Symons's

Meteorological Magazine.

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SYMONS'S METEOROLOGICAL MAGAZINE.

The present number completes Volume 54 of *Symons's Meteorological Magazine*, and marks also the end of a phase in its long history. Founded in 1866 by the late Mr. G. J. Symons as a means for the prompt publication of rainfall statistics for the British Isles, in continuation of the "Rainfall Circulars" issued for two or three years previously, the Magazine rapidly extended its scope to embrace the whole field of meteorological science. Although circulating in all parts of the world, *Symons's Meteorological Magazine* has always kept to its founder's original aim of being primarily the organ of the British Rainfall Organization and as such the medium for the discussion of meteorological matters from the point of view of the large body of volunteer Observers who have given British Climatology such a unique character.

Throughout the greater part of its career there can be no question that the Magazine has carried out this object the more effectively by being entirely under the personal control of its successive editors. It played a large part in bringing into being and encouraging the corps of voluntary meteorological Observers in the British Isles, and that in the course of time official meteorology in this country came to build largely upon this firm foundation is a tribute to the foresight and wisdom with which Mr. Symons shaped his policy.

In July, 1919, when the British Rainfall Organization became part of the official meteorological service of Great Britain, the continuance of this magazine on its present lines, with the general aim of promoting among Observers interest in the science of meteorology, was secured by agreement. In 1916 the Meteorological Office had commenced the publication of a leaflet, for distribution principally among observers, entitled the "Meteorological

Office Circular." This provided a convenient means for the publication of official notices, changes in the observing staff, brief reviews of recent publications and other matter of general meteorological interest. It has now been decided that it is no longer necessary to continue the "Meteorological Office Circular" as a separate publication, and arrangements have accordingly been completed for the amalgamation of the two periodicals under the title of "The Meteorological Magazine." In order to avoid any unnecessary break of continuity the new combined magazine will be issued in 1920 as volume **55**. Mr. M. de Carle S. Salter, Superintendent of the British Rainfall Organization, to whom *Symons's Meteorological Magazine* has been entrusted since the retirement of Dr. H. R. Mill, in July, 1919, will be joined in the editorship by Mr. F. J. W. Whipple, Superintendent of the Statistical Division of the Meteorological Office.

Whilst becoming, as a matter of course, the organ of the combined meteorological services, the Magazine will, it is hoped, fully maintain its traditional character, as a channel of communication between amateur meteorologists.

The design for the new cover, a reproduction of which forms the frontispiece of this volume, was drawn by Mr. W. Hayes, and embodies suggestions due to Sir Napier Shaw. The bringing together of the four portraits, respectively of Admiral Fitzroy, Edward Sabine, Sir Richard Strachey and George James Symons, symbolizes effectively the convergence into a common track of the work of these pioneers of meteorological science and organization.

MACEDONIAN METEOROLOGY.

THE following notes describing meteorological phenomena of a local nature in Macedonia have been forwarded to us by Mr. A. Harrison, who has recently returned to England after two and a half years on the Salonica front.

MOUNTAIN CLOUD.

During the winter of 1916-1917 a heavy canopy of cloud enveloped the summit of the Belashitja range continuously for some fifteen days. The wind was moderate from the north and it appeared to me that the small amount of moisture in the air current was condensed on the snow-capped peaks and poured over to the southern side.

By day the cloud spread to the Zenith, but at night it decreased, until by dawn, only a narrow line of cloud remained. Sometimes a thin film of snow fell on the higher slopes. The cloud finally dispersed at the commencement of a period of broken weather.

Cloud Formation in Salonica.

On a clear bright day in March, 1918, artillery fire caused a dense column of black smoke to arise from a village on the Struma plain. The pillar ascended in a straight column to a great altitude finally spreading out in a canopy above. The air was motionless and visibility remarkably high. Soon, just above the smoke canopy a small white cumulus appeared. This steadily increased in size and about an hour later presented a massive appearance suggestive of a thunder-shower. Then the smoke column began to thin and at the same time the cloud stood out boldly against the clear blue. At about 5 p.m. a light breeze from the west drifted the cumulus away in an easterly direction. This is a clear case of an ascensional column of moisture laden air (the sky otherwise being quite cloudless) producing a cumulus cloud.

Thunderstorms in Macedonia.

Thunderstorms were of frequent occurrence during the month of May both in 1917 and 1918 among the hills. They were all of local origin, occurring between the hours of 2 and 5 p.m. Cumulus formed on the summits of the highest mountains, increasing steadily, until suddenly becoming condensed, when heavy rain and hail fell, accompanied by lightning and thunder. Generally the storms were of small compass and moved along the course of the Struma, several raging at once within a small area. The clouds were of great altitude, as lightning flashes overhead were not followed by thunder before ten or twelve seconds had elapsed and then the sound was muffled and indistinct. At sunset the sky was clear. The storms were mainly preceded by sharp gusts of wind.

In August, 1917, during a hot rainless spell a heavy cumulus suddenly formed over Lake Doiran. It assumed a nimbus appearance and considerable thunder and lightning took place. The cloud mass passed on overhead, with muffled thunder and every appearance of rain, but none fell. Rain had not fallen for some days before this, neither did any occur until five weeks later. The wind was westerly and the air dry, whilst the temperature maximum averaged about 95°. Could it be that the rain was evaporated before reaching the earth?

The autumn thunderstorms were more of the "travelling" kind, coming in from the sea and were always accompanied by a lot of wind. Watching the approach of such storms, I have heard thunder at a distance of twenty miles, there being some hundred seconds elapse between flash and peal. The thunder was remarkably audible, but perhaps the sea carried the sound across and the neighbouring hills caught the vibrations, acting as a sounding board.

THE RAINFALL OF 1919.

A Preliminary survey of the 3,000 returns of rainfall in 1919 up to the present received enables us to form some idea of the general distribution of the year's fall in relation to the average. For this purpose we have confined ourselves to examining such records as have been carried on for a sufficient period to yield average values for 35 years. Of these some 230 are so far available.

The rainfall over England was nearly everywhere in excess of the average, the only important exception being in the north-west, but the excess was nowhere large, only reaching 10 per cent. in scattered patches, the largest of which extended from Malvern to the coast of south Lincolnshire. In the centre rather more than 20 per cent. excess occurred in Leicestershire. The English wet area was continued westward across North Wales, where part of Denbigh and Flint had more than 10 per cent. excess, but in South Wales the severe drought of the summer and autumn brought the year's rainfall well below the average, the deficiency being more than 10 per cent. in place. Parts of the east and north of Scotland had more than the average fall, the wettest districts being northern Aberdeenshire and the Orkneys, but from Inverness southward throughout the Scottish Midlands, and well into the north of England, the rainfall of the year was considerably below the average, the deficiency culminating in central Inverness-shire and Perthshire, where it exceeded 20 per cent. In Ireland the only areas with rainfall above the average were parts of the northern counties and a small patch in Co. Kildare. In the centre and south the fall was more than 10 per cent. below the average, the deficiency being more than 20 per cent. in Co. Cork and in eastern Galway and Kerry.

The general rainfall for the greater divisions of the country during each month was as follows :—

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Eng. & W....	155	103	196	124	41	62	74	85	79	59	82	155
Scotland ..	94	38	105	138	41	139	36	86	112	57	110	130
Ireland	122	69	112	72	120	105	45	81	97	41	79	156
British I. ...	124	71	143	113	62	96	55	84	94	54	91	147

Taking the British Isles as a whole the year, although by no means exceptional, was probably the driest since 1908, a result largely due to the persistent shortage of rain during the summer and autumn. The general rainfall calculated from about 200 stations was

England	33·59 in.	or	103	per cent. of average.
Wales	44·61	,,	98	,,
England and Wales.........	35·59	,,	102	,,
Scotland	40·70	,,	92	,,
Ireland	35·81	,,	90	,,
British Isles	37·03	,,	96	,,

Fig. 3. Thunderclouds developing, August 25th, 1918.

Fig. 4. Cloud-sheet at 2,500 feet, February, 3rd, 1919.

THE USE OF AEROPLANES IN METEOROLOGY.

By C. K. M. DOUGLAS,
Late Pilot of the R.A.F.

(*Continued from p.* 130).

Reference was made in the previous article to the frequency of temperature inversions within or at the boundaries of anticyclones, which were attributed to the presence of layers of air which had descended and been dynamically warmed.

These inversions are an effective check to convection and mechanical churning, and in consequence the clouds are usually spread out in a horizontal sheet with the upper surface just below the inversion. The height of the inversion is often 8,000 feet or more near the north-east boundary of the anticyclone, but is lower near the centre. Showers or drizzle may develop below an inversion when the humidity is high. The showers are particularly apt to form when cold air is passing over a warmer sea, but they do not, as a rule, extend very far inland. On the south-west side of the anticyclone the warm dry descending air is usually close to the ground, but in summer over the land there is no inversion owing to the surface heating. This part of the anticyclone is often cloudless, but fogs are not infrequent in winter or over the sea.

In winter, east or north-east winds are often accompanied by cloud-sheets, with inversions above them, at the southern boundaries of anticyclones, or just outside them. Fig. 4 shows such a cloud-sheet with its upper surface at 2,500 feet moving from north-east, on February 3rd, 1919, in a spell of very cold cloudy weather. The ripples are across the current, and there is also a curious ridge in the background from north to south, which was thirty miles long. There are thin patches up above at 10,000 feet, which have some resemblance to cirrus, though they consisted of super-cooled water-drops. The photograph was taken from 5,000 feet, looking west over the sea, from a point five miles inland.

Even when there is no inversion there is not infrequently a comparatively stable layer at about 6,000 to 8,000 feet, which checks the growth of cumulus clouds. When the upper air is stable and also of low relative humidity, widespread or heavy rainfall cannot develop. But if the upper air is warm and damp, rainfall is quite common. A good deal of the rainfall in front of depressions is supplied by warm damp currents. J. Bjerknes,* of Bergen, has shown that the warm air is pushed out in the form of a wedge over cold air in front of the depression, causing rain; while the cold current behind the depression pushes under the warm air, also in the form of a wedge and causes another rainy area. These conclusions were reached as the result of detailed examination of the

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* The Structure of Moving Cyclones, by J. Bjerknes. Monthly Weather Review, Vol. 47, No. 2, (February, 1919), pp. 95-99.

surface winds combined with cloud observations, and they are confirmed by the observations of temperatures, clouds, and upper winds made in France. The cold air in front of depressions is less frequently present in France than it is further north, but there were a few occasions when there was a mass of cold air which belonged originally to the north-west current of a previous depression, and a warm current which pushed over it and caused rain. When the high and medium clouds come over before the rain the upper air temperature (*e.g.*, 10,000 to 14,000 feet) rose considerably, although in the lower air there was little or no increase. Sometimes the warm damp upper current which brings the rain is from north-west, having curved round from south-west, the colder wedge below moving slowly from south or south-west. Rain is much more likely to develop near the south-east boundary of a depression if there is cold air in front of it than when there is a large anticyclone, which is always warm (except close to ground in winter). The undermining of the warm air by the wedge of cold air along the trough of a depression was frequently observed in France, usually somewhere in the south-east quadrant, the cold air having curved round. The fall of temperature and veer of the wind (which may be slight) begins near the surface and works up. Behind the rain there is medium and high cloud in a wedge above the cold air and moving from a more southerly point, tapering away into a thin edge. Once the cold air is about 10,000 or 12,000 feet thick, showers frequently develop. On September 23rd, 1918, there was heavy rain in the early morning, and a few showers about noon, when the wedge of cold air was 10,000 feet thick, and much heavier though local showers in the evening when the cold air was over 15,000 feet thick, and Fig. 2 (reproduced in the previous number) was obtained. Two photographs taken at about the same time were reproduced in the *Journal of the Scottish Meteorological Society* (Vol. xviii, No. 35, 1918), showing false cirrus being carried away by a strong upper west-south-west current at 20,000 feet (above the cold wedge) and an anvil with a very flat top at that level. The effect of the upper current is just visible at the top of the cumulo-nimbus in Fig. 2.

No rule can be laid down as regards the upper air temperature in any particular part of a depression, as either warm or cold air may curve a long way round it. The north-west current is almost always cold. By "warm" it must be understood that what is implied is a temperature above the average corresponding to the pressure. A good deal of rainfall may be attributed to warm air pushing over cold air (or cold air undermining warm air) in a large variety of conditions. As air above the influence of the surface variations often only changes its temperature slowly and may follow a complicated path, there is a large variety of possible temperature distributions. This is borne out by the complexity of wind currents. The relation between the upper winds and the distribution of upper air temperature and pressure are given in chap. vii. of Sir Napier Shaw's *Manual of Meteorology*, Part IV, on the assumption that the wind balances the pressure gradient at its level. The sequence of upper wind and temperature changes in France were consistent with that assumption, though there were a few cases where warm damp upper north-west currents in front of depressions may have had an outward component. Unfortunately the upper air temperature observations in other localities, which are required in order to confirm the existence of the outward component are wanting.

Steady rain due to this pushing of warmer air over colder air may fall from a fairly high level, from a uniform layer of clouds, without any "bumpiness" at all. This is frequently the case at the commencement of cyclonic rains, though low clouds afterwards develop. The rain-clouds extend up to a great height, usually to the cirrus.

The heavy rain sometimes experienced near or at the centre of depressions must often be due not to warm air being displaced by colder air, but simply to air converging at surface and rising up the cold core of the depression. For instance, there was very cold air on both sides of the centre of the depression which caused the heavy snowstorm of April 27th, 1919, and the whole area of the depression was certainly very cold, the heavy snowfall being due to the instability. The few days at the end of April were colder at 15,000 feet than any during the previous winter, except a few at the end of March. Depressions which move from a northerly point are always extremely cold, but the rainfall is not always heavy, being sometimes limited to showers. In order to understand rainfall development, a thorough investigation of the surface currents should be combined with upper air observations. The same is true for investigations of thunderstorms. Prof. V. Bjerknes, in a recent lecture to the Royal Meteorological Society, showed that thunderstorms often develop over points or along lines where the surface currents converge. The researches of J. Fairgrieve point to the same conclusion, and also to a wave structure in the movements which start the disturbance. The convergence of the lower currents lifts the strata above them and if there is a damp layer clouds form, which may grow into thunderstorms. The author has frequently observed the clouds first appear in a wave form, evidently due to an upward bulge, not to upward currents from the surface. Of course frequently the upward currents do start at the surface, but on other occasions the lower air may be quite stable and clouds appear at about 5,000 or 6,000 feet, which afterwards develop into thunderstorms. Fig. 3 shows clouds which developed with their base at 5,000 feet and developed upwards, the lapse of temperature above them being greater than the adiabatic for saturated air, though the lapse below them was less than the adiabatic for dry air. There was another layer above them at 10,000 feet, and the lower layer had reached it in places. Ultimately the clouds developed into cumulo-nimbus causing moderate thunderstorms with their tops above 15,000 feet. The photograph was obtained over the sea looking west on the evening of August 25th, 1918. The upward movement was started by convergence in a small secondary. Clouds with turreted tops similar to the lower clouds in the photograph may develop high up (*viz.*, 15,000 to 20,000 feet), and indicate instability at those heights, which is a favourable factor for thunderstorm development. But this development can only take place when a layer of cloud is formed below 10,000 feet. A warm damp layer at about 5,000 feet is a favourable condition for thunderstorms. A southerly current may bring about such a condition provided that the air at 5,000 feet is not drawn from an anticyclonic source, in which case it would be too dry for clouds to form. Sometimes a warm damp southerly current has a cold surface north-east current under it, and variations in the depth of this cold current may cause the upward bulge which starts the cloud development.

When clouds form at a temperature of 55° or 60° F., the heat given out by condensation is so great that the clouds grow up if there is merely a normal lapse of temperature above them. When thunderstorms develop in cold weather it is usually found that the lapse of temperature from the surface to a great height is little below the adiabatic for dry air, so that the clouds grow to a great height in spite of the small amount of heat liberated by condensation.

A large number of upper air observations in thunderstorm conditions have already been made. A careful investigation of the wind currents in the lower air which start the disturbance, together with the causes of the favourable distribution of humidity and temperature up above, is the most fruitful line of research, and this can only be done by the combined effort of a powerful organization.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

WIND IN RELATION TO TIDE.

Referring to the communication on the above subject in your October number, it would, I think, be worth while asking Observers in the Conway Valley for evidence. Some years ago, when I spent several holidays at Llanbedr, near Tal-y-Cefn, there were many occasions when the wind appeared to shift with the turn of the tide, often to the opposite direction. F. R. WALTERS, M.D.

Pinecroft, Farnham, Surrey, November 18th, 1919.

SEVERE WINTERS.

At the threshold of winter there is usually a good deal of curiosity as to what the season may bring forth, meteorologically. An inquiry into the distribution of severe winters in the sunspot cycle might conceivably be helpful. Suppose we take the ten coldest winters at Greenwich since 1841, measuring by the mean temperature of the months December to February. The following are all the winters with mean temperature under 37°·0 in descending order (coldest first) :—1891, 1879, 1847, 1845, 1895, 1855, 1917, 1880, 1886, 1871 (1891 meaning 1890—1891 and so on). I will now specify these in the position they take in the following schedule :—

1	Min.	1	2	3	4	5	6	7	8	9
'55		'79	'91		'47		'95		'86	
			'45		'17					
			'80		'71					

It will be seen that seven of those ten winters occur in the four years following minima; that is, roughly, at a time when the sun's spottedness is growing, (the maximum is reached in about three to five years after the minimum) and three remain for the rest of the cycle, as shown. As we have now to do with the seventh year after a minimum, (1913), we are at a part of the cycle less "frequented," apparently, by those severe winters; but the induction is, of course, not a large one. The seventh year has none of the ten, and curiously its history in the previous six sunspot waves, shows no winter colder than 39°·3, which is but a trifle under the general average (39°·5).

We might take another view, by considering all winters under the higher limit of 38°·0—a total of twenty-two. The following table shows the numbers in each category (*a.*), and the result of smoothing with sums of 3 (*b.*) :—

	1	Min.	1	2	3	4	5	6	7	8	9	[10	11]
(*a.*)	3	0	1	3	2	5	1	2	0	2	2	[0	1]
(*b.*)		4	4	6	10	8	8	3	4	4			

The lower series indicates a wave culminating in the third year after minimum.

ALEX. B. MacDOWALL.

Bellevue, Bridge of Allan, 4th December, 1919.

SNOW FOLLOWING FINE WEATHER.

I should like to point out to Mr. Chas. P. Hooker that I have only followed in my remarks on this subject the received heading as above.

As in his last example, in 1918, snow followed five days later, he must not claim that example as a success.

H. NOWELL FFARINGTON.

Worden, Leyland, Lancs, January 3rd, 1920.

ROYAL METEOROLOGICAL SOCIETY.

THE usual monthly meeting was held on Wednesday, December 17th, in the Society's Rooms, 70, Victoria Street, S.W., Sir Napier Shaw, F.R.S., President, in the Chair.

A paper by Mr. F. J. W. Whipple, M.A., entitled "The Laws of Approach to the Geostrophic Wind," was read. The mode of transition from the winds near the surface of the earth to the general current at moderate heights has been discussed by various authors. In the present paper stress is laid on the geometrical aspect of the question. The term "Relative wind velocity" being used for the velocity which must be combined with the geostrophic wind velocity by vector addition to give the actual wind velocity at any level, the laws of approach to the geostrophic wind are :—1. the relative wind turns uniformly with increasing height ; 2. the relative wind decreases with increasing height according to the exponential law ; 3. the actual wind at the surface and the relative wind there are inclined at 135°. The modification of the "laws" when departures from the ideally simple conditions they pre-suppose are allowed for, was discussed.

In the discussion which followed, Capt. D. Brunt called attention to Sverdrup and Heselberg's investigations in which the spiral is followed out nearly up to the height at which gradient direction begins and then tends to shoot off to the right. Mr. L. F. Richardson said that Eckman first discovered the equiangular spiral in 1905. He hoped Mr. Whipple would further generalize the spiral to fit the case in which eddy winds varied with height. The rapid variations in the first ten metres was often clearly shown by frozen snow on telegraph poles. Lieut.-Col. E. Gold said that the increase of velocity at relatively low altitudes was more rapid by night than by day. He had repeatedly found that at night the wind rose to a maximum velocity at 1,000 feet and then decreased ; this did not often happen in the daytime. Sir Napier Shaw said that Mr. Whipple's paper would be a useful appendix to Maxwell's "Matter and Motion."

Mr. G. M. B. Dobson, M.A., read a paper on "Winds and Temperature Gradients in the Stratosphere." From the results of temperature observations by "ballons sondes" it can be shown that the horizontal pressure gradient and therefore the wind velocity should decrease rapidly on passing from the troposphere to the stratosphere. Previously there had been little confirmation of this by actual observations. Seventy ascents recorded by the International Commission gave data for temperature, wind velocity and wind direction to great heights. These showed that almost without exception, winds of moderate or great velocity in the troposphere, fell off very rapidly on entering the stratosphere, while the wind direction remained constant. On days with small pressure gradients this effect was not usually found ; a result which was to be expected.

since the slope of the tropopause would then not necessarily be towards the low pressure. Horizontal pressure and temperature gradients calculated for the observed winds on typical days with moderate or large pressure gradients, show that the pressure gradient is suddenly reduced, and the temperature gradient suddenly reversed, on entering the stratosphere. The temperature gradients calculated from the observed wind velocities were in good agreement with those deduced by Mr. W. H. Dines, from temperature and pressure observations.

In a written communication, Mr. W. H. Dines pointed out that the correct measurement of upper winds depended upon an assumed uniform rate of ascent of the balloons. He had found the pressure gradient to be zero at about twenty kilometres. Lt.-Col. Gold said that if the ascentional velocity of a balloon increased, the increase of wind velocity must appear greater when the one-theodolite method of observation was employed. He discussed the effect of temperature change in the troposphere and in the stratosphere. Mr. Whipple said that the fact that the strongest winds were at the border between the stratosphere and troposphere indicated that the biggest centrifugal force was at that level and provided machinery for sucking in air from above and below. The actual distribution of pressure and temperature in cyclones indicated that they were regions in which air was being sucked up from above. Mr. Richardson, Mr. J. S. Dines and Mr. J. E. Clark also spoke.

A paper by Capt. C. J. P. Cave was entitled "Quotations from the Diary of Samuel Pepys on the Weather." The author had collected together all references to the weather from the diary, using for this purpose Wheatley's edition. These amounted to 557 entries, and were arranged in chronological order. They formed a brief comment on the general weather conditions prevailing from January, 1660 to May 1669. In a preliminary essay the author summarized the principal weather events for each year. He pointed out that Pepys cannot claim to be considered as a meteorologist, and that his references to the weather are such as any one might make in writing a diary or in correspondence. Pepys's memory for meteorological events was not always good, and his remarks on the worst or best weather he remembers must be taken with caution.

Sir Henry Lambert, exhibited a manuscript weather diary kept by his great grandfather, Daniel Lambert, in the years 1781-82. He believed the observations were made on Tower Hill, and arranged that a copy might be made and preserved in the library.

The following candidates were balloted for and elected Fellows of the Society :—Mr. N. C. Ahluwalia, Mr. F. W. Baker, Mr. G. A. Clarke, Lieut. W. M. Cooke, R.N.R., Mr. P. dė Rome, Mr. V. A. Jarvis-Clark, Mr. E. M. Maurice, Capt. L. F. Plugge, R.A.F., Capt. H. H. M. Spink, Mr. G. Thomson, Jun., Mr. R. G. Veryard, Lieut. D. C. Way, R.N.R., and Mr. P. R. Zealley.

SCOTTISH METEOROLOGICAL SOCIETY.

THE Annual Business Meeting of the Scottish Meteorological Society was held in the Society's Rooms, Edinburgh, on 19th December, 1919, Dr. C. G. Knott, President, in the Chair.

The Report from the Council referred to the working arrangements made with the Meteorological Committee in 1913; to the necessity of securing an adequate skeleton system of climatological stations under some public control which should guarantee continuity and efficiency; and to the loss sustained by the deaths of Mr. J. Mackay Bernard and Dr. John Aitken. There had been a slight increase in the membership list during the past year.

The Council had decided to regard the meeting held towards the end of each year as a purely business meeting for consideration of the Annual Reports and the election of Office-Bearers and Council. It was proposed, however, to hold a series of meetings, mainly in Edinburgh, at which lectures on popular lines will be given, or discussions opened, on questions of meteorological interest. The first of these lectures had indeed already been given in Glasgow by Captain Franklin, who opened the winter session of the Royal Philosophical Society of Glasgow by an address on "The Study of Meteorology in Schools and Universities." Other lectures were to be delivered in Edinburgh after Christmas.

The following Council and Office-Bearers were elected for the ensuing twelve months :—*President :* Dr. C. G. Knott; *Vice-Presidents :* Prof. T. Hudson Beare, and Mr. D. A. Stevenson; *Honorary Secretary :* Dr. E. M. Wedderburn, W.S.; *Honorary Treasurer :* Mr. W. B. Wilson, W.S.: *Council :* Mr. S. B. Hog, Mr. G. Thomson, Dr. A. Crichton Mitchell, Mr. G. A. Mitchell, Mr. M. M'Callum Fairgrieve, Prof. R. A. Sampson, F.R.S., Captain T. Bedford Franklin, Sir R. B. Greig, LL.D. and Mr. T. S. Muir.

REVIEWS.

Nedbφriagttagelser i Norge. Aargang xxiv., 1918. Christiania, 1919. Size, 14½ × 11. Pp. xii. + 123. One chart and 11 figures in text. Price, 6·00 kr.

WE should be lacking in the ordinary attributes of humanity if we were able to conceal a gleam of satisfaction that the magnificent Norwegian Rainfall Annual has at last dropped behind *British Rainfall* in the race for prompt publication in which it has so frequently carried off the palm. Glancing at the large mass of orderly statistics which it embodies, and bearing in mind the difficulties which surround the study of rainfall in a country like Norway, we can only wonder at the fact that its appearance is not more often delayed.

We note with interest the use of a novel form of rain gauge glass which overcomes the difficulty of accurately measuring small quantities, by means of a cone-shaped glass bottom with the apex upwards, the inverse of the device used in the "Camden" glass familiar in this country. It is probable that the meniscus difficulty is minimised in this way. The climatic peculiarities of the country make necessary the wide use of the Nipher shield for the prevention of loss by eddying, a hint which might well be taken to heart in some of the more exposed districts in the British Isles.

A finely reproduced rainfall map, on the scale of about twenty miles to an inch, present the year's records in a cartographical form. The distribution is highly orographical and presents many points of similarity to that in the West Highlands. The amounts recorded are, however, greatly inferior to those on our own western mountain barriers, rising only very locally above 2,000 mm. (79 inches), and falling to one-tenth of that amount at one or two places within the Arctic Circle. C.S.

Journal of the Scottish Meteorological Society. Vol. xviii. Third Series, No. xxxvi., 1918. Size, 11 × 7. Pp. 121. One plate. Price, 12s. 6d.

THE appearance of the Journal of the Scottish Meteorological Society is always welcome, and our own editorial struggles with adverse circumstances lead us readily to condone its somewhat tardy publication. The volume, for although issued between paper covers it attains that dignity, contains interesting and suggestive articles on some of the most recent developments of meteorological work.

Lt.-Col. E. Gold, F.R.S., betrays a wealth of knowledge and experience in his treatment of the relation between meteorology and aviation, especially in respect of accurate short-period forecasts.

Capt. T. B. Franklin contributes an instructive article on Meteorology and Agriculture; and C. K. M. Douglas an interesting paper on Optical Phenomena and the Composition of Clouds, a subject on which his keen meteorological instinct and exceptional opportunities for observation render his views peculiarly valuable. A fourth article by E. M. Wedderburn on Meteorology and Gunnery sets down some of the applications of meteorology to ballistics, which became of great importance during the war.

The usual statistical tables dealing with the Climatology of Scotland are given, including complete monthly rainfall records for 730 stations. It may perhaps be mentioned it has been the custom for many years past for these rainfall tables to be compared in detail with those sent to the British Rainfall Organization in order to eliminate errors and provide a means for the exchange of records received by only one of the two bodies. C.S.

A Continuous Record of Atmospheric Nucleation. By Carl Barus. Smithsonian Inst., Washington, 1905. Size, $9\frac{1}{4} \times 12\frac{1}{2}$. Pp. 226.

In this memoir Prof. Barus discusses the phenomenon which he entitles "Atmospheric Nucleation," and continues the researches described under "Experiments with Ionized Air" and "Structure of the Nucleus" in the Smithsonian Contributions to Knowledge, volume xxix., 1901 and 1903. The present volume consists of 226 large quarto pages, and describes only a part of the research which the author stated was being further continued. It is necessary for an intelligent appreciation of the work to refer to the preceding publications.

Professor Barus describes the nucleus as "at the outset simply a dust particle, small enough to float in the air, but much larger than the order of molecular size." He considers it one of the main features in bringing about the condensation of water from the atmosphere. Such nuclei, he states, are formed by agitating liquids such as by jets inpinging on obstacles and by combustion, *i.e.*, smokeless combustion. In addition to the mechanical, thermal, and chemical processes, he says high potential is a fruitful source of nuclei, such as a body highly charged with electricity. Also certain radiations, as ultra-violet light, x-rays, and radio-active bodies generate nuclei in air through which the radiation passes.

By the term nucleation is meant the number of such nuclei per cubic centimetre. Professor Barus holds that the nucleus is distinct from the ion, but that ionization is always accompanied by nucleation; he thinks nucleation owes its origin to the expulsion or absorption of the corpuscles representing the concomitant ionization. It is not very clear how under these circumstances the nucleus can exceed molecular dimensions as stated above.

The method of measuring nucleation and size of particles by the colour and diameter of "coronas" is used; the corona is observed when a beam of light is transmitted through the nucleated gas, and is a diffraction phenomenon more fully described in "the Structure of the Nucleus" above referred to.

The greater part of the volume is taken up with descriptions of apparatus and experiments. In chapter 7 a method is developed for the measurement of fog particles by means of the microscope. Chapter 9 is, perhaps, of the greatest interest to meteorologists, as it gives a record of over two years' observations of atmospheric nucleation in the City of Providence. It is shown that the maximum and minimum nucleation occurs at about the winter and summer solstices respectively. Much of the nucleation is attributed to combustion, and it is shown that generally speaking the cold weather causes a rise of nucleation, while rain or snow produces a fall; although snow, if dry, may even cause an increase. Tables and graphs of these results are given, and the graph showing the monthly nucleation for 1902 to 1904 shows the remarkable maximum which occurs about the middle of December, and a less well defined minimum about July.

The work is a useful record of experiments bearing on condensation apart from the particular explanations suggested as accounting best for the phenomena observed. J. S. OWENS.

THE ATLANTIC TYPE OF DECEMBER WEATHER.

By L. C. W. BONACINA.

IN England the depth of winter may manifest itself either by intense cold—the Arctic type, or by excessive damp—the Atlantic type. The latter type, the more common yet styled "unseasonable," is connected with the fact that the Atlantic Ocean is ceaselessly throwing off large quantities of vapour at a temperature much too high for the latitude belt between 50 and 60° N., and in the gloomy, damp heat from the stormy ocean, which characterizes it one simply sees the winter season in a dark garb instead of the more conventional white one. In this latitude warmth in winter almost invariably means weather of a severely rough and wet description, and the usual designation of such weather as "mild" in relation to the temperature only, is to put it mildly, rather unfortunate. This year the hard frost of early November gave place soon after the middle of the month to this other form of winter, which continued right through December. On many nights during the latter part of November and December, the deep roar of the great Atlantic gales—the true voice of the English winter—was very impressive. Heavy cyclonic gales are as much a climatic feature of midwinter as violent thunderstorms are of midsummer, and they are just as inspiring to the imagination. The close of December, 1919, was conspicuous for incessant rain, the intervals between the different quick-travelling bad weather systems being very brief and uncertain. A raw murky-looking morning with a touch of frost would be the sure precursor of another downpour by evening. To pedestrians and lovers of the open air excessive winter wet in place of invigorating frost and snow is very trying on account of the continual changing and drying of clothes which their outdoor habits render necessary. But the Atlantic type of weather brings its compensations in the form of a pure sweep of S.W. wind from the ocean, and in the soft transparency of the atmosphere during the finer intervals. Moreover, in open weather the forms of the forest trees loom out with a blackness and vividness as the branches sway in the gale, that is missing in the thicker atmosphere that prevails when the countryside is frost-bound and deep under snow.

METEOROLOGICAL NEWS AND NOTES.

MR. M. DE CARLE S. SALTER delivered a lecture entitled "Rainfall considered as a Geographical Function," at the meeting of the Geographical Association, at the London Day Training College, January 10th.

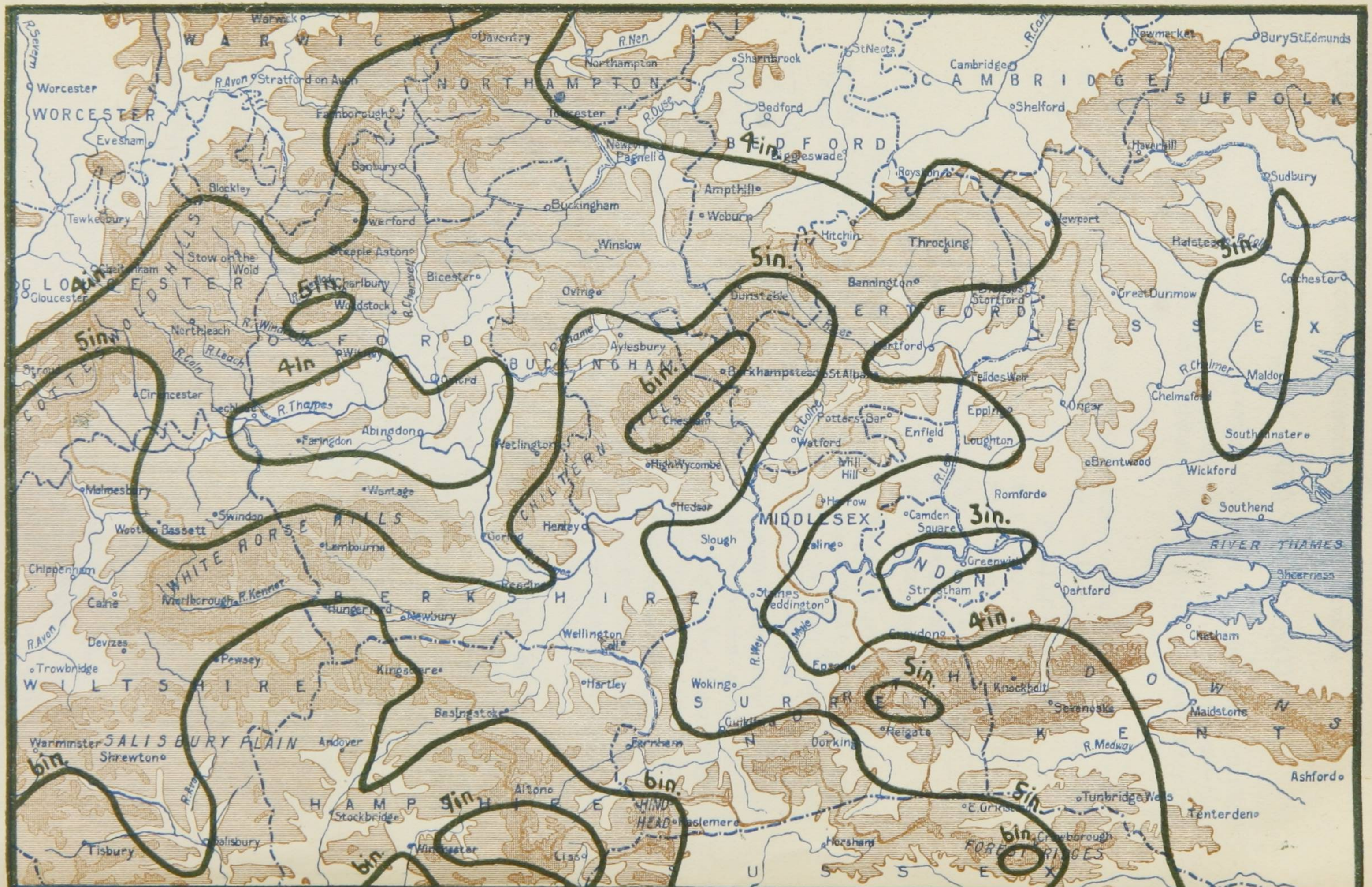
METEOROLOGICAL OFFICE RETIREMENTS:—The following members of the Staff of the Meteorological Office retired on December 31st, 1919:—

		Period of Service.
Mr. F. J. Brodie	..	April, 1869—Dec. 1919.
Mr. W. G. James	..	May, 1869— 1875.
		and Mar. 1879—Dec., 1919.
Mr. J. Sheerman	..	Feb., 1882—Dec., 1919.
Mr. R. F. Wallace	..	Feb., 1883—Dec., 1919.

Mr. Frederick J. Brodie has been a frequent contributor to the pages of this magazine and has been for many years past the author of the regular articles on the "Weather of the Month," which replaced the "Meteorological Notes on the Month" by substituting a connected narrative for the fragmentary remarks of the Observers. For this task his professional experience rendered him peculiarly fitted. He was for a very long time the Meteorological correspondent of *The Times.* Mr Brodie is one of the small group of senior members of the staff of the Meteorological Office whose term of service extended back to the administration of Admiral Fitzroy, having begun his work more than half a century ago. We wish him many years of peaceful life in retirement.

WEATHER CONTROLS over the fighting during the summer of 1918 are discussed by Prof. R. De C. Ward, in an interesting paper in the *Scientific Monthly,* for October, 1918. Instances are quoted of of the great effects produced in military operations in France by decreased mobility of the armies after heavy rain; and of the advantages gained by attacks in fogs (especially at night), in thunder storms which drowned the noise of barrage fire and of favourable winds in gas attacks. On the Austro-Italian front particular mention is made of the flooding of the Piave, leading to shortage of Austrian supplies and consequent defeat from Montello to the sea. Of the other fronts, Mesopotamia occupies the author's special attention, as climate is there "the first thing to be taken into consideration in every move that is made." The meteorological feature of the desert, the mirage, has curiously to be included since in the early days of the campaign the Turks apparently saw the British supply and ambulance train "magnified and multiplied by the deceptive desert atmosphere," and fled. Food supply as a factor of military importance renders necessary the discussion of the influence of climate on crops in enemy countries.

THAMES VALLEY RAINFALL DECEMBER, 1919.



ALTITUDE SCALE

Below 250 feet	250 to 500 feet	500 to 1000 feet	Above 1000 feet

SCALE OF MILES 0 5 10 15 20

Symons's Meteorological Magazine.

Watershed of River Thames above Teddington, and River Lee above Feildes Weir.

Isohyetals

THE WEATHER OF DECEMBER.

An abnormally cold November gave place to a period in which winds from some westerly quarter (from between S.W. and N.W.) were largely in evidence. As regards temperature the contrast between the two months was therefore very striking. In November midday shade readings of 50° and upwards were rare ; in December they were of common experience, the highest being reported over England on the 2nd or 3rd, and at some of the Irish stations on the 4th or 5th. In each case the thermometer rose to 55° in several places, and at Worksop on the 3rd it touched 56°. The months was, however, not uniformly mild. Between the 8th and 10th, when a ridge of high barometric pressure passed eastwards across the United Kingdom, sharp frost was experienced in most districts, the sheltered thermometer falling on the night of the 8th or 9th to 25° or less in many parts of Great Britain, to 22° at Rothamsted and Geldeston, near Beccles, and to 20° at Balmoral. On the surface of the grass the minimum readings at this time were as low as 12° at Greenwich, 14° at Wisley and 15° at Tunbridge Wells. Another rather sharp frost occurred on the night of the 16th, and a far sharper one in Scotland on Christmas night. On the latter occasion the sheltered thermometer fell to 16° at West Linton (Perthshire) and 14° at Balmoral and Eskdalemiur ; while on the surface of the grass it sank to 14° at Crathes, 12° at Balmoral and 10° at West Linton.

The mild weather which was so general at other times was due to oceanic winds blowing around deep cyclonic systems whose central areas travelled eastward across Iceland, or between Iceland and our own northern coasts. The passage of these disturbances was accompanied in most instances by heavy falls of rain, and in many cases by a serious increase in the strength of the wind. On the 2nd, when a secondary line-squall passed across England, the wind over our southern counties, rose, in gusts, to a velocity of 68 miles an hour at Kew, Brighton and Plymouth, 72 miles at Shoeburyness and 74 miles at Pendennis Castle (Falmouth). On the 18th or 19th, when a similar movement in pressure took place, the more northern districts were chiefly affected, the westerly to north-westerly gusts reaching a velocity of 70 miles an hour at Paisley and Alnwick Castle, and 78 miles at Southport. In not a few instances the sudden shift of wind from S.W. to N.W. was accompanied by thunder and lightning. At Kew a short by sharp thunderstorm was experienced on the 4th and again on the 6th, the occurrence of two such phenomena in December being without precedent in the records of the past 40 years.

In spite of the changeability of the weather the total duration of bright sunshine at some of the western stations was appreciably in excess of the average.

The rainfall of the month was above the average, practically everywhere, in one or two places reaching twice the average. Less than 4 inches was confined to small areas in the south Midlands, and parts of the east of Great Britain, and in Ireland only to a small strip round Dublin. More than 6 inches fell over considerable areas in the south of England, in the north-east of Scotland and Ireland, and practically everywhere in the west. More than 10 inches occurred over wide areas of the uplands. The general rainfall expresssed as a percentage of the average was as follows :—England and Wales, 155 ; Scotland, 130 ; Ireland, 156, and British Isles, 147.

In London (Camden Square) the month was unusually showery and mild. Rain fell on all but 5 days, and a rain spell lasted from the 13th to 31st. Mean temperature, 42°·7, or 3°·0 above the average. Duration of rainfall, 75·4 hours. Evaporation, ·06 inch.

RAINFALL TABLE FOR DECEMBER, 1919.

STATION.	COUNTY.	RAINFALL. Aver. 1875—1909. in.	1919. in.	Diff. from Av. in.	Per cent. of Av.	Max. in 24 hours. in.	Date.	No. of Days
Camden Square	*London*	2·13	3·47	+1·34	163	·85	1	27
Tenterden	*Kent*	2·77	3·38	+ ·61	122	·51	1	26
Arundel (Patching)	*Sussex*	2·91	6·08	+3·17	209	1·20	15	23
Fordingbridge (Oaklands)	*Hampshire*	3·35	6·14	+2·79	183	1·20	1	28
Oxford (Magdalen College)	*Oxfordshire*	2·06	3·82	+1·76	185	1·04	1	25
Wellingborough	*Northampn*	2·13	3·33	+1·20	156	·58	1	23
Bury St. Edmunds (Westley)	*Suffolk*	2·14	4·31	+2·17	201	·71	1	23
Geldeston [Beccles]	*Norfolk*	2·07	3·49	+1·42	169	·41	7	24
Polapit Tamar [Launceston]	*Devon*	4·46	7·83	+3·37	176	1·14	1	29
Rousdon [Lyme Regis]	,,	3·68	5·04	+1·36	137	·83	1	27
Ross (Birchlea)	*Herefordshr.*	2·71	3·28	+ ·57	121	·48	1	28
Church Stretton (Wolstaston)	*Shropshire*	2·99	4·69	+1·70	157	·52	1	23
Boston	*Lincoln*	1·88	3·75	+1·87	200	·63	1	28
Worksop (Hodsock Priory)	*Nottingham*	2·17	3·35	+1·18	154	·76	15	20
Mickleover Manor	*Derbyshire*	2·38	4·17	+1·79	175	·80	22	24
Congleton (Buglawton Vic.)	*Cheshire*	2·89	4·67	+1·78	162	·64	22	28
Southport (Hesketh Park)	*Lancashire*	3·10	4·39	+1·29	142	·90	22	25
Wetherby (Ribston Hall)	*York, W.R.*	2·27	3·85	+1·58	170	·65	26	14
Hull (Pearson Park)	,, *E.R.*	2·32	3·50	+1·18	151	·50	26	26
Newcastle (Town Moor)	*North'land*	2·46	3·01	+ ·55	122	·64	15	22
Borrowdale (Seathwaite)	*Cumberland*	15·14	16·85	+1·71	111	...	...	...
Cardiff (Ely)	*Glamorgan*	4·70	8·64	+3·94	184	·88	1	29
Haverfordwest	*Pembroke*	5·18	8·51	+3·33	164	1·36	10	30
Aberystwyth (Gogerddan)	*Cardigan*	4·66	...	...	...	...	...	...
Llandudno	*Carnarvon*	2·84	5·73	+2·89	202	1·17	22	25
Cargen [Dumfries]	*Kirkcudbrt.*	4·84	7·77	+2·93	161	1·00	10	26
Marchmont House	*Berwick*	2·83	4·24	+1·41	150	·93	15	20
Girvan (Pinmore)	*Ayr*	5·48	10·48	+5·00	191	1·96	10	26
Glasgow (Queen's Park)	*Renfrew*	3·95	5·83	+1·88	148	·58	30	27
Islay (Eallabus)	*Argyll*	5·73	7·85	+2·12	137	·88	26	29
Mull (Quinish)	,,	6·59	7·72	+1·13	117	·76	1	29
Loch Dhu	*Perth*	9·48	14·35	+4·87	151	1·90	10	28
Dundee (Eastern Necropolis)	*Forfar*	2·67	4·18	+1·51	157	·94	30	23
Braemar	*Aberdeen*	3·13	6·06	+2·93	194	·90	22	22
Aberdeen (Cranford)	,,	3·43	5·91	+2·48	172	1·55	15	22
Gordon Castle	*Moray*	2·72	2·28	— ·44	84	...	...	...
Drumnadrochit	*Inverness*	3·76	3·51	— ·25	93	·60	21	19
Fort William	,,	9·41	7·96	—1·45	85	·70	5	27
Loch Torridon (Bendamph)	*Ross*	9·71	7·98	—1·73	82	·91	26	24
Dunrobin Castle	*Sutherland*	3·09	3·85	+ ·76	125	·55	24	16
Glanmire (Lota Lodge)	*Cork*	5·29	4·97	— ·32	94	·60	10	28
Killarney (District Asylum)	*Kerry*	6·92	7·16	+ ·24	103	·85	30	29
Waterford (Brook Lodge)	*Waterford*	4·32	5·95	+1·63	138	1·14	10	28
Nenagh (Castle Lough)	*Tipperary*	4·34	6·47	+2·13	149	·68	10	29
Ennistymon House	*Clare*	5·03	7·52	+2·49	149	·79	30	31
Gorey (Courtown House)	*Wexford*	3·42	5·13	+1·71	150	1·35	10	24
Abbey Leix (Blandsfort)	*Queen's Co.*	3·41	5·84	+2·43	171	1·11	10	29
Dublin (FitzWilliam Square)	*Dublin*	2·27	3·48	+1·21	153	·60	14	24
Mullingar (Belvedere)	*Westmeath*	3·39	6·05	+2·66	178	·74	11	28
Crossmolina (Enniscoe)	*Mayo*	6·11	10·26	+4·15	168	1·21	30	31
Cong (The Glebe)	,,	5·42	8·30	+2·88	153	1·43	29	29
Collooney (Markree Obsy.)	*Sligo*	4·34	7·78	+3·44	179	·93	30	31
Seaforde	*Down*	3·77	8·21	+4·44	218	1·36	22	24
Ballymena (Harryville)	*Antrim*	3·97	6·60	+2·63	166	·98	22	30
Omagh (Edenfel)	*Tyrone*	3·91	9·14	+5·23	234	1·46	22	31

SUPPLEMENTARY RAINFALL, DECEMBER, 1919.

Div.	STATION.	Rain inches.	Div.	STATION.	Rain inches
II.	Sevenoaks, Speldhurst Close.	4·52	XI.	Lligwy	5·41
,,	Ramsgate	2·74	,,	Douglas, Isle of Man	7·25
,,	Hailsham	5·00	XII.	Stoneykirk, Ardwell House...	6·89
,,	Totland Bay, Aston House...	5·58	,,	Carsphairn, Shiel	15·76
,,	Stockbridge, Ashley	6·26	,,	Langholm, Drove Road	8·27
,,	Grayshott	6·50	XIII.	Selkirk	4·10
,,	Ufton Nervet	5·57	,,	North Berwick Reservoir	2·85
III.	Harrow Weald, Hill House...	4·34	,,	Edinburgh, Royal Observaty.	3·14
,,	Pitsford, Sedgebrook	3·96	XIV.	Biggar	5·80
,,	Woburn, Milton Bryant	4·40	,,	Maybole, Knockdon Farm ...	7·52
,,	Chatteris, The Priory	3·65	XV.	Shiskine	11·17
IV.	Elsenham, Gaunts End	3·79	,,	Ardgour House	9·86
,,	Rayleigh	2·28	,,	Oban	...
,,	Colchester, Hill Ho., Lexden	3·32	,,	Holy Loch, Ardnadam	13·68
,,	Aylsham, Rippon Hall	4·61	,,	Loch Venachar	10·65
,,	Swaffham	4·59	XVI.	Glenquey	7·00
V.	Bishops Cannings	5·25	,,	Loch Rannoch, Dall	7·09
,,	Weymouth	4·74	,,	Aberfeldy, Dunros	5·93
,,	Ashburton, Druid House	10·18	,,	Coupar Angus	4·83
,,	Cullompton	6·55	,,	Montrose, Sunnyside Asylum.	4·80
,,	Lynmouth, Rock House	7·69	XVII.	Balmoral	4·08
,,	Mortonhampstead	6·59	,,	Fyvie Castle	3·50
,,	Hartland Abbey	6·10	,,	Keith Station	3·58
,,	St. Austell, Trevarna	8·02	XVIII.	Rothiemurchus	3·54
,,	North Cadbury Rectory	5·52	,,	Loch Quoich, Loan	19·60
VI.	Ledbury, Underdown	3·41	,,	Skye, Dunvegan	10·54
,,	Clifton, Bishop Stoke	5·99	,,	Fortrose	2·23
,,	Shifnal, Hatton Grange	3·47	,,	Glencarron Lodge	8·40
,,	Droitwich	3·38	XIX.	Tongue Manse	3·98
,,	Blockley, Upton Wold	4·01	,,	Melvich	3·87
VII.	Grantham, Saltersford	3·33	,,	Loch More, Achfary	7·19
,,	Louth, Westgate	3·21	XX.	Dunmanway, The Rectory ..	10·10
,,	Mansfield, West Bank	4·19	,,	Mitchelstown Castle	5·53
,,	Derby, Midland Railway	3·68	,,	Gearahameen	14·90
VIII.	Nantwich, Dorfold Hall	5·12	,,	Darrynane Abbey	7·34
,,	Bolton, Queen's Park	7·83	,,	Clonmel, Bruce Villa	4·00
,,	Lancaster, Strathspey	5·89	,,	Roscrea, Timoney Park	5·54
IX.	Wath-upon-Dearne	2·89	,,	Broadford, Hurdlestown	6·87
,,	West Witton	4·15	XXI.	Enniscorthy, Monksgrange..	7·60
,,	Scarborough, Scalby	3·49	,,	Rathnew, Clonmannon	5·06
,,	Ingleby Greenhow	4·17	,,	Hacketstown Rectory	7·06
,,	Mickleton	4·20	,,	Ballycumber, Moorock Lodge	5·78
X.	Bellingham, High Green Manor	4·86	,,	Balbriggan, Ardgillan	5·21
,,	Ilderton, Lilburn Cottage ...	4·35	,,	Castle Forbes Gardens	6·08
,,	Keswick, The Bank	8·69	XXII.	Ballynahinch Castle	9·05
,,	Orton	8·29	,,	Woodlawn	5.08
XI.	Llanfrechfa Grange	7·40	,,	Westport House	7·81
,,	Treherbert, Tyn-y-waun	18·73	,,	Blacksod Point	9·15
,,	Carmarthen, The Friary	7·54	XXIII.	Enniskillen, Portora	7·54
,,	Fishguard, Goodwick Station.	6·64	,,	Dartrey [Cootehill]	7·25
,,	Crickhowell, Tal-y-maes	5·50	,,	Warrenpoint, Manor House ..	7.41
,,	Birmingham WW., Tyrmynydd	12·27	,,	Belfast, Cave Hill Road	7·45
,,	Lake Vyrnwy	10·90	,,	Glenarm Castle	6·66
,,	Llangynhafal, Plas Drâw	5·09	,,	Londonderry, Creggan Res...	7·03
,,	Rhiwbryfdir	17·23	,,	Milford Manse	8·03
,,	Dolgelly, Bryntirion	13·50	,,	Killybegs	10·93

ERRATUM.—November, 1919, at Swaffam, *for* 2·61 *read* 1·88.

Climatological Table for the British Empire, July, 1919.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain. Depth.	Total Rain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	82·3	11	43·2	9	68·9	51·5	51·0	75	127·8	42·2	1·75	14	7·6
Malta	103·6	13	67·0	17*	84·4	20·9	...	73	153·0	...	·00	0	2·5
Lagos	89·0	8	69·2	21	81·6	73·1	72·4	83	161·4	57·5	·86	6	7·6
Cape Town	69·8	28	34·1	[illegible]	60·8	45·3	46·8	79	...	...	3·80	13	5·2
Johannesburg	68·2	1	34·1	19	62·7	42·6	37·2	69	...	...	·05	2	2·6
Mauritius	76·6	14	57·2	23	74·1	61·5	58·1	73	..	49·8	2·55	27	6·5
Bloemfontein	70·4	1, 2	20·5	15	63·9	32·6	31·1	65	...	...	·39	3	1·1
Calcutta...	94·4	29	75·5	12	88·6	79·1	78·0	87	...	74·1	11·99	15	9·1
Bombay	87·9	17	75·4	2	85·4	78·4	76·9	85	134·2	72·2	24·49	30	7·9
Madras	102·2	3	73·5	11	94·3	78·2	72·8	73	154·3	72·9	6·16	12	6·3
Colombo, Ceylon ...	88·4	18	73·7	28	85·3	76·7	73·4	80	156·9	70·8	4·26	23	8·2
Hongkong	90·8	3	73·5	4	86·4	78·3	75·4	81	...	...	19·43	13	6·9
Sydney	74·0	21	38·5	16	63·6	45·7	41·7	68	120·3	38·6	2·02	7	3·5
Melbourne	61·9	25	31·0	17	55·3	42·0	39·4	68	107·6	22·0	2·34	19	6·3
Adelaide	68·6	24	36·8	27	60·3	44·5	43·5	70	125·2	25·2	1·39	15	5·7
Perth	74·1	17	40·5	12	65·5	50·9	49·9	77	131·7	32·4	2·76	19	6·0
Coolgardie	79·8	18	34·8	12	66·0	45·7	43·2	60	136·2	34·8	1·38	5	4·4
Brisbane	78·0	30	40·6	5	69·6	49·7	46·2	59	128·1	30·8	·18	4	2·9
Hobart, Tasmania ..	60·6	25	33·8	14	52·1	39·5	37·0	68	111·2	26·4	2·20	14	5·1
Wellington	57·7	13	32·0	8	53·4	42·3	42·2	81	107·0	...	3·05	18	6·9
Jamaica, Kingston ..	95·2	27	71·8	15	90·6	74·0	72·2	77	...	...	·60	5	4·5
Grenada	87·0	17	72·0	4	85·0	75·0	...	78	137·0	...	8·09	24	4·0
Toronto	98·0	4	52·0	11	84·9	61·6	58·6	67	134·9	48·4	3·20	7	3·8
Fredericton	92·5	5	46·5	9	78·4	54·7	58·0	72	...	...	3·22	9	5·5
St. John, N.B. ...	82·0	20	47·0	1	67·9	52·6	54·2	83	140·7	42·8	4·52	11	6·2
Victoria, B.C.	84·5	14	47·2	1	66·4	50·6	49·0	76	140·0	39·4	·02	1	2·3

* 19, 20.

Johannesburg.—Bright sunshine, 276·5 hours.

Mauritius.—Mean temp. 0°·5 below, dew point 1°·4 below, relative humidity 2·0 below, and R. ·06 in. above, respective averages.

COLOMBO, CEYLON.—Mean temp. 0°·1 below, dew point 0°·6 below, and R. 1·86 in. below, averages. Mean velocity of wind 5·3 miles per hour, prevailing direction W.S.W.

HONGKONG.—Bright sunshine, 241·4 hours. Mean velocity of wind 12·4 miles per hour, prevailing direction E.S.E. Mean temperature 81°·8.

Melbourne.—Mean temperature normal, R. ·52 in. below average.

Adelaide.—R. 1·26 in. below average.

Perth.—R. 0·47 in. above average.

Coolgardie.—R. ·40 in. above average.