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PEACE AND PROSPECTS.

The war has ended as all free and honourable peoples hoped and expected when it began. We concluded our first reference to the war in the number for September, 1914 (vol. **49**, p. 141) with the words referring to the introduction by the enemy of terrorist methods towards civilians :—

"May not the originator of such a policy fear that his name in history may be changed, like that of Pashur, the son of Immer, to Magormissabib—a terror to himself and to all his friends."

It seems now that the curse of Jeremiah has indeed fallen upon the German Kaiser in full measure.

In the winning of the war by force in the trenches and by mental toil on the Staff and in the scientific departments, meteorologists and Observers have done their part, like all their countrymen, and many have paid the utmost price. As members of the public we still know little of what the men in the Navy and the Army have done and suffered, for some reason unknown a little more has been allowed to appear regarding individual prowess in the Air Service.

The hatefulness of militarism as the guiding spirit of a nation has been proclaimed by the action of the German forces by land, sea and air, and the necessity of meeting force with force has brought the lesson nearer to us than the enemy was ever able to reach. The Defence of the Realm Act gave powers to public officials such as have never before been exercised in Great Britain, and all must agree that these powers were exercised with reason and moderation, and submitted to with a patriotic docility hardly to be expected from a people so much accustomed to their own way as we are. But while this is true, on the whole, there were, of course, inevitable instances of individual hardship and injustice that have been borne as parts of the evils of war, though felt the more deeply because the reason which made them inevitable was kept secret.

With the return of peace most of the grievances will gladly be forgotten or even forgiven. We cannot but wonder why the daily

weather forecasts were allowed to be published for so long after all meteorologists recognized, and many had urged upon the Government, the importance of keeping such valuable information from the enemy. It was right and necessary that such information should be kept from those to whom predictions of the weather over the British Isles were essential in the planning of air-raids or attacks from the sea. But when at last the fighting forces understood the value of keeping useful information from the enemy their expert advisers unfortunately sometimes failed to distinguish between information useful only to ourselves, though not to the enemy, and that which was in some way helpful to the latter.

It was only in August, 1918, when the war was practically won, that we were warned by the Admiralty that the publication of monthly totals of rainfall was an offence against that Act, which the humourist cites as Dora, and our Rainfall Tables had accordingly to be suppressed until this month. To us this appeared to be not only an unnecessary but a stupid and humiliating proceeding. These Tables could not assist any scientific meteorologist to forecast the weather of the British Isles on any future day. The expert advisers of the Admiralty when they suggested the suppression of monthly rainfall figures were, we fear, either ignorant of the limitations which beset the powers even of German meteorologists, or they were actuated by motives not in any way connected with the Defence of the Realm. The embargo at one time seemed to threaten the continued existence of this Magazine, but its short duration has averted the fatal effect. We should, perhaps, not take it seriously but content ourselves with Ian Hay's suggestion that the orders issued by the Authorities are sometimes expedited through the Practical Jokes Department, and invite our readers to laugh with us at the breezy humour of the jolly old sea-dogs in the rollicking diversions of Jack ashore. In any case the suppressed Tables and maps are sent out with this number and we are free once more to serve the public by passing on the devoted work of the rainfall Observers to those who are waiting to apply it to the practical good of mankind.

The problems of collective scientific work after the war have now to be faced. At home it is obvious that progress which has been arrested or reduced to the minimum compatible with existence must be re-started and accelerated so as to make up as speedily as possible for lost time. In our own small department it seems to us that the main problem is the more effective organization of voluntary effort and the fuller public recognition of voluntary work. This should be done in such a way as to strengthen and derive strength from the various public services which have to do with the air and these are legion. Here there is neither occasion nor room for rivalry, but an abounding opportunity for union and co-operation.

A much more difficult problem is presented by the shattered systems of international co-operation. The suggestion has been made, and in some departments of science it might be possible, that future international co-operation for some time to come should exclude the people of what were the central empires. In meteorology this is impossible. Records from the whole surface of the Earth must be obtained and the systems of observing re-established and maintained. We have shattered the military system which was our enemy, and it is the duty of men of science to resume their work with no spirit of personal animosity.

METEOROLOGICAL NEWS AND NOTES.

The Royal Meteorological Society asks, through its Secretary, that readers who have spare copies of the following which they no longer require will be kind enough to return them to 70, Victoria Street, S.W.1 :—*Quarterly Journal*, Nos. 121 (Jan., 1902), 122 (April, 1902), 141 (Jan., 1907), 162 (April, 1912), and any previous to No. 28 (1878). Also *Phenological Report* reprints, especially previous to 1911.

The Daily Weather Report of the Meteorological Office was re-issued on November 20th, for the first time since August 22nd, at which date even deferred publication was prohibited by the Censor. The missing numbers have since been issued. At the same time weather reports are again appearing in the daily press, though with less prominence than formerly, *The Times* in particular not having resumed its full and valuable daily reports.

The Prohibition of Weather Reports during the war made it impossible to publish numerous interesting letters in our correspondence pages and we much regret that most of these must now be omitted on account of pressure on our space.

The Relation of Rainfall to Configuration forms the subject of a paper by Mr. Carle Salter read before the Institution of Water Engineers on December 13th, in which it is shown that the average rainfall during 30 to 40 years is intimately dependent upon the land configuration in relation to prevailing winds. The causes of the variations in the relationship are examined in some detail. Another aspect of the same subject is touched upon in a recent paper on the Tata Hydro-Electric Works, Bombay, by Mr. R. B. Joyner, C.I.E , read to the Institution of Civil Engineers, in which it is claimed, we think without justification, that the monsoon rainfall is affected by the formation of large artificial lakes.

BRITISH RAINFALL, 1917.*

THE fourth volume of *British Rainfall* compiled under war conditions, and the fifty-seventh of the series, has been delayed in publication chiefly by the great difficulties of printing and engraving, and in a less measure by the continued absence on war service of several of the most experienced members of the staff of the Organization. Reference is made to the loss sustained by the death from wounds of Sec.-Lt. D. S. Salter, who had been for several years in charge of the cartographical work.

The absolute necessity for economy in money, labour and paper has compelled the restriction of the volume to the smallest limits compatible with the maintenance of all essential features, and this has been effected by the shortening of the letterpress, the reduction of the number of illustrations and by more compact type-setting of the tabular matter. The statistics are given in full in order to avoid any break of continuity with former volumes, and so are the monthly and annual maps of rainfall.

A feature of unusual interest is the discussion of two daily rainfalls of unprecedented magnitude, occurring respectively on June 16th, in London, and on June 28th, in the south-west of England. The latter, during which occurred a remarkable fall of 9·56 inches of rain during twenty-four hours, at Bruton, in Somerset, forms the subject of a special article, illustrated by a coloured folding map on the scale of 10 miles to an inch. Other remarkable rains of the year took place during the six days from July 29th to August 3rd, in the south-eastern counties, and during the last week of November in the West Highlands.

Articles by Mr. L. C. W. Bonacina, on the Snowfall of 1917, and by Mr. W. R. Nash, on the Variations of Rainfall with Height above the Ground, the latter based on the Greenwich records, and illustrated by diagrams, are also included.

The diminution in the number of rainfall records received for publication, which has been the inevitable result of the war, was smaller in 1917 than had been the case in 1916, and 5,085 complete records appear in Part III. We have every reason to hope that the near future will see this temporary set-back more than counterbalanced by the new impetus being given to scientific work in the period of national re-construction on the threshold of which we now stand.

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* *British Rainfall, 1917*, compiled from the records of more than 5,000 Observers in Great Britain and Ireland. By Hugh Robert Mill and Carle Salter, Joint Directors of the British Rainfall Organization. London, Stanford, Size, 9 × 6, pp. 288, 3 plates and 29 illustrations in text.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

CLOUD FORMS IN FORECASTING.

THE article by Lt. A. S. Martin-Smith in the November number advocating the more systematic study of clouds to supplement the data upon which forecasts are based is much to be commended. The study of clouds is a most attractive side of meteorology if only on account of the supreme beauty of many cloud-forms, and their groupings in the sky. I can thoroughly uphold a specific point which Lt. Martin-Smith makes, namely, that no diligent student of the sky need ever be caught unawares by a thunderstorm—at all events of the summer type. But I venture to criticise the contention implied in the following sentence :—" If the forfeiture of my life depended upon the correctness or otherwise of a weather forecast for any given day I would prefer to rely upon the one based upon cloud reports rather than that derived from the study of a similar number of barometer readings." Now frankly I would not, and for two reasons. Firstly, the distribution of barometric pressure bears a known mathematical relation to the force and direction of the wind, and what is wind, if not a part of the very weather itself ? But I have yet to learn that any particular type of cloud has any such certain and invariable connection with the weather of which it is the precursor. Secondly, the record of a barometric height is an unambiguous statement of something, namely, the local pressure of the atmosphere which is measured with absolute precision, or with as much precision as is necessary. But to get a cloud record to vie in precision with a barometric reading, we should require either a photograph, a painting or an elaborate word-picture of the cloud, any of which would be hopelessly impracticable in synoptic meteorology. So we are driven to adopt a sort of short-hand system of cloud recording, classifying each individual cloud into one or other of a number of species and subspecies. But in all procedure founded on systems of classification there are two sources of trouble (1) Nature is so abhorrent at having her phenomena subjected to cut and dried schemes of classification, that she always leaves a number of intermediate forms to frustrate them, and, (2), no two minds will ever relegate natural objects to a number of types or species with anything like accordance. The real value of clouds in local weather prevision lies in the almost indescribable *picture* they present to the individual mind ; but it is very difficult to transmit such a picture to another mind, and even if it were easy, it would be impracticable to do so in official reports. By all means let us have cloud observations in official meteorology, but to supplement, not supplant, barometric readings.

Hampstead, December 4th, 1918. L. C. W. BONACINA.

THE USE OF WATER POWER.

THERE is an application of Water Power, which, I think, may be seen in the "peaceful" days to come. Might not the many disused corn-mills, in hilly districts, driven by either over-shot or under-shot water-wheels be harnessed to produce electricity in country places? In Devonshire coal costs so much that making electricity by means of it for farm work or cottage lighting is out of the question. Meanwhile, countless mills with water laid on and even machinery in order, to a certain extent, lie idle. L.J.B.G.

November 18th, 1918.

[We believe that our correspondent's suggestion is already being put into application in many parts of the country.—ED., *S.M.M.*]

UNUSUAL TEMPERATURE RANGE.

IN the number of your valuable Magazine for May last, Mr Dines mentions two instances of a daily temperature range of 41° and 42° respectively. I do not know what the world record is in this respect, but one thing of the kind which I experienced many years ago at the other side of the world I am tempted to mention, viz., a fall of 50° in one half-hour, on a summer afternoon, I think, in 1857, when on the third day of the well known Melbourne hot wind, blowing from N.N.W., the wind suddenly changed to S., and the temperature fell from 110° to 60°, with most refreshing result to the whole creation, animal and vegetable. W. M. COOPER.

Wroxall, Isle of Wight, September 21st, 1918.

ROYAL METEOROLOGICAL SOCIETY.

THE first monthly meeting of this Society for the present session was held on November 20th at the Society's Rooms, 70, Victoria Street, Westminster, Sir Napier Shaw, F.R.S., President, in the Chair.

A paper by Prof. R. de C. Ward, of Harvard College, Cambridge, Mass., entitled "The larger relations of climate and crops in the United States," was read by the Foreign Secretary in the absence of the author. For the purpose of his enquiry Prof. Ward divides the States into two major divisions separated by the mean annual

rainfall line of 20 inches, which forms the eastern boundary of the Great Plains. These are again divided into agricultural districts or belts as a framework into which the larger facts of climate and crop distribution, and of types of farming are fitted. The eastern half of the country has sufficient rain in normal years and ordinary farming methods are followed. The western half, with generally inadequate rainfall, is a region of irrigation, of dry farming and of grazing. Here there are no great belts distinguished by certain dominant crops as in the east, the crops are very varied, often extremely localized. The crops in both divisions are discussed with much detail as to the influence of climatic factors. A comprehensive bibliography is appended.

A paper by Captain C. J. P. Cave, R.E., and Mr. J. S. Dines, entitled "Soundings with Pilot Balloons in the Isles of Scilly, November and December, 1911," was also read. The ascents were made to ascertain the wind structure in a place where the effect of land masses may be regarded as at a minimum. The Scilly Isles consist of a small group of islands 25 miles S.W. of Land's End. The greatest height above sea-level does not much exceed 150 feet. The period covered by the observations, November 22nd to December 8th, marked the setting in of a south-westerly type of pressure distribution with low pressure over Iceland. This type became well developed by November 30th and during the rest of the period several pronounced secondaries passed across the British Isles from the Atlantic. The ascents show that the changes in wind associated with the passage of these secondaries were more marked near the surface than at greater heights. Taking the mean of the ascents the layer in which surface friction made itself felt on the wind velocity was decidedly shallower than at inland stations. The majority of the balloons were followed with two theodolites and the vertical motion computed. The average rate of ascent is found to agree closely with the value given by the formula now generally adopted in this country. There was little change in the mean rate between the ground and 4 kilometres height. In this particular the results differ from those obtained at inland stations where the rate of rising has been found generally to be greater in the first half kilometre than at greater heights.

The following Candidates were elected Fellows of the Society :— Messrs. W. H. Allen, C. D. Anderson, E. H. Bowie, C. W. C. Browne, B. H. Clarke, L. J. Clements, P. T. Creswell, N. I. Curtis, C. B. Dall, Hassan Fahmy, J. Glasspoole, A. Gordon, E. O. Jones, H. Knox-Shaw, G. C. Lawson, T. H. Leadbetter, C. S. Meik, C. W. B. Normand, T. Ormiston, C. S. Payne, A. J. Prince-Cox, Lord St. Audries, S. N. Sen, E. C. Shankland, A. Sparrow, T. Spragg, R. S. Sugden, G. M. Thomas, H. L. de Loud Verry, T. Wain, L. Whitworth.

WORK AND WATER POWER.

By Hugh Robert Mill.

(*continued.*)

It is evident on reflection that foot-pounds do not give a sufficient measure of power. A million pounds of snow on the top of a mountain 10,000 feet high could do 10,000,000,000 foot-pounds of work by falling to sea-level: but if it took a year for the snow to melt and run down to the sea, work could only be done at the average rate of about 20,000 foot-pounds per minute, while if the snow melted and came down in a week it could do 1,000,000 foot-pounds of work per minute, that is to say it would develop about fifty times as much power for the time during which it was operative. Power being devised as the rate of doing work is measured by the number of units of work done in a unit of time. James Watt, for the purpose of stating the power of his steam-engines, introduced the horse-power as a unit, defining it as 33,000 foot-pounds per minute, and this unit of power has become universal for practical purposes. On the Continent it is usual to take the horse-power as equivalent to 4,500 kilogramme-metres per minute.

At this point a digression on units is desirable, though it has no immediate bearing on the scope of this article. The pound or gramme or any weight is not a perfect measure of force. In fact a mass of any material which has the weight of 1 lb. at sea-level in any particular latitude weighs more at sea-level in higher latitudes where the form of the Earth brings it nearer the centre, and less in lower latitudes where the equatorial bulge keeps it farther away. Similarly at distances above sea-level the weight diminishes with the diminishing force of gravity. The difference is not enough to disturb rough practical calculations of horse-power: but in theoretical discussions it is important. Hence for scientific purposes a system of units independent of the varying force of gravity has been devised, and these units are called absolute for that reason. It is a mere accident that the absolute system generally used is expressed in grammes and metres instead of pounds and feet, gravity could be cut out of the British unit of work in exactly the same way as out of the French. The absolute unit of force on the centimetre-gramme and second (C.G.S.) system is the dyne, and that amount of force is enough to produce a velocity of 1 centimetre per second in the mass of 1 gramme after acting upon that mass for 1 second. The unit of work or erg is 1 dyne acting through 1 centimetre, and as this is an extremely minute quantity it is convenient to use the joule, which is equal to 10,000,000 ergs. The unit of power on this system is the watt, which is 1 joule per second: but for convenience the kilowatt of 1,000 watts is generally used, and for all practical purposes 1 kilowatt may be taken as 1·34 horse-power, or 1 horsepower as 746 watts. If one may venture to refer

to vulgar fractions in the same sentence as absolute units one could say with enough truth for most purposes that a kilowatt is $1\frac{1}{3}$ horse-power, and a horse-power is $\frac{3}{4}$ of a kilowatt.

This digression will necessarily fail to explain the essential difference between the two systems of reckoning to any one who did not understand it before; but it may convey a useful hint.

Returning from the discussion of arbitrary units to the real things which they are used to express, I wish to make clear the principles on which the horsepower of falling water can be calculated; but not to intrude on the domain of the engineer by treating of how the calculations are actually made.

It is desirable to bear in mind that although the potential energy possessed by water at a high level is equal to the weight of the water multiplied by the height through which it falls, it by no means follows that all this energy can be converted into useful work. Some is spent in friction of the water flowing along its channel, and some in friction in the machinery by which it is transformed into driving power or into electric energy. The proportion of the theoretical power available is a matter for the mechanical or electrical expert and depends largely on the perfection of the mechanism or processes employed. In an ordinary undershot or overshot water wheel a very large amount of the potential energy is lost; but in a modern turbine working either at low pressure with a large volume of water and a small fall, or at a high pressure with less volume but a high fall, the loss is much less. It may be assumed that over 80 per cent. of the theoretical power can be made available for mechanical use and about 70 per cent. can be transformed into electrical energy capable of being applied either to mechanical or chemical purposes, or for producing light or heat.

There is no way that can be seen at present of utilizing the power of falling rain-drops, and all that can be done is to make use of the water as it passes from a higher to a lower part of the land surface. The easiest way to do this is at a waterfall where a stream falls over a vertical rock. The waterfall itself is not usually led into the machinery; but water diverted from above the fall is led into a shaft provided with an outlet below the fall, the power station being built either on the higher or the lower level as may be more convenient. Or in cases where there is no actual waterfall water may be led from the upper part of the stream by a new channel to a place where a vertical fall can be provided, or it may be led in a strong pipe down a slope where no vertical fall can be provided and utilized farther down by taking advantage of the pressure in the pipe caused by the head of water. In many cases where only a little power is required, as for lighting a house or a village, the natural flow of the stream suffices, the smallest flow of the driest weather being enough to yield the power required.

(*To be continued.*)

THE WEATHER OF AUGUST, SEPTEMBER AND OCTOBER.

By F. J. Brodie.

The following brief summaries of the weather during the three months in question serve to bridge over the gap due to the recent suppression of meteorological information :—

August.—Over the greater part of England the opening and closing weeks of August were rainy and unsettled. During the remainder of the month the weather was fine and sunny, and eminently favourable for the progress of the harvest. Temperature, which was, as a rule, above the average, reached its culminating point on the 22nd, when shade readings ranging between 85° and 90° were recorded over a large portion of the eastern, midland and southern counties; at Canterbury the thermometer rose to 93°. The weather was at the time under the influence of southerly winds blowing in the front of a shallow cyclonic system which was advancing from the Atlantic. Next day, when the disturbance passed away to the eastward, the wind shifted to north, and an unusually rapid fall of temperature occurred. In Ireland and Scotland changeable showery weather prevailed throughout nearly the whole month. The mean temperature of August was everywhere above the average, but the duration of bright sunshine showed an excess only in the eastern parts of England; in most of the western districts there was a large deficiency. Thunderstorms were somewhat rare for the time of year.

September.—In addition to its extraordinarily heavy rainfall (to which full reference is made on p. 103) the month was characterised by an abnormally low temperature. In Scotland it appears to have been the coldest September for at least sixty years. Between the 5th and 7th the thermometer rose a little above 70° in many parts of the United Kingdom and touched 75° at Manchester. At most other times the daily maxima were below 60°, and on the 29th there were many places in which the thermometer failed to reach 50°. Accompanying the frequent passage of cyclonic disturbances across the more northern districts the prevailing winds were westerly, and often very strong in force, with occasional gales on our western coasts. The mean temperature of the month was below the average, especially in the north. In Wales and the neighbouring English counties bright sunshine was very deficient, but in other parts of the Kingdom it was equal to, or slightly above, the average. Thunderstorms were unusually frequent, more especially in the earlier half of the month.

October, although not particularly wet, was for the most part dull, damp and cheerless. The opening week was also very stormy, the passage of deep depressions outside our western and northern coasts being marked by southerly and south-westerly gales of considerable severity. At Quilty (co. Clare) the wind on the 7th reached, in gusts, a velocity of 39 metres per second, or 85 miles per hour. The highest temperatures were recorded mostly around the 6th or the 10th, when the thermometer rose to 65°, or a trifle above it, at a number of places situated in nearly all parts of the country. Sharp touches of frost occurred from time to time in most districts; on the surface of the grass several places experienced a ground frost on at least ten or a dozen nights, and at Hemel Hempstead on as many as fourteen nights. In the latter part of the month a good deal of wet fog prevailed over England and yielded in many instances perceptible quantities of water in the rain gauges. The mean temperature of the month was a trifle below the average, and the aggregate amount of bright sunshine was generally very deficient, few districts experiencing as much as one-fourth of the possible duration.

THE WEATHER OF NOVEMBER.

THE month opened with a week of mild cyclonic weather, and on the 2nd, the 5th and the 7th—8th, deep depressions moving over adjacent regions of the Atlantic caused strong gales from between south and west on many parts of our coasts. On the 2nd and again on the 7th and 8th, the wind rose in gusts to a velocity of 70 miles an hour and upwards at many places in the west and north, and on the 2nd reached a velocity of 78 miles an hour at Falmouth (Pendennis Castle). The highest temperatures were recorded, as a rule, on the 1st or 2nd, when the thermometer rose to 55° and upwards in most districts, and touched 60° at Holyhead. Between the nights of the 5th and 7th lightning was seen off the west coast of Scotland, and the north coast of Ireland.

After about the 9th a large anticyclone of considerable intensity appeared over the United Kingdom and remained in force until about the 20th. In many parts of the country no measurable quantity of rain fell for at least ten or twelve days, and in some few places the minimum limit of an absolute drought (fifteen consecutive rainless days) was attained. Over eastern and Central England, however, there was much fog during the night and early morning hours, and in several instances the air was sufficiently humid to deposit appreciable quantities of water in the rain gauges. Towards the middle of the anti-cyclonic spell the weather became very cold, and sharp night frosts were experienced. In many places the thermometer between the 17th and 19th failed to reach 40°, and at Glasgow on the former date it did not get above the freezing point. At night the thermometer in the screen fell below 25° at stations, a reading as low as 14° being reported at Eskdalemuir on the 20th. On the surface of the grass frost was unusually prevalent; at Kew, Aberdeen and Dublin it occurred on nineteen nights, and at Benson on as many as twenty-one nights. Towards the close of the month the anticyclone passed away to the westward, and mild southerly winds and unsettled rainy weather set in over the entire kingdom. Owing, however, to the long spell of cold which had previously been experienced the mean temperature of the month was everywhere below the average.

One of the most striking features in the weather of November was the prevalence of fog, more especially over the eastern and midland counties. Records made during the 20 years ended 1915 show that in an average November not more than 3 or 4 days are affected by this disagreeable visitant. Last month many places reported fog on at least 8 or 9 days. At Tynemouth it occurred on as many as 15 days, the number being more than four times the average, and twice as large as in any November of the previous 22 years.

The total duration of bright sunshine last month was, as a rule, not widely different from the normal; at the majority of stations there appears to have been a slight excess.

The distribution of total rainfall was normal, and no great departures from the average were observed. England had a rainfall slightly in defect nearly everywhere with less than 2 inches over the north midlands and north-east. More than 3 inches fell in patches in the south and south-west, and over part of the Pennines, but more than 6 inches was very local. Wales had more than the average in the west, and Scotland everywhere except in the north and north-east, and more than 10 inches fell widely in the west Highlands. Ireland was dry in the south and wetter in the north, more than 4 inches falling generally over the north-western half. The general rainfall for the countries, expressed as a percentage of the average, was :—England and Wales, 79; Scotland, 105; Ireland, 102; British Isles, 95.

In London (Camden Square) the mean temperature was 42°·9, or 0°·6 below the average for 50 years. The duration of bright sunshine was 22·3 hours, and the duration of rainfall, 63·3 hours. Evaporation, ·24 in.

RAINFALL TABLE FOR NOVEMBER, 1918.

STATION.	COUNTY.	RAINFALL.						
		Aver. 1875–1909. in.	1918. in.	Diff. from Av. in.	Per cent. of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	Nos. of Day
Camden Square	*London*	2·34	2·21	— ·13	94	·52	3	16
Tenterden	*Kent*	3·07	2·39	— ·68	78	·68	4	14
Arundel (Patching)	*Sussex*	3·54	2·00	—1·54	56	·54	4	11
Fordingbridge (Oaklands)	*Hampshire*	3·41	3·14	— ·27	92	1·11	4	17
Oxford (Magdalen College)	*Oxfordshire*	2·25	1·94	— ·31	86	·47	4	13
Wellingborough (Swanspool)	*Northampn*	2·22	1·94	— ·28	87	·46	3	14
Bury St. Edmunds (Westley)	*Suffolk*	2·40	2·10	— ·30	88	·95	3	14
Geldeston [Beccles]	*Norfolk*	2·49	1·42	—1·07	57	·61	3	15
Polapit Tamar [Launceston]	*Devon*	4·07	4·28	+ ·21	105	1·24	1	18
Rousdon [Lyme Regis]	,,	3·51	2·42	—1·09	69	·61	4	13
Stroud (Field Place)	*Gloucester*	2·77	2·19	— ·58	79	·74	5	11
Church Stretton (Wolstaston)	*Shropshire*	2·94	1·55	—1·39	53	·50	4	11
Boston	*Lincoln*	2·05	2·11	+ ·06	103	·78	3	15
Worksop (Hodsock Priory)	*Nottingham*	1·98	1·40	— ·58	71	·32	3, 4	13
Mickleover Manor	*Derbyshire*	2·21	1·74	— ·47	79	·34	4	13
Congleton (Buglawton Vic.)	*Cheshire*	2·61	2·06	— ·55	79	·63	28	15
Southport (Hesketh Park)	*Lancashire*	3·16	1·97	—1·19	62	·32	30	15
Wetherby (Ribston Hall)	*York, W.R.*	2·34	1·56	— ·78	67	·29	4	7
Hull (Pearson Park)	,, *E.R.*	2·34	1·51	— ·83	65	·45	3	11
Newcastle (Town Moor)	*North'land*	2·63	1·46	—1·17	56	·30	1	15
Borrowdale (Seathwaite)	*Cumberland*	13·59	10·51	—3·08	77	...	...	...
Cardiff (Ely)	*Glamorgan*	4·08	3·27	— ·81	80	1·01	4	18
Haverfordwest	*Pembroke*	5·16	5·25	+ ·09	102	1·40	1	16
Aberystwyth (Gogerddan)	*Cardigan*	4·50	4·61	+ ·11	102	1·05	10	17
Llandudno	*Carnarvon*	3·19	1·80	—1·39	56	·38	28	12
Cargen [Dumfries]	*Kirkcudbrt.*	4·35	4·62	+ ·27	106	1·00	4	14
Marchmont House	*Berwick*	3·21	1·32	—1·89	41	...	...	...
Girvan (Pinmore)	*Ayr*	5·24	6·08	+ ·84	116	1·20	5	18
Glasgow (Queen's Park)	*Renfrew*	3·63	3·58	— ·05	99	·62	5	19
Islay (Eallabus)	*Argyll*	5·33	6·99	+1·66	130	1·16	4	19
Mull (Quinish)	,,	6·24	7·58	+1·34	121	2·01	7	20
Balquhidder (Stronvar)	*Perth*	7·87	9·49	+1·62	121	1·80	9	17
Dundee (Eastern Necropolis)	*Forfar*	2·62	1·63	— ·99	62	·50	1	20
Braemar	*Aberdeen*	3·76	3·41	— ·35	91	1·32	1	10
Aberdeen (Cranford)	,,	3·29	1·99	—1·30	61	·75	4	10
Gordon Castle	*Moray*	2·85	...	...	...	...	...	...
Drumnadrochit	*Inverness*	3·41	3·72	+ ·31	109	1·25	4	15
Fort William	,,	7·55	8·95	+1·40	119	1·42	9	19
Loch Torridon (Bendamph)	*Ross*	8·90	7·74	—1·16	87	1·31	6	17
Dunrobin Castle	*Sutherland*	3·25	3·17	— ·08	98	1·22	4	10
Glanmire (Lota Lodge)	*Cork*	4·45	3·11	—1·34	70	·85	7	16
Killarney (District Asylum)	*Kerry*	5·54	4·52	—1·02	82	1·06	1	20
Waterford (Brook Lodge)	*Waterford*	3·80	3·46	— ·34	91	1·07	1	15
Nenagh (Castle Lough)	*Tipperary*	3·88	3·54	— ·34	91	·97	1	16
Ennistymon House	*Clare*	4·62	4·21	— ·41	91	·60	27	19
Gorey (Courtown House)	*Wexford*	3·41	3·50	+ ·09	103	·68	7	14
Abbey Leix (Blandsfort)	*Queen's Co.*	3·28	3·02	— ·26	92	·90	1	17
Dublin (Fitz William Square)	*Dublin*	2·64	2·52	— ·12	95	1·20	1	14
Mullingar (Belvedere)	*Westmeath*	3·38	3·72	+ ·34	111	·73	4	16
Crossmolina (Enniscoe)	*Mayo*	5·75	6·48	+ ·73	112	1·40	1	19
Cong (The Glebe)	,,	5·00	...	...	...	...	...	...
Collooney (Markree Obsy.)	*Sligo*	4·02	4·62	+ ·60	115	·78	4	20
Seaforde	*Down*	3·86	4·58	+ ·72	122	1·42	1	17
Ballymena (Harryville)	*Antrim*	3·95	5·69	+1·74	144	1·79	4	21
Omagh (Edenfel)	*Tyrone*	3·66	4·15	+ ·49	113	1·15	4	19

SUPPLEMENTARY RAINFALL, NOVEMBER, 1918.

Div.	STATION.	Rain inches.	Div.	STATION.	Rain inches
II.	Warlingham, Redvers Road..	2·72	XI.	Lligwy	2·58
,,	Ramsgate	2·20	,,	Douglas, Isle of Man	4·33
,,	Hailsham	2·58	XII.	Stoneykirk, Ardwell House...	3·72
,,	Totland Bay, Aston House...	2·47	,,	Carsphairn, Shiel	9·37
,,	Stockbridge, Ashley..	3·31	,,	Langholm, Drove Road	3·64
,,	Grayshott	3·87	XIII.	Selkirk, The Hangingshaw..	2·94
III.	Harrow Weald, Hill House...	2·20	,,	North Berwick Reservoir.....	1·35
,,	Pitsford, Sedgebrook....	...	,,	Edinburgh, Royal Observaty.	1·31
,,	Woburn, Milton Bryant.....	...	XIV.	Biggar.....	3·46
,,	Chatteris, The Priory..... ...	2·08	,,	Maybole, Knockdon Farm ...	5·06
IV.	Elsenham, Gaunts End	2·10	XV.	Buchlyvie, The Manse.....	5·68
,,	Shoeburyness	2·34	,,	Ardgour House	12·37
,,	Colchester, Hill Ho., Lexden	1·91	,,	Oban.....	7·04
,,	Ipswich, Rookwood, Copdock	1·86	,,	Campbeltown, Witchburn ..	...
,,	Aylsham, Rippon Hall	2·00	,,	Holy Loch, Ardnadam..... ...	10·56
,,	Swaffham	2·00	,,	Tiree, Cornaigmore	...
V.	Bishops Cannings	2·81	XVI.	Glenquey	3·30
,,	Weymouth..... ...	2·28	,,	Loch Rannoch, Dall	7·27
,,	Ashburton, Druid House.. ...	5·51	,,	Blair Atholl	3·25
,,	Cullompton	3·01	,,	Coupar Angus	1·65
,,	Lynmouth, Rock House	4·66	,,	Montrose, Sunnyside Asylum.	1·85
,,	Okehampton, Oaklands... ...	3·97	XVII.	Balmoral	2·98
,,	Hartland Abbey.....	3·27	,,	Fyvie Castle	1·05
,,	St. Austell, Trevarna	4·63	,,	Keith Station	2·30
,,	North Cadbury Rectory...	2·54	XVIII.	Rothiemurchus	...
VI.	Clifton, Stoke Bishop	2·05	,,	Loch Quoich, Loan	22·60
,,	Ledbury, Underdown..... ..	1·86	,,	Skye, Dunvegan	7·73
,,	Shifnal, Hatton Grange.....	1·61	,,	Fortrose.....	2·13
,,	Droitwich.....	1·74	,,	Glencarron Lodge	6·59
,,	Blockley, Upton Wold.....	2·71	XIX.	Tongue Manse	2·47
VII.	Grantham, Saltersford.....	1·96	,,	Melvich	3·10
,,	Louth Westgate	1·92	,,	Loch More, Achfary	5·21
,,	Bawtry, Hesley Hall	1·15	XX.	Dunmanway, The Rectory ..	5·17
,,	Whaley Bridge, Mosley Hall	2·71	,,	Mitchelstown Castle.....	3·02
,,	Derby, Midland Railway.....	1·39	,,	Gearahameen	8·00
VIII.	Nantwich, Dorfold Hall	2·11	,,	Darrynane Abbey.....	5·69
,,	Bolton, Queen's Park	3·09	,,	Clonmel, Bruce Villa	3·07
,,	Lancaster, Strathspey	2·55	,,	Broadford, Hurdlestown.....	3·73
IX.	Langsett Moor, Up. Midhope	1·48	XXI.	Enniscorthy, Ballyhyland...	4·27
,,	Scarborough, Scalby	1·35	,,	Rathnew, Clonmannon	2·65
,,	Ingleby Greenhow	1·86	,,	Ballycumber, Moorock Lodge	2·96
,,	Mickleton	2·40	,,	Balbriggan, Ardgillan	2·27
X.	Bellingham, High Green Manor	1·74	,,	Castle Forbes Gardens.....	3·76
,,	Ilderton, Lilburn Cottage ...	1·35	XXII.	Ballynahinch Castle.....	7·38
,,	Keswick, The Bank.....	5·74	,,	Woodlawn	3·77
XI.	Llanfrechfa Grange	3·21	,,	Westport House	6·25
,,	Treherbert, Tyn-y-waun	8·87	,,	Dugort, Slievemore Hotel ...	6·20
,,	Carmarthen, The Friary	4·28	XXIII.	Enniskillen, Portora.....	4·41
,,	Fishguard, Goodwick Station.	8·82	,,	Dartrey [Cootehill]	4·09
,,	Crickhowell, Tal-y-maes.....	2·50	,,	Warrenpoint, Manor House ..	3·27
,,	Gwern-y-argllwydd	2·50	,,	Belfast, Cave Hill Road	5·25
,,	Birmingham WW., Tyrmynydd	4·55	,,	Glenarm Castle	5·62
,,	Lake Vyrnwy	3·77	,,	Londonderry, Creggan Res...	3·84
,,	Llangynhafal, Plas Drâw.....	2·13	,,	Milford, The Manse.....	4·19
,,	Rhiwbryfdir	7·15	,,	Killybegs	7·18
,,	Dolgelly, Bryntirion.....	6·64			

Climatological Table for the British Empire, June, 1918.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	83·2	2	41·0	17	71·2	48·3	48·5	67	90·8	39·0	1·30	11	5·9
Malta	88·7	29	61·2	1	75·9	65·0	...	65	137·0	57·0	·16	3	1·9
Lagos	88·0	10	70·1	2	83·5	73·5	72·3	82	147·0	68·1	18·13	21	8·2
Cape Town	74·9	6	39·8	15	62·8	48·5	50·5	82	...	...	4·80	13	6·9
Johannesburg	65·3	14	30·9	23	61·1	41·4	32·8	58	...	20·9	·02	2	1·3
Mauritius	77·3	2	57·0	...	74·9	62·3	61·0	79	...	51·0	2·66	26	5·6
Bloemfontein	67·2	25*a*	21·2	28	62·4	31·5	30·8	62	..	...	·00	0	3·1
Calcutta...	95·0	5	74·6	18	87·5	77·7	77·5	89	...	73·1	16·09	21	9·2
Madras	102·3	9	72·8	15	98·2	79·2	71·1	66	155·2	73·3	1·80	10	5·2
Colombo, Ceylon ...	87·1	7	73·1	17	85·8	77·9	73·7	80	156·1	71·3	5·04	21	7·2
Hongkong	89·9	29	72·8	17	83·6	76·5	74·7	86	...	...	24·80	22	8·0
Sydney	72·3	15	41·3	29	65·2	46·6	43·8	73	114·7	32·9	·55	4	2·6
Melbourne	65·2	2	40·2	30	57·8	46·8	44·4	74	108·2	30·3	1·76	16	6·8
Adelaide	66·9	2	38·0	8	62·1	47·9	47·8	78	121·0	29·0	2·71	15	...
Perth	74·0	1	43·1	28	65·4	53·3	51·8	78	127·6	57·0	10·50	27	7·0
Coolgardie	75·2	1	30·2	28	63·1	44·4	44·1	68	128·0	25·5	1·67	6	5·8
Brisbane	88·9	19	38·5	29	72·7	47·8	47·2	62	136·0	34·6	·20	3	2·5
Hobart, Tasmania ..	59·0	24	33·2	8	53·3	41·0	38·8	71	102·6	31·1	1·97	16	5·8
Wellington	61·9	3	32·9	30	56·1	44·8	44·5	79	120·0	20·8	7·08	16	6·1
Jamaica, Kingston ..	92·0	28	69·6	25	87·6	72·8	70·8	78	...	...	·84	8	4·2
Grenada	88·0	8	70·0	11*b*	83·0	73·0	...	77	136·0	...	11·26	21	4·6
Toronto	88·8	1	39·0	8	71·6	51·4	49·0	69	140·0	34·0	3·35	13	4·9
Fredericton	86·5	2	33·0	21	69·2	45·4	48·6	68	...	...	4·48	7	5·1
St. John, N.B. ...	80·5	3	40·3	19	62·8	46·4	46·5	76	135·4	35·0	4·48	11	5·7
Victoria, B.C.	79·5	5	41·9	2	66·4	49·4	46·0	69	138·0	33·2	·33	3	3·4

a—26. *b*—17

Johannesburg.—Bright sunshine 278·1 hours.

COLOMBO, CEYLON.—Mean temp. 81°·8, or 0°·1 above, dew point 1°·0 below, and R 2·61 in. below, averages. Mean hourly velocity of wind 5·8 miles.

HONGKONG.—Mean temp. 79°·5. Bright sunshine 147·6 hours. Mean hourly velocity of wind 7·6 miles.

Sydney.—The highest mean max. temp. on record for June.

Melbourne.—Temperature low with mild winter and almost complete absence of frosts.

Adelaide.—Mean temp. 1°·6 above, and R ·39 in. below, averages.

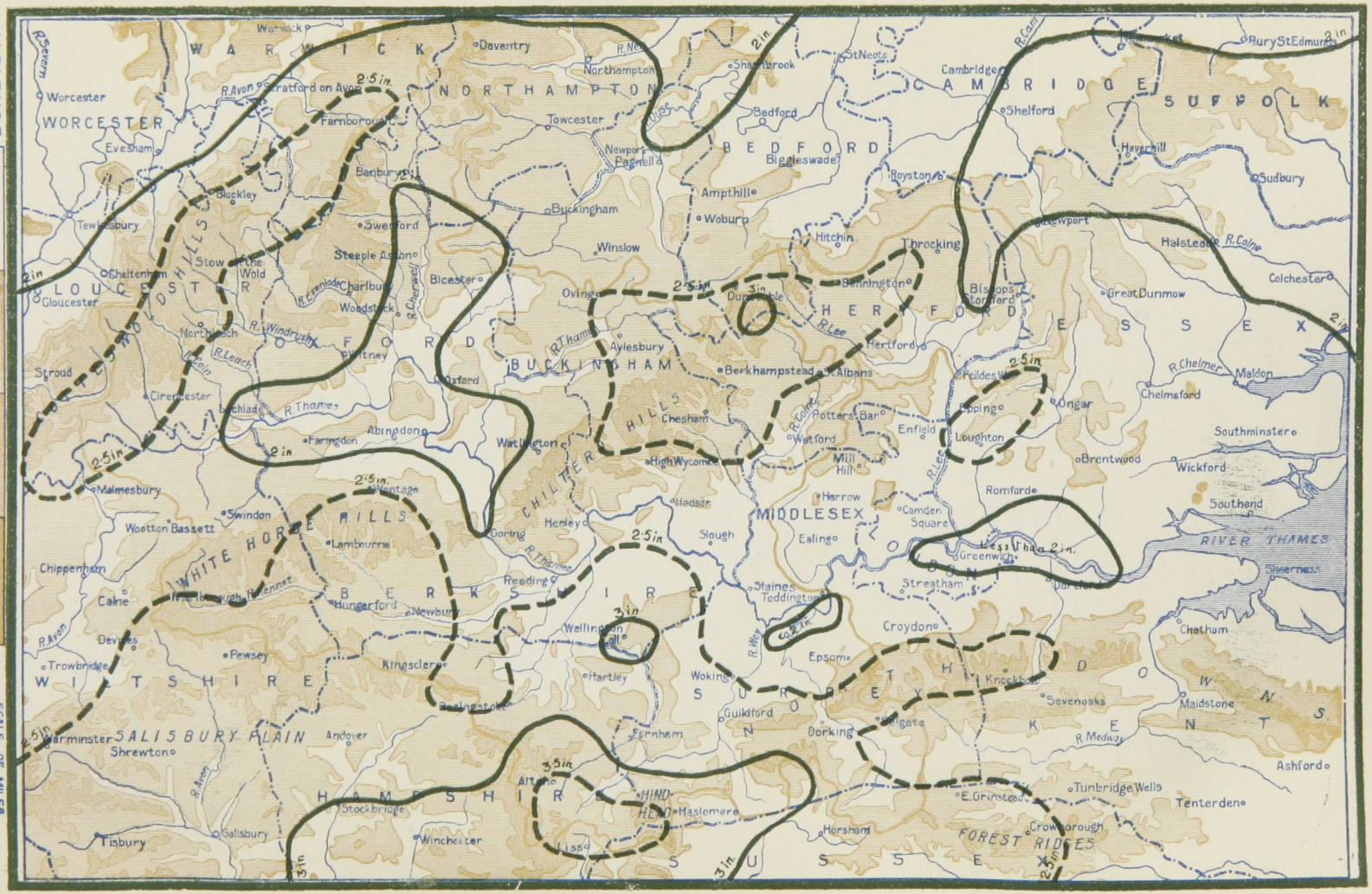
Perth.—Rainfall 3·67 in. above average.

Coolgardie.—Temp. 1°·2 above, and R about ·50 in. above, averages.

Brisbane.—Rainfall 2·39 in. below average. Frost on 8 days.

Wellington.—Mean temp. 1°·0 above, and R 2·06 in. above, averages. Bright sunshine, 110·6 hours. Frost on 11 days.

THAMES VALLEY RAINFALL. NOVEMBER, 1918.



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