulletins from a sufficient number of wireless stations to admit of ships being constantly supplied with reliable weather reports and forecasts wherever they may be.

Six or eight observation stations are being established in the North-eastern Atlantic and ships are asked to supply to them information regularly at 1 a.m., 7 a.m. and 1 p.m. (G.M.T.) each day, besides sending additional messages when required to do so from areas in which peculiar conditions obtain. All ships fitted with the necessary apparatus will be called upon to assist, but on receipt of an intimation that another ship in the vicinity is reporting no message will be sent. This avoids not only duplication, but interference, a very necessary precaution with wireless telegrams. The technical difficulties of securing priority of transmission are considerable, but they can be overcome by co-operation. Should it prove impossible to decipher long-range telegrams, international "silent periods" might possibly have to be resorted to, but it is hoped that this may be avoided. Earnest endeavours are being made to secure international agreement in the matter of codes, signals, times and methods in general.

The organization which has been undertaken by the Meteorological Office involves the collection of observations by code messages, at Valencia and Malin Head. The data will then be transmitted to

London by wireless for co-ordination. Wireless bulletins will be issued, and may include either a weather report, that is an official statement of existing conditions in some particular area, or a weather forecast of the probable weather conditions, or both. A list is given of 42 wireless transmission stations in all parts of the world from which bulletins will be issued regularly. There are in addition certain other stations which will be available for the supply of information on demand. The British stations proposed are Poldhu, in Cornwall, and Cleethorpes, in Lincolnshire, both of which will shortly be ready for the purpose.

Quite apart from the enormous advance in the economic utilization of modern weather forecasting, the scheme holds almost boundless possibilities for the development of scientific meteorology, and we look forward with the highest hopes to the fruition of so important a scheme of co-operative effort.

ROYAL METEOROLOGICAL SOCIETY.

A MEETING of this Society was held on April 16th at 70, Victoria Street, S.W., Mr. F. J. W. Whipple, M.A., Vice-President, in the Chair.

Mr. A. A. Barnes, C.E., read a paper entitled, "Rainfall in England: the true long-average as deduced from symmetry." It had been usual to assume that the average annual rainfall during any period of 35 years can be adopted for obtaining the "long average" at any rain gauge, but the author considered that the fluctuations which occurred between such averages for various thirty-five year periods tended to show that the basis was somewhat uncertain. By an exhaustive analysis by mean of plotting the residual mass curves of the annual totals of thirty-eight rain gauges in England during 1856-1917, the author proved that variations of as much as 5 per cent. on each side of the mean were possible when dealing with successive thirty-five year periods. From the same records it was shown that far greater consistency in the value of the average can be obtained by taking periods symmetrical about the end of the year 1886. By means of tables and diagrams the author showed that that date was a critical one in regard to rainfall in England, and that as a rule the years before were relatively wetter than years subsequent to it. Hence the balancing of the earlier wet years by the later dry years established the principle of symmetry about that date. It was shown that by this method the maximum departure from normal resulting from taking each of the fifteen long periods symmetrical to the end of the year 1886 did not exceed 1 per cent. in the case of any of the thirty-eight gauges.

Mr. C. E. P. Brooks, M.Sc., read a paper entitled, "The Secular Variation of Rainfall." In order to obtain a measure of the secular variation of rainfall during the past 30 to 50 years, correlation coefficients were worked out between the annual rainfall at each station and "time," the measure of the latter being the number of years before or after the middle year of the series. This was done for 162 stations distributed over the globe, and the results were plotted on a map. The map showed that the greater part of the world was divided into a few definite regions of wide extent, in each of which the rainfall had been either increasing or decreasing. The most important area of increasing rainfall was temperate Eurasia (except the western sea-board); other areas were south-east South America and the south of Australia. Areas of decrease were the tropical regions as a whole, South Africa and the west coast of Europe. It was noted that the number of sunspots and also of solar prominences during the period in question had been decreasing. For a few stations records of longer period were dealt with, giving indications that the results obtained were due to a periodicity of upwards of 50 years.

A discussion followed in which Mr. F. J. W. Whipple thanked the authors for their valuable papers and hoped that Mr. Barnes would extend his investigation to include Scotland and Ireland. Mr. Carle Salter suggested that it would probably be found that the shorter phased rainfall fluctuations were local, the longer ones less so, and the longest possibly world-wide, as Mr. Brooks contended. Mr. R. H. Hooker and Mr. E. H. Chapman considered that the low correlation coefficients and the irregular nature of distribution in Mr. Brooks's results were highly inconclusive and well within the range of accidental error. Mr. H. E. Carter, who had examined some records outside the area considered by Mr. Barnes, said that the symmetry about the end of 1886 apparently held good in the Scottish Highlands, but did not exist at the two Irish stations considered. In a written communication, Dr. H. R. Mill called attention to a possible wave-length in the residual mass curves of about sixty years over the north of England and about forty years over the south, and suggested that it might be found that a symmetry existed about the minima of the curves similar to that which Mr. Barnes had proved to exist about the maxima. Mr. J. Baxendell wrote that the 1886 discontinuity found by Mr. Barnes probably arose from the synchronization of several periods of different length.

The following candidates were ballotted for and elected Fellows of the Society:—T. J. Arnold, Surg.-Lt. R. A. D. J. Bernhardt, R.N.V.R., G. T. Osborn, L. F. Richardson, A.M.I.E.E., G. L. Smith, C. A. Spon, Lieut. D. N. Stewart, R.A.F., R. L. Waterfield, and C. J. Wyke.

Correspondence.

To the Editor of Symons's Meteorological Magazine

DEW PONDS.

IN your note on Dew Pond construction in the February number, you describe Mr. G. Hubbard's experiment as being extremely interesting and successful. But, judging from the report in *The Times*, he only showed over again what has perhaps been known in India for centuries that a body placed in a pit and thermally isolated from the earth will fall to a lower temperature on a still clear night than surrounding bodies not isolated. He has neither shown that the surface of a "dew pond" will fall so low nor that dew will condense upon such a surface.

My immediate object in writing, however, is in reference to Mr. Hubbard's extraordinary statement that there are "natural dew ponds in the Colesberg district of Cape Colony, where in the absence of springs, streams, and rains, ponds have a higher water level in the morning than they had in the previous evening" (*Times Report*). Seeing that this statement is at variance with the common assertion (baseless, of course), that evaporation in South Africa goes on more rapidly by night than by day, and just to ascertain whether there was any sort of foundation in rumour or in imagination or otherwise, for what Mr. Hubbard is reported to have said, I wrote to the Resident Magistrate at Colesberg, quoting *The Times Report* and asking whether the claim had ever been made locally, to his knowledge, that the water in the ponds in his district increases during the night, and if so how the measurements were made. His reply is short and to the point:—

"I have the honour to inform you that from information received it would appear that there is no basis of truth in the statement made by Mr. G. Hubbard."

The rain maker has had a long and a flourishing career. Is he going to be supplanted at last by the dew maker?

Kimberley, South Africa, March 30th, 1919.

J. R. SUTTON.

RAINFALL OF JANUARY TO APRIL.

I HAVE to report 14·07 in. of rain for the past four months, the wettest January to April since 1877, when 14·23 in. fell. This was also the first year since then with the rainfall of all four months above the average.

January and February were wetter in 1900 and 1915, February and March much wetter in 1914 and 1916, and March in 1909 and 1912. But April had over 3 inches before only in 1871, 1878, 1879 and 1907, the wettest being 3·81 in., in 1878. J. ELLIS MACE.

View Tower, Tenterden, May 1st, 1919.

MAMMATO-CUMULUS.

METEOROLOGICAL writers appear to be almost unanimous upon at least one point and that is the "rare occurrence and fleeting duration of the mammilated or festooned appearance of cloud usually designated by the prefix "Mammato."

My own experience as an amateur Observer of cloud phenomena convinces me that the occurrence is by no means so rare as they might lead us to suppose, and that the modification in question is not confined exclusively to cumuliform clouds is shown by the fact that I personally recorded during the years 1911-1913 inclusive 101 occasions upon which mammato effects were observed and that these were distributed over six different types of cloud.

The descriptions usually met with are not very lucid and some confusion on the subject evidently exists in the minds of meteorologists, unless it is that their powers of observation are at fault, for most authors who consider it worth their while to discuss cloud forms at any length (and they are few), maintain the idea of the rarity of the phenomenon, whilst Sir J. W. Moore, in his "Meteorology" testifies to having often seen it and W. M. Davis in "Elementary Meteorology" conveys the impression that there is nothing unusual in the occurrence.

The cloud effects recorded by me as "Mammato" are in agreement with those indicated in the photographic illustrations under that head in Capt. Cave's "The Forms of Clouds," in the "Meteorological Glossary," and in Dr. Lockyer's article in Cassell's "Nature Book," respectively.

I have already fourteen instances recorded during the first four months of this year, and the face of the sky here during the evening of Friday, 25th April, was among the most ominous and threatening I have ever seen. The Mammato effect could scarcely have failed to make a vivid impression upon the mind of the most casual observer.

It is not my intention to discuss here the general significance of this phenomenon, but it is not without interest to record that we experienced a respectable thunderstorm within twenty-four hours and a prolonged and destructive blizzard on the second day, neither of which appear to have been anticipated in the forecasts issued to the Press.

On this occasion at least the sequence of severe weather more than justified the conclusion of the late Rev. W. Clement Ley, viz., that "the cloud seems to be one indicating the very worst possible description of weather," and of that other great student of clouds, Mr. A. W. Clayden, who says, that "it is an indication of very disturbed conditions."

A. S. MARTIN-SMITH.

71, Wood Street, Barnet, April 28th, 1919.

SNOWFALL OF APRIL 28th.

RAIN here began about 9.30 a.m. (G.M.T.), gradually giving a steady downpour of rain and sleet. Before 4 p.m. it almost ceased. About 4.10 an ashen mist supervened, with fine snow, from north-west. The rain began with wind from north-west, but it backed slowly to south-east by about 1 p.m. and remained there until 4 p.m. By 4.30 it was snowing fast. By 4.45 p.m. a dense yellow fog made it almost dark—evidently London smoke rolled back by the sudden wind reversal. A paragraph in the *Westminster Gazette* of the 29th indicates a closely parallel reversal at Edinburgh just four hours previously.

Snow fell nearly all night and at 6 a.m. several measurements showed a depth of 8 inches or over. Probably fully 10 inches fell, allowing for what certainly melted. The 8 inches melted out to .82 in.

J. EDMUND CLARK.

Asgarth, Riddlesdown Road, Purley, Surrey, April 28th, 1919.

SNOW and sleet began at 9.30 a.m. yesterday and fell lightly until the afternoon, mist and yellow fog at 4 p.m. Snow fell heavily from 7 p.m. and all night. I measured 1.71 in. at 9 a.m. this morning for the previous twenty-four hours. The depth of the undrifted snow was $8\frac{1}{2}$ inches. The ground was still covered with snow at 3.30 p.m. The above are local mean times and not summer time.

E. R. TAYLOR.

Can Hatch, Burgh Heath, Tadworth, Surrey April 28th, 1919.

UNUSUAL OPTICAL PHENOMENON.

A RATHER unusual phenomenon was noticed here on Wednesday, April 23rd, at 17 h. 30 m. The sky was overcast with cirro-nebula, which was only discernible by its slight milkiness and which was evidently of no great thickness. An arc of which the colours were almost as bright as those of a rainbow, appeared not far from the zenith. I at first thought it was an arc of contact to a 46° halo, the red being on the outside, but estimated its distance from the sun at from 55° to 60° . Even supposing that I over-estimated this, it does not account for the total absence of halos, for the production of which the conditions seemed extremely favourable. I should add that there were some thin alto-cumulus clouds to the north of the arc moving from the north or north-west. I should be glad of some explanation of this.

F. HEYWOOD.

34, Longford Avenue, Stretford, Manchester, May 1st, 1919.

SNOW FOLLOWING FINE WEATHER.

ACTING on Mr. Dines's suggestion, I sent him further dates, showing the same sequence, and in reply he says : "The pressure conditions on these occasions were of a very variable type, so that the simple explanation which I suggested will not go far to explain the phenomena."

Corroboration of my note followed five days after. March 10th was a warm mild day (though not sunny) with a maximum temperature of 55° : on March 12th the wind shifted to the north, and there was a heavy snowstorm. A sudden rise of temperature with a soft warm atmosphere is frequently a signal for a cold snap. This was shown on April 18th and 19th, when there was a sudden jump to a maximum on both days of 66°. A cold north-east wind immediately followed and a minimum of 31° occurred on the 21st and 22nd.

Dollarward House, Cirencester, May 1st, 1919. C. P. HOOKER.

METEOROLOGICAL NEWS AND NOTES.

THE ROYAL METEOROLOGICAL SOCIETY, it was announced at the meeting on April 16th, contemplate holding a special summer meeting at Kew Observatory, Richmond, by the invitation of the Director of the Meteorological Office. The date has been provisionally fixed for Wednesday, July 2nd.

METEOROLOGICAL OBSERVATIONS AT
LU-KIA-PANG, CHINA, FOR 1918.

By REV. J. DE MOIDREY S.J.

(concluded from page 29).

VI.—Rainfall.

	(a). INTENSITY.									DAYS WITH		
	mm. 0.1—0.9	1.0—2.9	3.0—4.9	5.0—9.9	10.0—19.9	20.0—39.9	40.0—59.9	60.0 & over		Rain.	Snow.	Total.
Jan.	—	—	—	—	—	—	—	—		10	1	11
Feb.	4	5	2	—	—	—	—	—		15	—	15
Mar.	10	2	—	1	5	1	—	—		14	—	14
April	9	1	2	5	1	1	—	—		10	—	10
May	6	3	2	2	—	—	—	—		14	—	14
June	3	4	3	1	1	1	2	—		12	—	12
July	5	—	1	1	2	2	—	1		9	—	9
Aug.	2	1	1	3	1	1	—	—		11	—	11
Sept.	3	4	2	—	1	1	—	—		5	—	5
Oct.	4	2	—	—	1	—	1	—		13	—	13
Nov.	5	3	1	1	5	1	—	—		19	—	19
Dec.	3	2	2	5	5	2	—	—		132	1	133
Year	54	27	16	19	22	10	3	1				

VI.—(con.)

(b.) *Total Rainfall. Millimetres.*

	8 p.m. —8 a.m.	8 a.m. —8 p.m.	Total.
Jan. ..	—	—	—
Feb. ..	8.0	10.2	18.2
Mar. ..	43.5	51.9	95.4
April ..	55.0	30.3	85.3
May ..	21.7	14.8	36.5
June ..	127.8	122.1	249.9
July ..	74.0	88.7	162.7
Aug. ..	41.7	79.3	121.0
Sept. ..	5.5	63.8	69.3
Oct. ..	55.1	16.9	72.0
Nov. ..	51.8	71.7	123.5
Dec. ..	74.8	89.3	164.1
Year ..	558.9	639.0	1197.9

(c.) *Rainless Periods of 10 days or more, excluding dew.*

	Began.	Ended.	Lasted.
Dec. 15, 1917	Feb. 4	52 days.	
Feb. 16	Feb. 26	11	„
July 20	Aug. 10	22	„
Sept. 29	Oct. 20	22	„
Dec. 27	Jan. 7	12	„

VIII.

Mean Duration of Bright Sunshine. Hours.

	Fore-noon.	After-noon.	Total.	Per-centage of possible	Mean amount of Cloud.
Jan. ..	3.4	2.8	6.2	60	0.4
Feb. ..	2.2	1.7	3.9	35	0.6
Mar. ..	2.5	1.9	4.4	37	0.6
April ..	2.0	1.9	3.9	30	0.7
May ..	3.5	3.1	6.6	48	0.5
June ..	2.2	1.9	4.1	29	0.7
July ..	3.7	3.5	7.2	51	0.5
Aug. ..	4.1	3.9	8.0	60	0.4
Sept. ..	3.4	3.4	6.8	55	0.4
Oct. ..	3.5	3.0	6.5	57	0.4
Nov. ..	1.7	1.7	3.4	33	0.7
Dec. ..	1.2	0.9	2.1	20	0.8
Year ..	2.8	2.5	5.3	43	0.6

VII.—Wind. (a)

Mean Velocity at 8 a.m., 2 p.m. and 8 p.m. Metres per second.

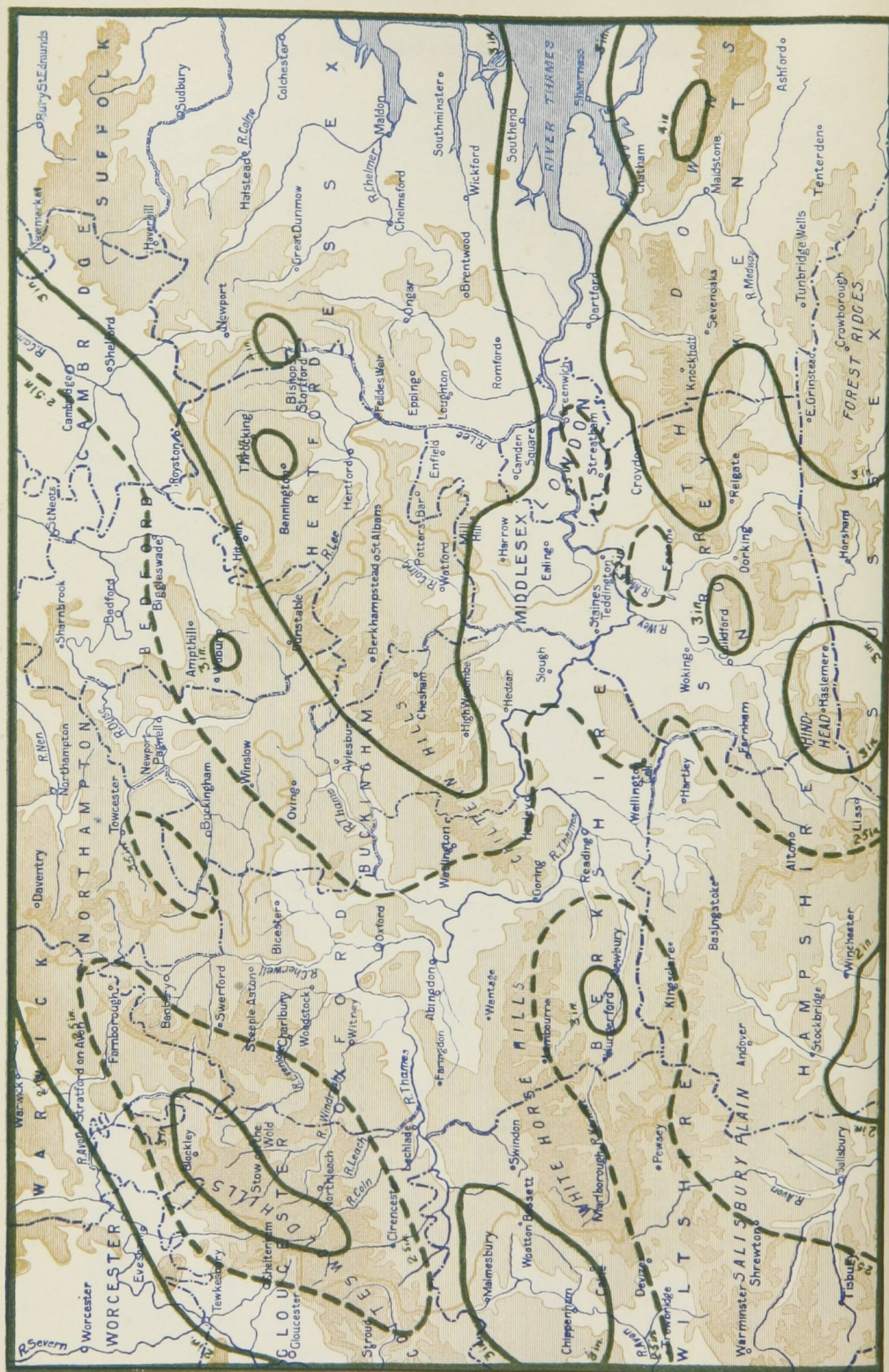
	Mean.	Min.	Max.
Jan. ..	4.0	1.2	6.9
Feb. ..	3.8	2.2	7.8
Mar. ..	3.7	1.9	8.2
April ..	3.7	2.1	8.8
May ..	3.3	1.6	7.0
June ..	3.1	0.8	6.1
July ..	3.4	0.7	9.4
Aug. ;..	—	—	—
Sept. ;..	—	—	—
Oct. ..	3.1	0.5	6.3
Nov. ..	2.9	0.7	6.1
Dec. ..	3.8	1.0	6.0
Year ..	3.5	0.5	9.4

VII.—Wind. (b.) *Direction. Percentage Frequency.*

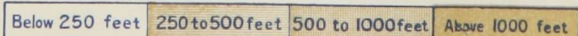
	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.	Vari-able.
Jan.	17	9	1	7	3	8	9	32	11	3
Feb.	28	9	14	11	7	6	4	19	1	0
Mar.	13	25	18	16	4	5	2	16	1	0
April	13	16	19	20	9	7	5	9	0	1
May	4	4	15	33	11	9	5	16	3	0
June	3	2	10	33	25	10	4	4	6	1
July	7	7	16	37	10	2	8	6	5	0
Aug.	—	—	—	—	—	—	—	—	—	—
Sept.	1	9	18	44	20	3	1	2	0	0
Oct.	23	14	15	10	7	4	10	14	2	1
Nov.	21	18	11	7	6	2	6	24	3	1
Dec.	27	24	10	3	4	2	4	24	2	0
Year	14	12	13	20	10	5	5	15	3	1

The anemometer was repaired in August.

THAMES VALLEY RAINFALL, APRIL, 1919.



ALTITUDE
SCALE



SCALE OF MILES



THE WEATHER OF APRIL.

THE weather of April was of the proverbially changeable character, and, for the fourth month in succession, the mean temperature over the country generally was appreciably below the average. The deficiency of warmth last month did not, however, extend to the whole country. Along the east coasts of Great Britain the mean values were quite equal to the normal, and in a few places, *e.g.*, Aberdeen and Tynemouth, the mean of all the daily maxima was distinctly high for the time of year.

At the opening of the month when an anticyclone extended temporarily over the country from the Atlantic, sharp frost occurred in most districts, the temperatures recorded on the 1st being in some places the lowest of the whole month. After the 3rd, and for a period of nearly ten days, the winds were affected by cyclonic disturbances moving along far to the northward of these islands, and were, therefore, mainly W. or S.W., with temperatures rather above the normal. On the 7th the thermometer in the south-east of England rose slightly above 60°, and on the 11th similar readings were recorded in parts of the United Kingdom. Between the 14th and 16th the weather was influenced by a deep depression whose centre moved eastward across the northern parts of Ireland and England, the wind in its rear increasing to a gale from the N.W. on many portions of our western and northern coasts. The departure of the storm system was followed by the extension of a large anticyclone from the Atlantic, and on the 18th and 19th, when a wave of warm air from the south-westward was accompanied by much sunshine, the thermometer rose to between 65° and 70° in many parts of Great Britain, and slightly exceeded 70° in a few isolated places. On the 20th a shift of wind to the N. occasioned a sudden drop in temperature, the maximum readings in the south-east of England being about 15° lower than those of the previous day. Sharp frost was experienced on the nights of the 20th and 21st, the sheltered thermometer falling below 25° in several districts, and touching 22° at Rhayader.

The cold weather continued until practically the end of the month, and between the 26th and 28th, the conditions were, for so advanced a period in the season, more inclement than in any recent year, with the exception of 1908, when a touch of winter was also experienced shortly after Easter. The disturbing influences last month were supplied by a large depression which moved southward across northern Europe and by small secondary systems which were developed over Great Britain and the North Sea. On the 27th light west winds and steady rain were followed by northerly gales and a heavy fall of snow, the depth in several parts of London and the home counties amounting to between 10 and 12 inches. On the same night a sharp frost was experienced, the thermometer falling to at least 27° in many places and reaching 22° at West Linton.

The distribution of rainfall was irregular. Less than 2 inches fell along the east coast of Great Britain from the Firth of Tay to East Anglia and along the south coast east of Selsey. The area below 2 inches also embraced the greater part of the Midlands and the north of England except the Lake District, and the Pennines. A large triangular area with more than 3 inches, including patches above 4 inches, lay to the north and east of London. Small areas in the Welsh mountains and the Lake District had more than 5 inches of rain, and in Scotland there was a considerable area west of the Caledonian Canal with more than 10 inches. In Ireland the rainfall was generally light, 2 inches being exceeded only at elevated stations. The general rainfall expressed as a percentage of the average was :—England and Wales, 124 ; Scotland, 138 ; Ireland, 72 ; British Isles, 113.

In London (Camden Square) the mean temperature was 45°·9, or 2°·2 below the average. The duration of sunshine was 100°·1 hours and of rainfall, 57·7 hours. It was the wettest April in 62 years' record, with the exception of April, 1878, when 4·97 in. of rain fell. The total rainfall of the first four months of 1919 was 94 per cent. above the average. Evaporation, 1·06 in.

RAINFALL TABLE FOR APRIL, 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	1.74	3.93	+2.19	226	1.59	27	18
Tenterden.....	Kent	1.77	3.33	+1.56	188	.89	27	13
Arundel (Patching).....	Sussex	1.82	2.29	+ .47	126	.58	27	11
Fordingbridge (Oaklands)...	Hampshire	1.92	2.34	+ .42	122	.94	13	12
Oxford (Magdalen College)...	Oxfordshire	1.67	2.21	+ .54	132	.83	27	16
Wellingborough (Swanspool)...	Northampton	1.78	1.82	+ .04	102	.64	27	16
Bury St. Edmunds (Westley)...	Suffolk	1.62	3.56	+1.94	220	1.08	27	17
Geldeston [Beccles].....	Norfolk	1.55	1.80	+ .25	116	.28	15	17
Polapit Tamar [Launceston]...	Devon	2.34	3.19	+ .85	136	.73	14	17
Rousdon [Lyne Regis]	"	2.39	2.28	— .11	95	.46	14	14
Ross (Birchlea).....	Herefordsh.	2.09	1.60	— .49	77	.50	27	15
Church Stretton (Wolstaston)...	Shropshire	2.20	1.73	— .47	79	.47	15	9
Boston	Lincoln	1.57	2.20	+ .63	140	.55	27	18
Worksop (Hodsock Priory)...	Nottingham	1.62	1.70	+ .08	105	.31	27	17
Mickleover Manor	Derbyshire	1.77	1.40	— .37	79	.41	27	16
Congleton (Buglawton Vic.)...	Cheshire	1.86	1.83	— .03	98	.29	27	19
Southport (Hesketh Park)...	Lancashire	1.84	1.37	— .47	74	.22	13, 14	18
Wetherby (Ribston Hall)...	York, W.R.	1.85	1.19	— .66	64	.27	27	6
Hull (Pearson Park)	" E.R.	1.69	1.75	+ .06	104	.82	27	13
Newcastle (Town Moor)	Northland	1.84	1.79	— .05	97	.33	14	16
Borrowdale (Seathwaite)	Cumberland	6.91	12.09	+5.18	175	...	...	...
Cardiff (Ely).....	Glamorgan	2.50	2.13	— .37	85	.58	13	20
Haverfordwest.....	Pembroke	2.82	3.18	+ .36	113	.65	28	14
Aberystwyth (Gogerddan)...	Cardigan	2.48	3.77	+1.29	152	.73	26	16
Llandudno	Carnarvon	1.79	1.97	+ .18	110	.30	26	18
Cargen [Dumfries]	Kirkcudbrt.	2.50	2.20	— .30	88	.65	13	17
Marchmont House	Berwick.....	2.28	1.45	— .83	64	.41	27	9
Girvan (Pinmore)	Ayr	2.81	2.44	— .37	87	.45	15	21
Glasgow (Queen's Park)	Renfrew	1.86	1.14	— .72	61	.26	10	14
Islay (Eallabus)	Argyll	2.64	3.73	+1.09	141	.80	7	18
Mull (Quinish).....	"	2.98	3.92	+ .94	131	.80	10	25
Loch Dhu	Perth.....	4.38	4.20	— .18	96	.85	10	19
Dundee (Eastern Necropolis)...	Forfar	1.93	2.02	+ .09	105	.59	14	13
Braemar	Aberdeen	2.30	2.16	— .14	94	.82	15	9
Aberdeen (Cranford)	"	2.23	3.16	+ .93	142	.81	14	17
Gordon Castle	Moray	1.74	3.08	+1.34	177	...	...	...
Drumnadrochit	Inverness	1.85	3.99	+2.14	215	.70	25	23
Fort William	"	3.65	7.77	+4.12	213	2.57	10	25
Loch Torridon (Bendamph)...	Ross	4.70	10.84	+6.14	231	2.03	10	25
Dunrobin Castle	Sutherland	2.02	2.70	+ .68	134	.50	27	17
Glanmire (Lota Lodge)	Cork	3.23	1.25	—1.98	39	.43	14	14
Killarney (District Asylum)...	Kerry	3.46	2.98	— .48	86	.82	14	25
Waterford (Brook Lodge)...	Waterford	2.68	1.13	—1.55	42	.25	13	12
Nenagh (Castle Lough).....	Tipperary....	2.54	1.65	— .89	65	.38	13	20
Ennistymon House	Clare	2.81	1.78	—1.03	63	.27	26	20
Gorey (Courtown House)	Wexford	2.37	1.46	— .91	62	.26	3	14
Abbey Leix (Blandsfort)	Queen's Co.	2.54	1.45	—1.09	57	.31	14	16
Dublin (Fitz William Square)...	Dublin	2.03	.90	—1.13	44	.22	26	17
Mullingar (Belvedere)	Westmeath	2.37	1.77	— .60	75	.35	12	14
Crossmolina (Enniscoe).....	Mayo	3.13	3.68	+ .55	118	.39	9, 26	24
Cong (The Glebe).....	" .....	...	...	...	...	...	...	...
Collooney (Markree Obsy.)...	Sligo	2.52	3.10	+ .58	123	.38	26	25
Seaforde	Down.....	2.76	1.46	—1.30	53	.56	13	13
Ballymena (Harryville).....	Antrim	2.57	2.32	— .25	90	.39	13	20
Omagh (Edenfel)	Tyrone	2.50	2.10	— .40	84	.26	25	24

SUPPLEMENTARY RAINFALL, APRIL, 1919.

Div.	STATION.	Rain inches.	Div.	STATION.	Rain inches
II.	Sevenoaks, Speldhurst Av.	3·14	XI.	Lligwy	1·79
„	Ramsgate	2·66	„	Douglas, Isle of Man	2·31
„	Hailsham	2·90	XII.	Stoneykirk, Ardwell House... ..	2·08
„	Totland Bay, Aston House... ..	1·37	„	Carsphairn, Shiel	4·29
„	Stockbridge, Ashley	2·12	„	Langholm, Drove Road	3·10
„	Grayshott	3·07	XIII.	Selkirk, The Hangingshaw.. ..	3·01
„	Upton Nervet	2·15	„	North Berwick Reservoir	2·27
III.	Harrow Weald, Hill House... ..	2·76	„	Edinburgh, Royal Observaty.	3·03
„	Pitsford, Sedgebrook... ..	1·77	XIV.	Biggar	4·09
„	Woburn, Milton Bryant.....	3·11	„	Maybole, Knockdon Farm	2·01
„	Chatteris, The Priory.....	2·18	XV.	Shiskine	2·79
IV.	Elsenham, Gaunts End	3·65	„	Ardgour House	12·63
„	Rayleigh .....	...	„	Oban.....	3·88
„	Colchester, Hill Ho., Lexden ..	3·34	„	Holy Loch, Ardnadam.....	3·97
„	Aylsham, Rippon Hall	2·19	„	Loch Venachar	2·70
„	Swaffham	1·87	XVI.	Glenquey	2·90
V.	Bishops Cannings	2·45	„	Loch Rannoch, Dall	2·03
„	Weymouth.....	1·43	„	Blair Atholl	1·49
„	Ashburton, Druid House.....	1·71	„	Coupar Angus	1·59
„	Cullompton	2·60	„	Montrose, Sunnyside Asylum.	3·15
„	Lynmouth, Rock House ..	2·86	XVII.	Balmoral	3·28
„	Okehampton, Oaklands... ..	4·02	„	Fyvie Castle	2·47
„	Hartland Abbey.....	1·96	„	Keith Station ..	4·77
„	St. Austell, Trevarna	4·10	XVIII.	Rothiemurchus	3·69
„	North Cadbury Rectory.....	2·35	„	Loch Quoich, Loan	26·80
VI.	Clifton, Stoke Bishop	2·21	„	Skye, Dunvegan	6·41
„	Ledbury, Underdown.....	1·83	„	Fortrose.....	3·25
„	Shifnal, Hatton Grange.....	2·05	„	Glencarron Lodge	11·43
„	Droitwich	1·90	XIX.	Tongue Manse	4·32
„	Blockley, Upton Wold.....	3·15	„	Melvich	2·92
VII.	Grantham, Saltersford.....	1·87	„	Loch More, Achfary	14·42
„	Louth, Westgate	1·91	XX.	Dunmanway, The Rectory ..	3·02
„	Bawtry, Hesley Hall	1·55	„	Mitchelstown Castle.....	1·61
„	Derby, Midland Railway	1·20	„	Gearahameen	6·50
VIII.	Nantwich, Dorfold Hall	2·13	„	Darrynane Abbey.....	2·60
„	Bolton, Queen's Park	3·11	„	Clonmel, Bruce Villa	1·63
„	Lancaster, Strathspey	1·74	„	Roscrea, Timoney Park	1·61
IX.	Langsett Moor, Up. Midhope ..	1·60	„	Broadford, Hurdlestown.....	1·83
„	West Witton ..	1·86	XXI.	Ennisoorthy, Ballyhyland... ..	1·96
„	Scarborough, Scalby	2·13	„	Rathnew, Clonmannon	1·16
„	Ingleby Greenhow	2·20	„	Hacketstown Rectory	2·45
„	Mickleton .....	...	„	Ballycumber, Moorock Lodge ..	1·19
X.	Bellingham, High Green Manor ..	2·22	„	Balbriggan, Ardgillan	1·25
„	Ilderton, Lilburn Cottage ...	1·85	„	Castle Forbes Gardens.....	1·78
„	Keswick, The Bank.....	3·34	XXII.	Ballynahinch Castle.....	3·14
„	Orton	2·95	„	Woodlawn	60
XI.	Llanfrechfa Grange	1·84	„	Westport House	2·74
„	Treherbert, Tyn-y-waun	4·57	„	Dugort, Slievemore Hotel	6·03
„	Carmarthen, The Friary	2·05	XXIII.	Enniskillen, Portora	1·89
„	Fishguard, Goodwick Station.	1·71	„	Dartrey [Cootehill] .....	...
„	Crickhowell, Tal-y-maes	3·30	„	Warrenpoint, Manor House ...	1·18
„	Birmingham WW., Tyrmynydd ..	3·90	„	Belfast, Cave Hill Road	1·55
„	Lake Vyrnwy	3·57	„	Glenarm Castle	2·02
„	Llangynhafal, Plas Drâw.....	2·65	„	Londonderry, Creggan Res... ..	3·15
„	Rhiwbryfdir	7·67	„	Milford Manse	2·87
„	Dolgelly, Bryntirion.....	4·92	„	Killybegs .....	...

ERRATA.—Plas Drâw, 4·70 should be 6·70 in March.

Climatological Table for the British Empire, November, 1918.

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	57·8	1	28·5	9	49·1	37·1	40·6	91	60·5	24·6	2·21	16	7·7
Malta	77·0	9	52·0	30	67·3	58·9	...	85	121·5	43·0	4·67	14	7·5
Lagos	98·3	7	70·0	4	89·2	76·0	75·2	76	161·3	67·0	2·05	7	6·1
Cape Town	94·0	3	44·8	19	74·3	55·0	52·5	65	...	...	2·19	9	3·7
Johannesburg	82·6	7	42·8	3	74·4	54·0	48·5	64	...	43·0	4·24	13	5·3
Mauritius	86·4	*29	63·2	25	82·6	67·8	63·2	69	...	58·2	1·35	11	5·5
Bloemfontein	88·5	6	40·7	16	80·5	52·3	49·6	53	...	...	2·56	9	4·1
Calcutta	90·3	5	57·7	26	84·5	65·2	63·0	69	...	48·4	·04	1	4·0
Madras	87·6	23	70·9	11	83·7	75·0	75·8	88	161·6	60·5	39·18	23	7·6
Colombo, Ceylon	88·9	3	71·7	7	86·5	74·2	73·6	83	159·2	68·1	5·10	21	7·4
Hongkong	82·5	6	59·7	19	72·7	66·1	62·5	78	...	...	5·08	13	7·6
Sydney	94·3	14	49·7	29	73·2	59·6	54·4	66	139·0	45·0	1·27	10	5·8
Melbourne	94·0	23	39·8	18	68·9	50·1	46·5	60	144·2	31·0	·52	7	5·4
Adelaide	97·5	22	44·1	5	79·2	54·6	48·0	46	155·0	31·7	·26	4	3·7
Perth	94·6	24	48·0	13	77·0	59·2	55·8	65	156·4	37·1	·52	12	5·0
Coolgardie	102·5	21	49·8	13	88·9	59·0	46·4	32	167·0	47·2	·00	0	3·1
Brisbane	92·3	1	56·5	30	84·0	64·4	61·1	65	153·5	51·6	2·16	7	4·3
Hobart, Tasmania	84·4	9	39·2	29	64·0	48·4	43·4	59	146·0	32·9	1·23	14	6·0
Wellington	69·7	14	40·2	4	61·5	49·9	47·1	73	151·0	30·1	3·34	11	6·4
Jamaica, Kingston	90·3	15	66·1	9	87·3	70·7	69·2	79	...	...	·71	3	3·8
Grenada	86·0	5, 26	73·0	† 9	84·0	75·0	...	80	135·0	...	6·54	25	4·5
Toronto	65·7	7	17·8	26	48·4	35·5	35·3	85	116·9	14·0	1·34	15	7·2
Fredericton	58·0	1	12·0	‡ 26	40·8	26·1	27·6	79	...	...	3·90	11	5·9
St. John, N.B.	54·7	1	13·5	27	42·1	31·1	30·3	76	108·7	10·7	5·34	11	5·7
Victoria, B.C.	54·5	5	34·0	‡ 26	49·3	41·5	41·0	86	110·0	24·0	3·28	18	7·4

* and 30.

† 10.

‡ 27.

Johannesburg.—Bright sunshine 261·3 hours.

COLOMBO, CEYLON.—Mean temp. 80°·3, or 0°·8 above, dew point 0°·7 above, and R 5·84 in. below, averages. Mean hourly velocity of wind 2·6 miles. TS on 30th.

HONGKONG.—Mean temp. 69°·2. Bright sunshine 124·6 hours. Mean hourly velocity of wind 11·3 miles.

Melbourne.—Mean temp. 1°·8 below, and R 1·75 in. below, averages.

Adelaide.—Mean temp. normal and R ·91 in. below average.

Perth.—R ·25 in. below average.

Coolgardie.—Temp. 3°·2 above the average.

Brisbane.—Temp. 0°·2 above average.

Wellington.—Mean temp. 1°·2 below, and R ·22 in. below, averages. Bright sunshine, 191·8 hours. Heavy N.W. gale on 7th.