

Symons's Meteorological Magazine.

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THE RAINFALL OF 1917.

A PRELIMINARY examination of the rainfall returns for 1917, of which some 3,000 have been received at the moment of writing, gives a fairly clear indication of the main features of the distribution in relation to the average. Speaking broadly the year was one of average rainfall, but large and continuous areas of deficient rainfall occurred in parts of all the great divisions of the country. Of these the most important in point of extent occupied the centre, and part of the north and the south-west of England, deficiencies of more than 10 per cent. occurring in all these areas and reaching 20 per cent. along a narrow strip of the south-west coast. The east, and particularly the east Midlands, of Scotland, were also extremely dry, the deficiency exceeding 20 per cent. over a considerable area extending from the Firth of Forth to the Grampians. The whole of the southern half of Ireland had less than the average rainfall, as was also the case in the extreme north and the south of Wales, but nowhere in these districts did the deficiency exceed 20 per cent. The largest wet area lay in the west and north of Scotland, but as far as the records available indicate the excess reached as much as 10 per cent. only in the extreme south-west. There was a more marked excess of rainfall in the north of Ireland, where a large district had more than 10 per cent. above the average, and a smaller patch, extending from Sligo Bay to Lough Foyle, more than 20 per cent. above the average. The last mentioned area was relatively the wettest portion of the British Isles. The wet areas in England and Wales were more broken, occupying approximately two interrupted belts, stretching respectively from Cardigan Bay to Berwick and from Exmoor to Yarmouth. On the shores of Cardigan Bay and over part of the Yorkshire Wolds the rainfall was more than 10 per cent. above the average, and a similar excess occurred in the London district. The appearance of a wet area in the south-west of England was undoubtedly due to the remarkable rainstorm of June 28th, when over a small area round Bruton as much as 9 inches of rain fell in 24 hours. London, probably as a result of the unprecedented thunderstorm of June 16th, was relatively the wettest spot in Great Britain, the excess just reaching 20 per cent.

The general rainfall of the greater divisions of the British Isles, expressed as a percentage of the average, for the year was as follows :—

England	97	per cent. of the average.		
Wales	99	"	"	"
Scotland	97	"	"	"
Ireland	99	"	"	"
British Isles	98	"	"	"

The only months in the year in which an appreciable excess of rainfall occurred in general over the country were August, October and November. May was rather wet in Ireland and June in England, especially locally. Of the remaining months only February, with 55 per cent. less than the average, was remarkably dry, December following with 40 per cent. defect. There was however, a widespread general deficiency in the first seven months of the year, and a return to dry conditions at the end, especially in England.

TEMPERATURE OF 1917 IN LONDON.

THE most interesting features of the temperature results shown in the annexed table were the unusually prolonged cold spell from January to April, in which the mean defect was 4°, the unusual warmth of May, June, September, and November, with an average excess of 3°·5, and the coldness of October and December. The mean temperature of the year was 49°·3, or 0°·7 below the average. So persistent has been the run of warm years during the last quarter of a century, that only one year, *viz.*, 1909, with a mean of 49°·2, had a lower temperature than 1917. For a year with as many warm and cold months the extremes of temperature were quite moderate if we except the two warm days June 16th and 17th, with maxima of 88° and 90° on the Glaisher stand. The lowest temperature occurred on February 7th, *viz.*, 19°·1. The mean temperature of April was 43°·1, and of May, 59°·1, showing the very large increase of 16°, there being practically no spring. October was 12°·4 colder than September.

Temperature at Camden Square in 1917.

	Mean.		Mean Maximum.		Mean Minimum.	
1917.	1917.	Difference from aver.	1917.	Difference from aver.	1917.	Difference from aver.
January	35·5	—3·0	38·3	—5·0	32·7	—1·1
February ..	35·4	—4·2	40·7	—4·8	30·7	—4·0
March	38·6	—3·5	45·2	—4·8	32·8	—2·6
April	43·1	—5·3	52·6	—5·3	34·6	—5·1
May	59·1	+5·1	71·4	+6·8	48·5	+3·9
June	63·8	+3·7	76·0	+5·2	54·2	+3·5
July	63·9	+0·4	75·2	+0·9	54·7	+0·5
August	62·3	0·0	71·4	—1·3	55·6	+2·2
September ..	59·5	+1·8	69·8	+2·4	51·9	+3·2
October ...	47·1	—3·0	55·9	—1·8	40·3	—3·4
November ..	46·8	+3·3	52·1	+3·0	41·8	+3·6
December ..	36·0	—3·7	41·1	—3·2	31·3	—3·7
Year	49·3	—0·7	57·5	—0·6	42·4	—0·3

REVIEWS.

Réseau Mondial, 1911. Monthly and Annual Summaries of Pressure, Temperature and Precipitation at Land Stations, generally two for each ten-degree square of latitude and longitude. (British Meteorological and Magnetic Year Book, 1911, Part V.). Also charts showing monthly difference of Temperature and Pressure from normal values. The same for 1912. London, Meteorological Office. Size, $12\frac{1}{2} \times 10$. Pp. xvi.+112.

THE new departure of the Meteorological Office in publishing systematic records of world-wide meteorology deserves a particularly warm welcome in these pages, and we heartily congratulate Sir Napier Shaw on the appearance after very exceptional difficulties of these two issues. As long ago as 1873 Mr. G. J. Symons undertook to prepare monthly meteorological tables of the British Empire for publication in *The Colonies*, and when, in 1882, that journal ceased to print them, he introduced the Climatological Table into this Magazine, in which it has appeared ever since, and has expanded from eighteen to twenty-six stations. Thus, for forty-five years, a regular publication of data was kept up by which the general character of the climate of the Empire was recorded within six months. Such prompt publication in terms familiar to the public is sufficient justification for continuing these humble records on our last page; but we gladly recognize that they are superseded for scientific purposes in which the retardation of date is no objection by the splendid compilation of the Meteorological Office.

The basis of the selection of stations is that for every reticulation of the network of lines of latitude and longitude drawn on the globe at intervals of 10 degrees (loosely designated as "squares," though two tiers of them are triangles and only two tiers are anything approaching squares) there shall be two or sometimes three stations. It is probably this method of distribution which gives rise to the quaint and almost poetic title which may be translated "World Network." This idea of naming a meteorological work by the method of classifying the stations is attractive and capable of expansion. We might even dally with the thought of re-christening "British Rainfall" after the mosaic of river-divisions in which the stations are grouped, veiling the crudity of English in some such guise as *Mosaïque Albionale*.

The compilation of world data is so fine a thing that it well deserves to be made the first exponent of the new nomenclature, as it is, we believe, the first instance of the use of the new meteorological units for the presentation of the work of many nations. In all about 400 stations are dealt with, all lying within the sixteen tiers of "squares" between 80° N. and 80° S., and the working up of the temperature, pressure and rainfall data for all these must have been a formidable piece of work, the credit for which is given in

the preface to Mr. C. E. P. Brooks, assisted by Mr. H. W. Braby. The extraction and conversion of the actual monthly data was a comparatively simple task, the real difficulty arose in the calculation of normal values with which to compare them. This is, indeed, a weak mesh in the network, the weakness arising from the fact that the periods for which averages can be computed vary for different places. It is well known that spells of several years may occur in which annual values are all on one side of the long period average so that any comparatively short period may yield an average so distorted from the normal value as to afford very misleading results by comparison. Again, in rainfall at any rate, the monthly totals have a far greater variability than the annual so that a period of years sufficient to yield satisfactory annual normals might be far too short to supply sound normals for the months. The compilers must assuredly have had this aspect of the case borne in upon them while handling the data, but the unwarned reader may not realize the greater certainty of the monthly figures than of the normals.

One can only view these issues of the Réseau Mondial as approximations to perfection; indeed, no scientific production, save, perhaps, the *Nautical Almanac*, can hope to be more, and as the years succeed each other the normals will improve, and the student of world meteorology will get firmer and firmer ground on which to base his generalizations.

The maps show deviations from normal pressure by lines termed "is anomalies" and those of temperature by red figures for positive values and blue for negative. The maps are rather bewildering to one accustomed to ordinary geographical presentations; but if the five-lobed figure is pasted on stiff paper and cut out it can be fitted together into a sort of "globe" on which all the features join up and become extremely suggestive.

Etudes sur le Climat de la France. Régime des Pluies. Première Partie. : Considérations générales : Région du nord-ouest. Par [Studies of the Climate of France. Rainfall, Part I., General considerations: the North-Western Region. By Alfred Angot. Size, 13 + 10. Pp., 128. Plates.

THIS is an extract from the *Memoirs* of the French Central Meteorological Office for 1911. The first part deals with the preparation of statistics for use in compiling maps of average rainfall supplementary to a memoir on the Rainfall of Europe in the *Annales* of the Central Office for 1895. The present work, of which a portion only is yet completed, makes use of all the rainfall data accumulated since 1851. For this purpose the figures given in the annual rainfall volumes (commencing in 1877) have been revised, and many errors detected and rectified, and the earlier records have been compiled from documents preserved in various places. The data have been calculated to a fifty years' average by comparing short records

with the nearest long records, though in many cases the distance of the standard stations is considerable.

A discussion on the variability of rainfall and the value of monthly and annual means is based on 50 years' records (1851-1900) at sixteen stations in France and neighbouring countries. Two English stations are included, *viz.*, Greenwich Observatory and the Royal Institution, Truro, the latter an unsatisfactory choice as the rain gauge was on a roof 40 feet above the ground. The discussion resulted in proof that the deviations of individual years from the mean value accorded well with the theory of probabilities.

This demonstrates that rainfall averages have a true physical significance and are not to be valued simply as the mean of fortuitous numbers. The probable error of the monthly and annual means is discussed in some detail and the conclusion drawn that tenths of a millimetre are of no significance in monthly values, while the nearest centimetre more than suffices for annual values.

The whole data for France are to be discussed in four parts, those for the North-West, South-West, North-East and South-East. Of these the first is before us. Tables of data are given by departments and are preceded by a numbered list of stations giving the altitude, the date and duration of the observations, arranged in river basins from the highest downwards. The rain gauge in practically all cases was fixed with its receiving surface between 1.50 and 1.80 metres (say 5 and 6 feet) above the ground; this means that to compare with British statistics, collected mainly at 1 foot, the values given in the memoir should be increased by 4 or 5 per cent. The total area of the 22 departments of north-west France is 144,260 square kilometres, or 55,685 square miles, the number of rainfall stations 78½, or .54 per square myriametre, *i.e.*, 1.4 per 100 square miles.

Very little is said as to the process of mapping employed; but the maps were originally drawn on the scale of 1 : 1,500,000 or 22 miles to an inch, and then reduced for publication to 1 : 2,500,000, or 39 miles to an inch. Rivers are shown but no indication of departments, towns, railways, roads, relief or watersheds. Nothing is said as to how the isohyetal lines are drawn in their places; but the maps appear to have been drawn without reference to the configuration of the land. The monthly isohyets are at intervals of 10 mm. (.49 in.) up to 100 mm., then only 120 and 150 mm.; on the annual maps at intervals of 100 mm. (4 inches).

Discovery; or The Spirit and Service of Science. By R. A. Gregory.
London, Macmillan and Co., Limited, 1917. 7½ × 5. Pp.,viii + 340. 5s. net.

THIS thoughtful and inspiring book was designed by the author to combat the too common misconceptions as to the real meaning of

science to the scientific student. Professor Gregory approaches his subject with praiseworthy detachment and impartiality, conceding that certain minds may pursue science unworthily but making it clear by an amazing wealth of instances that this is an exceptional and abnormal effect. He says in his preface :—

“When scientific work is instituted solely with the object of securing commercial gain, its correlative is selfishness; when it is confined to the path of narrow specialisation, it leads to arrogance; and when its purpose is materialistic domination, without regard for the spiritual needs of humanity, it is a social danger and may become an excuse for learned barbarity. But scientific research is rarely inspired by these motives, and devotion to it does not necessarily inhibit response to other notes with which a well-balanced mind should be in symphony. Moreover, direct contact with Nature and inquiry into her laws produce a habit of mind which cannot be acquired in literary fields, and they are associated with a wide outlook on life more often than is usually supposed.”

Twelve chapters are devoted to as many aspects of the subject, the general principles being illustrated by examples drawn from the work of more than 400 investigators and thinkers whose names are set out in a biographical index. All branches of science are referred to, and we are particularly interested in noting how frequently the facts of meteorology are made use of as illustrations. We may call special attention to the remarks on gunfire and rainfall and on the influence of the moon on the weather in the chapter entitled, “Belief and Evidence.” Professor Gregory is probably the only man in this country possessed of a wide enough knowledge of the facts of all the sciences to succeed in producing a work of this kind free from technical error and presented in a readable and convincing form.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

GUNFIRE AND RAINFALL.

REFERRING to the discussion in your pages upon rainfall and gunfire, just after reading p. 115, came a letter from my sister-in-law, Prof. Elizabeth Kendall, reporting extraordinary travel difficulties in Japan from excessive rainfall. The cables of unprecedented South Australian floods belong to a subsequent date. Rather earlier came cables of destruction to life and property through equally abnormal floods in Natal. Earlier in the summer the basin of the Yellow River, in China, was the scene of devastation on an appalling scale. Does Mr. D. W. Horner associate these also with the gunfire on the western front? For myself I am more inclined to take refuge in Dr. Lockyer's astro-physical forecast, early in the century, of exceptional rainfalls from, if I remember right, about 1910 to 1925.

J. EDMUND CLARK.

REFERRING to the article in your December number on Gunfire and Rainfall, another and equally reliable method of examining the data is to note the number of quarters, both during the war and during peace, when an excess of rain occurred in the S.E. districts. We may consider the number of quarters in which the rainfall was above, or below, the average in the S.E. districts, and these figures are given in Table I. below. As these figures will be affected by abnormally wet or dry seasons extending over a wide area, a more reliable test is to consider the number of quarters in which the rainfall, expressed as a percentage of the average for each district, was greater in the S.E. or N.W. districts. These figures are given in Table II.

I.—*Number of Quarters with excess Rainfall in S.E. districts.*

	Oct. 1914 Mar. 1916	Ap. 1916 Sept. 1917	Total (War)	Oct. 1909 Mar. 1911	Ap. 1911 Sept. 1912	Total (Peace)
Excess in S.E.	5	3	8	4	3	7
Deficit in S.E.	1	2	3	2	2	4
Uncertain	0	1	1	0	1	1

II.—*Number of Quarters with more rain in S.E. or N.W. districts.*

	5	1	6	3	3	6
Excess in S.E.	5	1	6	3	3	6
Excess in N.W.	0	3	3	2	1	3
Uncertain	1	2	3	1	2	3

These figures appear to show (1) that the excess of rain in the S.E. districts during the war is almost entirely confined to the first half of the war, in spite of the very much greater quantity of explosive detonated during the latter half. (2) Almost identical results are found for the years of peace as for those of war.

This is but another example of the difficulty of reaching trustworthy conclusions without the application of strict statistical methods.

GORDON DOBSON.

R. A. F., Farnborough,
Dec. 12,-17.

My remarks on p. 99 dealt with Mr. Horner's "theory," as explained at p. 91, which certainly differs from his "expression of opinion" to Mr. Elgie. It is not for me to reconcile these mere hypotheses. Has it not occurred to Mr. Horner that in Nature's laboratory rain (whether an insignificant shower of drizzle, the Somerset 9-inch fall of June 28th, or the 40-inch a day deluges in the tropics) is produced in absolute silence? Is his "theory" of the slightest use in explaining why, with the Ordnance Testing ground along the foreshore between Southend and the Maplin Sand, where big guns have been roaring for many years, rain is less frequent and less heavy in that locality of Essex than in any other part of the kingdom? Speaking generally, the further away from the noise of the guns and the chemical matter they discharge, the more frequent and heavy the downpours!

From the remarks of Mr. Horner and the Rev. H. A. Boys, both writing from the far west country, the inference is that they have been misled into supposing that south-east England has had large rainfalls during the war years only. Briefly, we can regard September, 1909, as the commencement of the present period in the district. Since then we have had numerous wet months, with no artillery violence to explain the excessive rainfalls, 5 inches to more than 9 inches at various stations in this quarter, in nearly every October, November and December before the war.

If readers will consult the Meteorological Office Monthly Weather Reports for August, 1912, and August and October, 1917, they will learn that the great rains of these months were to a very large extent due to the atmospheric conditions over Greenland!—a more reasonable explanation than wireless telegraphy and guns. The September, 1917, report should be consulted for an explanation of the comparative dryness of that month.

HY. HARRIES.

Dec. 3, 1917.

IN "King Henry the Fourth" the following lines occur:—

GLENDOWER:—I cannot blame him, at my nativity,
The front of heaven was full of fiery shapes,
Of burning cressets; and, at my birth
The frame and huge foundation of the earth
Shak'd like a coward.

HOTSPUR: Why so it would have done at the same season if your mother's cat had but kitten'd though yourself had never been born.

I think this quotation is most appropriate to the controversy about the connection between gunfire and the excessive rainfall which has undoubtedly occurred in the South-east of England, and I must confess that my sympathies are entirely and whole-heartedly on the side of Hotspur in the matter.

W. H. DINES.

I CANNOT bring to bear on this subject the copious statistics employed by Mr. F. J. Brodie, but I should like to make two comparisons:—

Camden Square, 1878-80	..	Mean Excess, 30 per cent.
Seathwaite, 1878-80	..	Mean Defect, 12 per cent.

Again, Seathwaite shows for the whole decade 1860-9 a mean excess of 19 per cent., Camden Square, for the same years, a mean excess of only 2 per cent.

Yet there was no heavy gunfire in Flanders in 1878-80, nor in the neighbourhood of the north of Ireland in 1860-9. Depressions seem

to have a tendency, sometimes lasting for several years, to take at one period a more southerly track, bringing much rain to the south of England, and at another period a more northerly track, bringing heavy and frequent rains in the north and west. We are still in the dark as to the causes of this variation, but I have yet to be convinced that gunfire has anything to do with it. F. J. WARDALE.

Shrewton, Wills, December 31st, 1917.

THE SQUALL OF 25th NOVEMBER, 1917.

DURING the night of the 24th November, a warm S.W. gale associated with an intense cyclonic system, shifted to the N.W. with clearing sky, marked decrease of temperature and rapidly rising barometer. In London the outlook on the morning of the 25th was scarcely for anything more eventful than a gradual subsidence of the bitter N.W. gale and an ensuing night frost. But about 11 a.m. a terrific squall, accompanied by blinding snow, suddenly swooped down and lasted for the best part of an hour. I happened to be on the Hampstead ridge at the time, and watched the squall advancing from Mill Hill in clouds of white powder and encroaching on the nearer trees and landmarks in icy spirals. The wintry fury of this storm furnished a spectacle certainly more suited to the wild uplands of Dartmoor than the gentle undulating landscape of Middlesex.

The barographic trace during the disturbance became horizontal—a characteristic feature—indicating that the rapid recovery of pressure in rear of the cyclone was checked by a local irregularity. Evidence points to the passage of a line-squall of a simple type occurring in the homogeneous cold current in the rear of the cyclone. When a squall occurs along the line of separation between two currents of different temperature, as on 8th February, 1906, the whole phenomenon is much intensified; but the case of 25th November emphasises what I have suggested elsewhere, that the vertical displacement motion which is a feature of squall action may take place in a single current of uniform temperature, the slight pressure reduction in front of the squall being transmitted from some upper region of the atmosphere.

L. C. W. BONACINA.

December 4, 1917.

BIRD'S NEST IN A RECORDING ANEMOMETER.

THE frontispiece to this volume shows the recording part of an anemograph at the Colombo Observatory, (Ceylon) in which a bird had built its nest so cleverly that the working of the instrument was not affected.

The anemometer is one of a pattern designed by Mr. A. J. Bamford

and constructed locally. It consists of a chain hanging vertically in calm weather with a metal cone attached to it some distance below the point of suspension. As the wind blows on this "sail" (not shown in the photograph) a metal rod attached to the lower part of the chain is raised vertically through guides and lifts a series of cones one within the other, finally in the strongest gusts lifting the outer cone which is shown in the photograph. The record is made on a drum, shown in the upper part of the picture, by means of a pen carried by the vertically moving rod. The instrument is thus a pressure anemometer controlled by a series of weights (the cones) which come into action successively as the strength of the wind increases.

Mr. J. E. Evans, Acting Superintendent of the Colombo Observatory, in sending us the photograph, says :—

"I enclose a photograph of the nest of the magpie robin in one of the anemometers designed by Mr. Bamford. The principle upon which this instrument works is that successive cones are lifted according to the strength of the gusts and the lift recorded upon the drum by means of a pen. Inspection of instruments usually takes place at least once a week, but at the time had been deferred. The anemograph, with other observatory records, is submitted daily, but as at the time no heavy winds were experienced the top cone on which the nest rests would not have been lifted, so nothing unusual was suspected. As calm weather was likely to continue the nest was left undisturbed. Despite that the box was uncovered twice daily by the Observer, to change the forms and fill the pen, the eggs were duly hatched and the chicks successfully reared."

EARLY RECORD OF RAINFALL DURATION.

THE late Mr. George Pile, of Hartley, Cranbrook, Kent, who died in 1916, bequeathed to the Trustees of the British Rainfall Organization his manuscript meteorological records and weather memoranda kept with remarkable regularity during the fifty years, 1867-1916. Among the earlier registers, which it has now been possible to examine, we note with great interest a series of records of the duration of rainfall covering a period of two years, 1866 and 1867. It is not stated how these records were obtained, and it seems probable that they were non-instrumental estimates made from day to day. Whether this is the case or not they are, so far as we know, the earliest systematic observations of this element of weather obtained in the British Isles and possibly in other parts of the world also, preceding those of Mr. F. E. Sawyer published in *British Rainfall* 1869, 1870 and 1871, by two and a half years.

The following tables give the monthly totals and the mean rate of fall per hour as deduced by Mr. Pile :—

Duration of Rainfall at Cranbrook, Kent.

	1866			1867		
	Rainfall in.	Duration hrs.	per hour in.	Rainfall in	Duration hrs.	per hour in.
January	4·90	116	·042	4·12	161	·026
February . . .	4·66	158	·030	1·93	83	·023
March	1·87	65	·029	3·24	96	·034
April	2·15	59	·036	1·94	66	·029
May	·86	31	·028	3·09	61	·051
June	3·46	44	·079	1·23	25	·049
July	2·52	43	·058	4·51	73	·062
August	3·43	58	·059	1·88	33	·057
September . .	5·68	137	·041	1·84	24	·077
October . . .	1·74	78	·022	3·10	78	·040
November . .	2·34	55	·043	1·65	48	·034
December . .	2·16	104	·021	2·62	80	·033
Year	35·77	948	·038	31·15	828	·038

The duration values are rather high, and the intensity values consequently rather low, as compared with the amounts recorded in recent years in Kent, but the differences are not larger than might easily occur from year to year.

We should be much interested if any readers know of earlier records of rainfall duration, and, if so, we should be glad to have copies for preservation.

ROYAL METEOROLOGICAL SOCIETY.

THE second meeting of this Society for the present session was held on December 19th at the Society's Rooms, Westminster, Major H. G. Lyons, F.R.S., President, in the Chair.

A paper on "The Computation of Wind Velocity from Pilot Balloon Observations," was read by Mr. P. Bolton, in which a graphic method of ascertaining the required wind velocity was described. Mr. E. G. Bilham, B.Sc., read a paper on, "The Use of Monthly Mean Values in Climatological Analysis," in which the corrections to be applied to the original monthly means and to the Fourier amplitudes had been determined.

The following gentlemen were elected Fellows of the Society on November 21st :—Lieut. F. W. Barlow, A. A. Barnes, E. A. Beale, W. J. E. Binnie, P. H. Budgen, Prof. E. J. Garwood, F.R.S., Lieut. J. L. Gray, A. Mortimer Gunnell, Flt.-Lieut. T. E. Barham Howe, D. B. Mackenzie Hume, Mian Iltaf Hussain, H. F. Jackson, H. Jeffreys, A. J. L. Knapton, Lt.-Col. G. C. Lambton, D.S.O., Lieut. G. D. Lane, Lieut. A. H. Low, Lieut. C. L. J. Nicoll, Lt.Comm. J. W. Scudamore, D.S.C., A. Smith, Rev. D. Holland Stubbs, L. A. Wells.

At the meeting on December 19th, the following candidates were elected:—Lieut. J. H. Grills, Capt. S. M. Holmden, Lieut. J. Logie, T. D. Parkin, Miss A. F. Poole, Miss L. D. Sawyer.

SCOTTISH METEOROLOGICAL SOCIETY.

THE Annual Business and General Meeting of the Society was held on December 20th, 1917, in the Lecture Hall of the Royal Society of Edinburgh, Professor R. A. Sampson, F.R.S., in the Chair.

A report from the Council was adopted and the following Council and Office-bearers were elected for the ensuing twelve months:—*President*:—Prof. R. A. Sampson, F.R.S.; *Vice-Presidents*: Mr. M. McCallum Fairgrieve, and Dr. C. G. Knott; *Council*: Prof. T. Hudson Beare, Dr. J. D. Falconer, Mr. J. Mackay Bernard, Mr. D. A. Stevenson, Mr. R. Cross, Mr. S. B. Hog, Mr. G. Thomson, Dr. A. Crichton Mitchell, Mr. G. A. Mitchell; *Honorary Secretary*: Capatin E. M. Wedderburn, R.E.; *Honorary Treasurer*: Mr. W. B. Wilson.

The Secretary, Mr. A. Watt, M.A., communicated an interesting paper, entitled "Some cases of Ground Ice," a summary of which, owing to exigences of space, is unavoidably held over till our next issue.

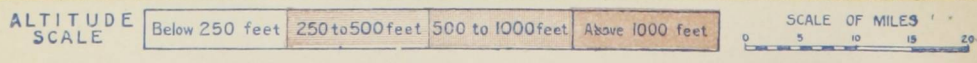
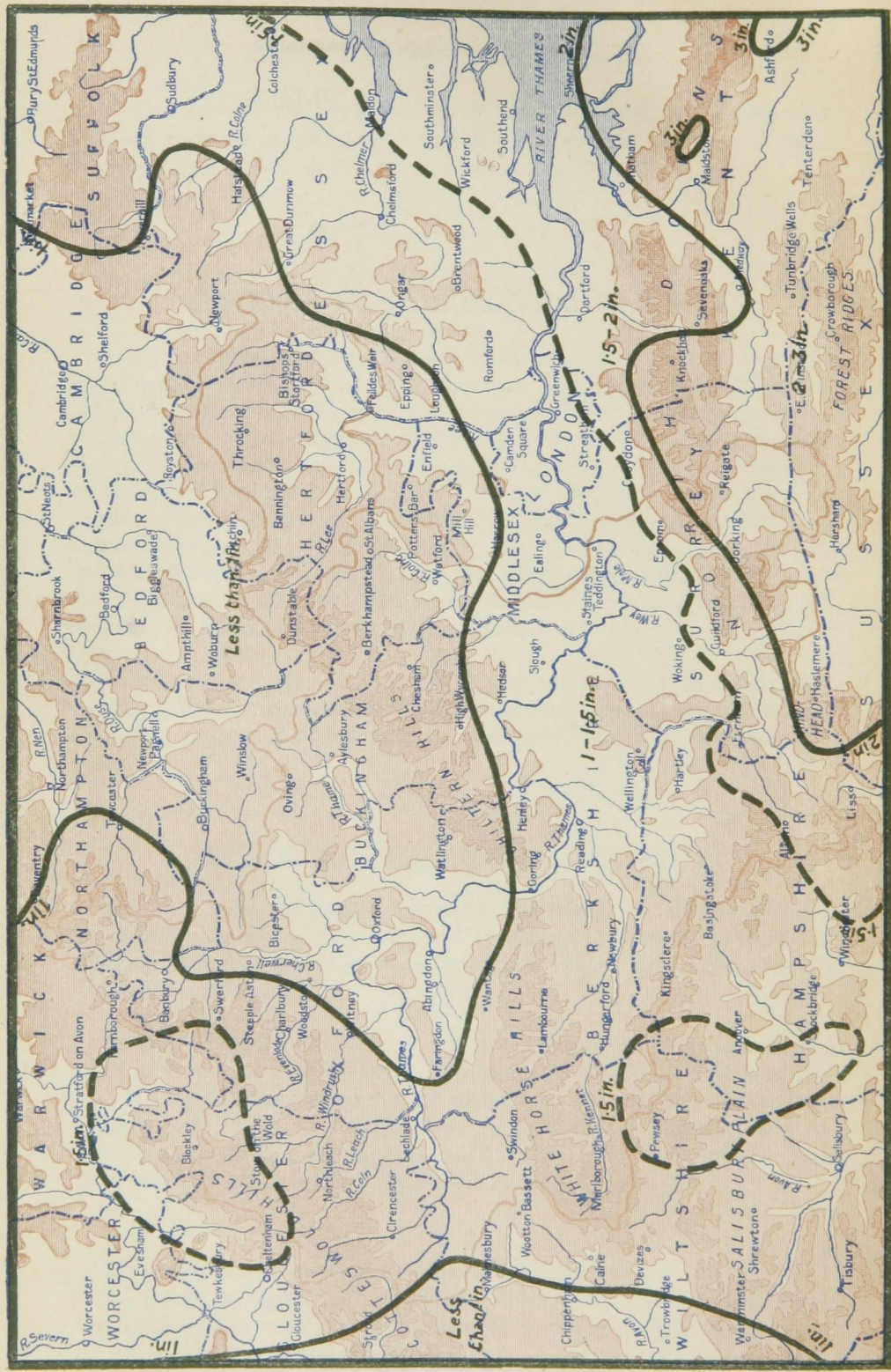
METEOROLOGICAL NEWS AND NOTE.

Mr. R. G. K. LEMPFERT, head of the Forecast Division of the Meteorological Office has received the Order of Commander of the British Empire in connection with the New Year Honours for National Service.

ANGELIC ORIGIN OF RAIN is apparently one of the graceful fairy tales of the East. The *Daily Express* has printed the following:—

"Mr. Ernest Young, who went to Siam to organise the educational system, said at the Aldwych Club yesterday that Siamese children believe that when many angels get into the same bath at the same time water runs over the side and it rains."

ERRATUM.—In the December number of the Magazine, p. 128, Mr. W. H. Dines, F.R.S., is reported as having stated that the standard deviation is four-fifths of the mean of the numerical departures. This is a misprint, the value is approximately five-fourths.



THE WEATHER OF DECEMBER.

THE outstanding features of the weather of December were the low mean temperature, and the deficient rainfall. At the beginning of the month a low pressure area passed to the north of Scotland, with much snow in places. During the first half the weather was dominated by Atlantic depressions and anti-cyclones alternately, but during the second half of the month a high pressure area covered the British Isles. The mean temperature of the month was 3° F. under the normal, the deficit being greatest, $4^{\circ}\cdot5$ or more, in the south-east and south-west of England, and least, about $1^{\circ}\cdot5$, in the north of Scotland and north of Ireland. The cold weather was far more pronounced in the second than in the first half of the month, although during the last ten days or so the north of Ireland enjoyed a temperature slightly in excess of the normal. The highest temperatures of the month were recorded round about the 7th and 13th, when shade maxima well over 50° occurred nearly everywhere. The maximum values recorded were 56° , at Cahir, and 55° , at Gordon Castle, Valentia, and Killarney, on the 6th, and 55° , at Kilkenny, on the 13th. The lowest temperature was recorded quite early in the month, Balmoral having a reading of 8° on the 4th. Other low temperatures occurred between the 17th and 22nd, the lowest being 11° , at Marlborough, and 13° , at Raunds, on the 19th, and 12° at Balmoral, on the 22nd. In the north of Scotland the 16th or 17th were the coldest days, but the minima were unimportant.

Sunshine was in general in excess of the average, the greatest excess observed—over three-quarters of an hour per day—being in the south-east and south-west of England. In Ireland and the north of Scotland average conditions obtained. The actual mean daily amount exceeded two hours in the eastern counties of England, and the English Channel.

The month was dry nearly everywhere, especially in a large area to the north of London, where less than an inch fell. The southern part of this area is shown on our map of the Thames Valley. In Scotland less than an inch fell only in the vicinity of Montrose, although the greater portion of the eastern half of the country had less than 2 inches. In Ireland the rainfall was unusually uniform, ranging from rather under 2 inches in King's County to between 4 and 5 inches in the north-east and south-west. The wettest areas in the Kingdom were located in West Inverness and the English Lake District respectively, where from 9 to 18 inches fell. Rainfall hardly exceeded the average anywhere, the general fall expressed as a percentage of the average, was :—England and Wales, 50 per cent. ; Scotland, 65 per cent ; Ireland, 69 per cent ; British Isles, 60 per cent.

In London (Camden Square), the mean temperature was $36^{\circ}\cdot0$, or $3^{\circ}\cdot7$ below the average, the month being the coldest December since 1890. The duration of bright sunshine was 39·0 hours, and the duration of rainfall 34·9 hours. Evaporation, ·12 in.

RAINFALL TABLE FOR DECEMBER, 1917.

STATION.	COUNTY.	RAINFALL.						
		Aver. 1875— 1909. in.	1917. in.	Diff. from Av. in.	Per cent. of Av.	Max. in 24 hours. in.	Date.	No. of Days
Camden Square.....	London.....	2·13	1·10	—1·03	52	·28	8	14
Tenterden.....	Kent.....	2·77	2·74	—·03	99	1·03	9	18
Arundel (Patching).....	Sussex.....	2·91	2·26	—·65	78	1·10	16	9
Fordingbridge (Oaklands)...	Hampshire.....	3·35	1·27	—2·08	38	·68	16	15
Oxford (Magdalen College)...	Oxfordshire.....	2·06	·88	—1·18	43	·35	16	11
Wellingborough (Swanspool)...	Northampton.....	2·13	·67	—1·46	31	·22	29	16
Bury St. Edmunds (Westley)...	Suffolk.....	2·14	1·22	—·92	57	·34	25	16
Geldeston [Beccles].....	Norfolk.....	2·07	1·49	—·58	72	·35	16	18
Polapit Tamar [Launceston]...	Devon.....	4·46	1·47	—2·99	33	·43	8	16
Rousdon [Lyne Regis].....	".....	3·68	1·08	—2·60	29	·39	16	8
Stroud (Field Place).....	Gloucester.....	2·71	·93	—1·78	34	·22	16	12
Church Stretton (Wolstaston)...	Shropshire.....	2·99	1·05	—1·94	55	...	...	...
Boston.....	Lincoln.....	1·88	·89	—·99	47	·18	16	14
Worksop (Hodsock Priory)...	Nottingham.....	2·17	·97	—1·20	45	·32	16	10
Mickleover Manor.....	Derbyshire.....	2·38	1·03	—1·35	43	·21	30	13
Buxton.....	".....	5·38	2·56	—2·82	48	·39	23	23
Southport (Hesketh Park)...	Lancashire.....	3·10	1·63	—1·47	53	·33	15	15
Arneliffe Vicarage.....	York, W.R.....	6·75	...	...	...	...	...	...
Wetherby (Ribston Hall)...	".....	2·27	1·30	—·97	57	·50	23	6
Hull (Pearson Park).....	" E.R.....	2·32	1·68	—·64	72	·36	16	16
Newcastle (Town Moor)...	North'land.....	2·46	2·57	+·11	104	·64	16	19
Borrowdale (Seathwaite)...	Cumberland.....	15·14	8·55	—6·59	57	1·82	20	15
Cardiff (Ely).....	Glamorgan.....	4·70	1·28	—3·42	27	·36	15	15
Haverfordwest.....	Pembroke.....	5·18	1·16	—4·02	22	·44	16	8
Aberystwyth (Gogerddan)...	Cardigan.....	4·66	2·51	—2·15	54	·55	15	15
Llandudno.....	Carnarvon.....	2·84	1·72	—1·12	61	·45	16	16
Cargen [Dumfries].....	Kirkcudbrt.....	4·84	2·85	—1·99	59	·45	15	18
Marchmont House.....	Berwick.....	2·83	2·02	—·81	71	·38	9	15
Girvan (Pilmore).....	Ayr.....	5·48	4·22	—1·26	37	·83	16	22
Glasgow (Queen's Park)...	Renfrew.....	3·95	2·85	—1·10	72	1·08	20	15
Islay (Eallabus).....	Argyll.....	5·73	7·28	+1·55	127	·80	1, 3	23
Mull (Quinish).....	".....	6·59	3·97	—2·62	60	·54	19	23
Balquhiddy (Stronvar).....	Perth.....	8·83	3·68	—5·15	42	·62	5	15
Dundee (Eastern Necropolis)...	Forfar.....	2·67	1·19	—1·48	45	·67	19	11
Braemar.....	Aberdeen.....	3·13	1·22	—1·91	39	...	...	...
Aberdeen (Cranford).....	".....	3·43	1·38	—2·05	40	·29	1	15
Gordon Castle.....	Moray.....	2·72	1·55	—1·17	57	...	...	...
Drumnadrochit.....	Inverness.....	3·76	2·55	—1·21	68	·39	1	20
Fort William.....	".....	9·41	5·45	—3·96	58	·82	6	20
Loch Torridon (Bendamph)...	Ross.....	9·86	7·10	—2·76	72	·71	7	25
Dunrobin Castle.....	Sutherland.....	3·09	2·19	—·90	71	·70	13	11
Killarney (District Asylum)...	Kerry.....	6·92	4·22	—2·70	61	1·17	21	24
Waterford (Brook Lodge)...	Waterford.....	4·32	2·39	—1·93	55	·51	4	16
Nenagh (Castle Lough).....	Tipperary.....	4·34	1·89	—2·45	44	·51	14	15
Ennistymon House.....	Clare.....	5·03	2·69	—2·34	54	·49	6	20
Gorey (Courtown House)...	Wexford.....	3·42	2·77	—·65	81	·89	16	17
Abbey Leix (Blandsfort)...	Queen's Co.....	3·41	2·05	—1·36	60	·60	20	20
Dublin (Fitz William Square)...	Dublin.....	2·27	2·26	—·01	100	·57	16, 20	17
Mullingar (Belvedere).....	Westmeath.....	3·39	2·45	—·94	72	·39	13	14
Crossmolina (Enniscooe).....	Mayo.....	6·11	3·63	—2·48	59	1·14	19	20
Cong (The Glebe).....	".....	5·42	3·81	—1·61	70	1·01	19	20
Collooney (Markree Obsy.)...	Sligo.....	4·34	3·02	—1·32	70	·64	19	21
Seaforde.....	Down.....	3·77	2·96	—·81	79	·47	15, 20	21
Ballymena (Harryville).....	Antrim.....	3·97	4·49	+·52	113	1·50	15	21
Omagh (Edenfel).....	Tyrone.....	3·91	3·23	—·68	83	·56	15	23

SUPPLEMENTARY RAINFALL, DECEMBER, 1917.

Div.	STATION.	Rain inches.	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road .	2·62	XI.	Lligwy	2·50
„	Ramsgate	2·10	„	Douglas, Isle of Man	2·
„	Hailsham	2·53	XII.	Stoneykirk, Ardwell House...	3·77
„	Totland Bay, Aston House...	1·17	„	Carsphairn, Shiel	4·71
„	Stockbridge, Ashley	1·48	„	Langholm, Drove Road	3·40
„	Grayshott	1·98	XIII.	Selkirk, The Hangingshaw..	2·34
III.	Harrow Weald, Hill House...	1·02	„	North Berwick Reservoir...	1·69
„	Pitsford, Sedgebrook.....	·73	„	Edinburgh, Royal Observaty.	1·71
„	Woburn, Milton Bryant.....	·66	XIV.	Biggar.....	2·00
„	Chatteris, The Priory.....	·57	„	Maybole, Knockdon Farm ..	2·35
IV.	Elsenham, Gaunts End	·88	XV.	Buchlyvie, The Manse	3·04
„	Shoeburyness	1·72	„	Ardgour House	7·85
„	Colchester, Hill Ho., Lexden	1·36	„	Oban.....	3·74
„	Ipswich, Rookwood, Copdock	1·56	„	Campbeltown, Witchburn ..	4·56
„	Aylsham, Rippon Hall	1·19	„	Holy Loch, Ardnadam.....	5·16
„	Swaffham	·83	„	Tiree, Cornaigmore	2·45
V.	Bishops Cannings	1·18	XVI.	Glenquoy	2·70
„	Weymouth.....	1·03	„	Glenlyon, Meggernie Castle..	...
„	Ashburton, Druid House.. ...	1·34	„	Blair Atholl	1·28
„	Cullompton	1·11	„	Coupar Angus	1·15
„	Lynmouth, Rock House	1·53	„	Montrose, Sunnyside Asylum.	·76
„	Okehampton, Oaklands.....	1·97	XVII.	Balmoral	1·65
„	Hartland Abbey.....	1·26	„	Fyvie Castle	2·24
„	St. Austell, Trevarna	1·63	„	Keith Station ..	1·44
„	North Cadbury Rectory.....	·81	XVIII.	Rothiemurchus	1·55
VI.	Clifton, Stoke Bishop	·68	„	Loch Quoich, Loan	18·70
„	Ledbury, Underdown.....	·75	„	Skye, Dunvegan	4·80
„	Shifnal, Hatton Grange.....	·93	„	Fortrose	1·90
„	Droitwich.....	1·10	„	Glencarron Lodge	7·10
„	Blockley, Upton Wold.....	2·00	XIX.	Tongue Manse	3·07
VII.	Grantham, Saltersford.....	·73	„	Melvich	3·26
„	Market Rasen	1·23	„	Loch More, Achfary	5·93
„	Bawtry, Hesley Hall .....	...	XX.	Dunmanway, The Rectory ..	4·00
„	Whaley Bridge, Mosley Hall	2·28	„	Glanmire, Lota Lodge.....	3·01
„	Derby, Midland Railway.....	1·04	„	Michelstown Castle.....	2·49
VIII.	Nantwich, Dorfold Hall	1·22	„	Darrynane Abbey.....	4·30
„	Bolton, Queen's Park	2·66	„	Clonmel, Bruce Villa	2·16
„	Lancaster, Strathspey	2·10	„	Broadford, Hurdlestown.....	2·85
IX.	Langsett Moor, Up. Midhope	2·31	XXI.	Ennisecorthy, Ballyhyland...	2·71
„	Scarborough, Scalby	1·89	„	Rathnew, Clonmannon	2·69
„	Ingleby Greenhow	2·05	„	Ballycumber, Moorock Lodge	1·82
„	Mickleton	1·20	„	Balbriggan, Ardgillan	2·33
X.	Bellingham, High Green Manor	2·46	„	Castle Forbes Gardens.....	2·00
„	Ilderton, Lilburn Cottage ..	1·76	XXII.	Ballynahinch Castle.....	5·06
„	Keswick, The Bank.....	2·57	„	Woodlawn	1·96
XI.	Llanfrecfa Grange	·89	„	Westport, St. Helens ..	2·67
„	Treherbert, Tyn-y-waun	2·36	„	Dugort, Slievemore Hotel ..	4·12
„	Carmarthen, The Friary	1·70	XXIII.	Enniskillen, Portora.....	2·38
„	Fishguard, Goodwick Station.	·86	„	Dartrey [Cootehill]	2·15
„	Crickhowell, Tal-y-maes.....	1·50	„	Warrenpoint, Manor House ..	2·44
„	New Radnor, Ednol	2·60	„	Belfast, Cave Hill Road	2·77
„	Birmingham WW., Tyrmynydd	2·09	„	Glenarm Castle	3·87
„	Lake Vyrnwy	2·53	„	Londonderry, Creggan Res...	4·43
„	Llangynhafal, Plas Drâw.....	1·84	„	Dunfanaghy, Horn Head ..	...
„	Dolgelly, Bryntirion.....	3·31	„	Killybegs	5·31
„	Bettws-y-Coed, Tyn-y-bryn...	...			

Climatological Table for the British Empire, July, 1917.

STATIONS. (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain		Aver. Cloud.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	83·2	14	46·6	11	75·2	54·7	54·3	..	133·6	44·7	4·13	11	6·2
Malta	88·2	23	69·9	16	82·8	72·5	...	76	141·0	...	·00	0	0·5
Lagos	87·4	9	69·1	4, 16	84·6	72·9	73·7	84	148·3	67·0	29·36	26	8·5
Cape Town	74·5	7	41·2	27	62·4	49·8	48·3	76	...	...	8·61	13	6·1
Johannesburg	64·2	11	29·2	3	56·6	37·5	29·5	62	...	25·5	·83	5	3·3
Mauritius ... ..	...	...	...	...	...	...	...	...	...	...	...	...	...
Bloemfontein	68·8	12	16·4	3	58·4	29·6	29·4	68	...	...	·24	3	3·2
Calcutta... ..	91·5	12	76·1	2, *	88·2	79·2	78·3	88	...	74·1	12·16	22	9·3
Bombay... ..	87·9	12	76·2	22	85·6	78·9	77·1	84	132·0	71·1	12·91	27	8·4
Madras	101·0	8	73·7	5	95·1	78·7	72·8	71	155·2	73·2	4·21	15	6·8
Colombo, Ceylon	87·7	3	74·1	7	86·3	77·4	73·8	80	152·6	70·0	1·71	14	6·7
Hongkong	90·8	13	73·7	24	85·4	77·7	75·5	83	...	...	30·08	15	7·3
Sydney	69·1	9	41·8	6	60·2	47·7	41·4	65	110·8	30·4	·42	7	4·2
Melbourne	63·0	1, 25	35·5	31	56·3	44·6	41·4	79	105·8	26·1	1·41	21	7·4
Adelaide	68·0	24	39·8	13	59·7	47·6	47·1	80	118·0	33·5	4·10	21	6·3
Perth	67·5	22	35·9	28	62·0	49·5	48·6	78	130·4	29·1	11·29	25	6·8
Coolgardie	71·4	22	33·4	18	60·4	43·1	41·1	64	122·2	29·0	·76	9	4·8
Hobart, Tasmania	61·8	24	32·8	6	52·7	41·5	38·8	71	109·3	25·0	2·74	25	6·8
Wellington	59·2	16	35·2	13	55·2	46·3	46·9	90	117·0	26·3	6·66	25	7·5
Auckland ... ..	...	...	...	...	58·4	49·5	...	...	...	...	9·59	27	...
Jamaica, Kingston	93·4	19	71·4	6	89·8	73·3	70·2	76	...	...	·66	8	5·0
Grenada	86·0	22	70·0	Sev.	83·0	73·0	...	81	137·0	...	17·85	26	6·0
Toronto	98·0	30	49·0	4	80·1	60·7	62·5	80	147·4	46·7	3·58	17	4·9
Fredericton	92·0	26	45·0	29	77·9	56·5	61·3	81	...	...	2·54	15	6·0
St. John, N.B.	80·0	31	48·0	1	67·3	53·3	55·9	87	138·5	44·2	1·31	14	6·7
Victoria, B.C.	81·0	14	49·0	11, †	67·0	50·5	49·0	73	138·3	39·0	·16	6	2·4

* And 5, 6.

† And 13.

LAGOS.—Heavy rains, 4·77 in. fell on the 9th.

Johannesburg.—Bright sunshine 268·7 hours.

Bloemfontein.—On the 3rd the coldest night on record.

COLOMBO, CEYLON.—Mean temp. 81°·8 or 0°·8 above, dew point 0°·3 below and R 4·89 in. below averages. Mean hourly velocity of wind 6·3 miles.

HONGKONG.—Mean temp. 81°·1. Bright sunshine 189·5 hours. Mean hourly velocity of wind 8·8 miles.

Melbourne.—Mean temp. 1°·9 above and R ·43 in. below averages.

Adelaide.—Mean temp. 2°·0 above and R 1·47 in. above averages.

Perth.—Rainfall the heaviest on record for July, 4·82 in. above the average. Severe gale on the 1st.

Coolgardie.—Temp. 0°·8 above and rainfall slightly below averages.

Wellington.—Mean temp. 3°·3 above and rainfall ·82 in. above averages. Bright sunshine 70·5 hours. Frost on 6 days.