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Presentation to Sir Napier and Lady Shaw.

THE portrait of Sir Napier Shaw, which has been painted by Mr. W. W. Russell, A.R.A., was presented to Sir Napier and Lady Shaw in the Library of the Meteorological Office at South Kensington on Wednesday, June 22nd. The original portrait is still in the exhibition of the Royal Academy at Burlington House, and a copy painted by Mr. Russell as a gift from the staff to Lady Shaw formed the actual object of presentation.

The Staff of the Office and the members of the Meteorological Committee, as well as other friends who had been brought into relation with the office as observers, or voluntary workers, or who had taken part in the Monday afternoon discussions commenced by Sir Napier in January 1905, were present in large numbers.

Major General Sir Frederick Sykes, Chairman of the Meteorological Committee, presided and invited Sir Arthur Schuster, F.R.S., the senior member of the Committee, to make the presentation on behalf of the subscribers.

In inviting Sir Napier and Lady Shaw to accept the gifts, Sir Arthur referred to Sir Napier's long connection with the Office, which dated back to 1879, when he was invited by the Meteorological Council to undertake an experimental investigation on hygrometry. The work was carried out at the Cavendish Laboratory, Cambridge, and was the means of bringing Lady Shaw also into early contact with the

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Office, for she was at the time a student at the laboratory and assisted in some of the experiments.

Sir Arthur Schuster proceeded to say that there was no need for him to dwell on the distinguished services which Sir Napier had rendered to meteorology, they would be familiar to his hearers as they are to the readers of this magazine, but he emphasized Sir Napier's great power of combining the work of a successful administrator with that of a distinguished scientist. He ended by handing to Sir Napier a book containing the signatures of all associated with the presentation.

Lady Shaw, in returning thanks, recalled the fact that this year marked the coming of age of Sir Napier's directorship of the Office. It was exactly 21 years since he came to London as successor to Dr. Scott.

Dr. Simpson, at the request of the Chairman, accepted the portrait on behalf of the Office.

Sir Napier, in his reply, described the circumstances under which he took charge of the Office and the change which had occurred in the outlook of the Office during the years which had elapsed between his first undertaking work for the Council in 1879 and his becoming its secretary in 1900. Readers of this magazine will remember the interesting account he gave of them in his letter, addressed to Sir Frederick Sykes, which we printed last December. He proceeded to refer to past and present members of the staff who had worked under him by name, and recalled many episodes in the domestic history of the Office that brought back to his audience the remembrance of former days.

After the presentation, tea was served in Room 25—the room designed originally as the Forecast Room, now the home of the British Climatology and Autographic Records Sections.

Mr. Russell's portrait of Sir Napier is reproduced as the frontispiece to this magazine.

On the Design of Rain Gauges.

THE existence of a large body of voluntary and self-equipped observers of rainfall in the British Isles carries with it, among a multitude of advantages, the disadvantage that it is extremely difficult to eliminate the use in many cases of rain gauges of undesirable patterns. Such gauges are not infrequently obtained by persons interested in rainfall observing, but unaware of the errors to which they are likely

Photographs of the portrait of Sir Napier Shaw by Mr. W. W. Russell, A.R.A., can be obtained from Mr. Paul Laib, 3, Thistle Grove, Drayton Gardens, S.W. 10. Prices:—10 in. by 8 in., 5*s.* 6*d.*, and 7½ in. by 6 in., 2*s.* 6*d.* each, plus postage.

to give rise. The collective experience of those who have made rainfall observing a special study is unequivocally in favour of the universal adoption of the now recognised standard patterns of rain gauge and the rejection of certain obsolete patterns.

There are unfortunately price-lists, even amongst those issued by the well-known makers of rain gauges, which include particulars of gauges which have been definitely proved to be unsuitable for accurate measurement of rainfall. It is understood, however, that there is a certain market for obsolete types of rain gauges such as the "Howard" and the "British Association," which are unsatisfactory for measuring heavy rain and snow because of the absence of the deep cylindrical rim above the collecting funnel, and are also open to other objections. In the same way the well-known "Glaisher" gauge is still frequently listed and sold, although it has been clearly proved to be liable to develop serious errors.

It therefore seems desirable that the essential characteristics of a reliable rain gauge should be briefly explained for the guidance of purchasers who may not be aware of the defects inherent in some of the listed instruments. The prototype of the approved gauge is the "Snowdon" rain gauge. The "Meteorological Office" pattern gauge, the "Bradford" gauge and the "Seathwaite" gauge are variants of this type which embody the essential features of the "Snowdon" gauge, and are therefore also satisfactory. Most other gauges are unsatisfactory in that they do not contain the essential features, which may be stated as follows:—

(1) The stout brass turned ring terminating upwards in a knife-edge, exactly 5 or 8 inches in diameter, which forms the rim of the gauge.

(2) The vertical cylinder 4 to 6 inches deep, extending from the rim to the upper edge of the funnel, which is intended to retain snow and hail, to prevent the outsplashing of rain which has fallen upon the funnel, and to reduce to a minimum the risk of loss due to wind eddies.

(3) An inner collecting vessel, which can be removed for measuring the fall without disturbing the body of the gauge. Taps for drawing off water are extremely objectionable.

(4) Provision for a depth of at least 6 inches of the body to be firmly fixed in the ground.

(5) Simplicity of construction and avoidance of the use of rivets.

(6) Strength and durability.

(7) A capacity of not less than 10 inches of rain for a daily gauge. Gauges for monthly readings should be larger according to the district in which they are to be used.

Drawings of some of the gauges referred to will be found in "Rules for Rainfall Observers," a copy of which will be forwarded to any address gratis, on application to the Superintendent of the British Rainfall Organization. "The Observer's Handbook" of the Meteorological Office may also be consulted.

The above conditions, with the exception of that numbered (3), apply generally also to self-recording rain gauges, it being noted, however, that the diameter of the rim of modern British recording gauges is usually either 6, 8, or 11 inches. Condition (5) is most important, and the following further desiderata apply:—

(8) The scale values of the chart must conform accurately with the indications of the instrument.

(9) It is desirable that the hour lines on the chart should be straight and not curved.

(10) It is desirable that the scale value for rainfall should be not less than six times the natural scale, and that the drum should make a complete revolution in 24 hours.

(11) Dial gauges, tipping-bucket, and electrical recording rain gauges are not in general suited to modern requirements.

(12) Should the mechanism of the gauge include an automatic syphon, the design and construction of the syphon require special care; the liability to failure of syphons is a serious drawback.

(13) Space should be available inside the case of the instrument for the insertion of a small oil lamp or a night-light to warm the gauge in frosty weather.

Makers of rain gauges could materially assist in the extermination of undesirable types of rain gauge by refraining, in the interests of science as well as in their own ultimate interests, from making and listing any instrument which is known to be unsuitable for measuring or recording rainfall. As such a step could, no doubt, only be taken gradually, it is suggested that, as a preliminary, makers should issue with their lists of rain gauges a slip stating that ordinary rain gauges of the "Snowdon," "Meteorological Office," "Bradford," and "Seathwaite" gauges are the only kind recommended for use by the Meteorological Office (which includes the British Rainfall Organization). This

suggestion is due to one of our leading firms of instrument-makers, which has already decided to issue such a slip in the manner indicated.

Intending rainfall observers, or existing observers who have the intention of re-equipping themselves with new gauges, are advised to insist that goods should be accompanied by certificates of accuracy. These certificates not only ensure the accuracy of the construction, but also give a guarantee that the gauge is of the approved pattern.

No instrument sent to the Meteorological Office for test will be granted the certificate of the British Rainfall Organisation unless it is considered to be of suitable design as well as found to be accurate as regards essential dimensions.

It has been decided that, in the interests of the science of meteorology, no advertisements of instruments will be accepted for publication in this Magazine or in "British Rainfall" when, in the opinion of the Director of the Meteorological Office, the instruments referred to are defective in design.

The Case for the Modern Units in Meteorology.

By F. J. W. WHIPPLE, M.A., SUPERINTENDENT, CLIMATOLOGY DIVISION, METEOROLOGICAL OFFICE.

1. Rainfall.

LETTERS which have recently been published in this Magazine expressing the dissatisfaction which is felt in some quarters with regard to the adoption of new units in meteorological publications merit serious consideration, especially by those who are in responsible positions as servants of the public.

The first point which I should like to bring home to our correspondents is that the inconvenience of any change of units is more serious for those who have to handle meteorological statistics every day than for those whose interest in them is only secondary. Such changes would not be made deliberately unless the weight of the arguments in their favour were felt to be very strong.

On the general question of the choice between units of the metric system and the British system there is no room for doubt; the world has decided that wherever uniformity in measurement is required the metric system holds the field. Is such uniformity required in meteorology? That it is desirable no one can deny.

Now consider the case of rainfall. We may be interested in the occurrence of rainfall day by day, or in comparisons between the rainfall of large areas over long periods. In either case we must either have all the readings made in the same units or else ask someone to convert the readings of other people into the unit of our choice.

In the preparation of a publication like the Daily Weather Report, which includes the rainfall of all parts of Europe, it is obviously an economy of time to avoid all unnecessary conversions from one unit to another, as, for example, from millimetres to inches, whilst the elimination of the risk of error is also of prime importance.

Moreover, the figures are not only required for printed reports, they are also to be used in the messages sent out broadcast periodically, and economy of time is again of the first importance. It must be admitted, in fact, that for an official weather service working at high pressure an unnecessary difference between the units in use for rainfall measurement in this country and on the other side of the Channel would be intolerable.

How far the usage of the official weather service should govern the practice of rainfall observers in general is a matter for discussion. As far as the actual measurements go, there is no more difficulty in one system than the other: it is simply a question of the provision of a suitable glass measure. When it comes to visualising what the measurements mean, it is probably easier for most of the younger generation to think of, say, 8 millimetres than to think of the equivalent ·31 inch, but, on the other hand, it is easier to think of 3·1 inches than of 80 millimetres. On such *a priori* grounds there is nothing to choose between the systems. The amateur observer who is setting up a rain gauge is usually interested in comparing his readings with official records, and therefore is wise when he adopts the millimetre measure.

But how about the old established observer with a long series of observations to his credit? He is not asked to change his own system, but he is practically told that if he wishes to maintain his interest in rainfall statistics in general he should educate himself to convert readings from millimetres to inches, and *vice versa*. Undoubtedly this conversion is a nuisance. The only consolation that can be offered is that it is borne with for the sake of the coming generation, a generation which will find the study of meteorology freed from the distraction of confused units.

As to the conversion from millimetres to inches, it is convenient to remember that 25 millimetres being nearly an inch, a measurement in millimetres has only to be multiplied

by 4 to give the rainfall in hundredths of an inch. The habit of conversion is not entirely a good one, however. Just as the aim of a student of languages is to learn to think in foreign languages without translating to and from his mother tongue, so it is desirable to get into the habit of appreciating measurements given in a novel unit without converting to the more familiar unit. For this purpose we want certain standards of reference. Such in the case of rainfall are the following:—Really heavy rainfall such as the children call "cats and dogs" is at the rate of one millimetre a minute or more, whereas a slight drizzle may only yield one-tenth of a millimetre per hour. The normal annual rainfall of London is 500 millimetres, and, on the other hand, in the thunderstorm of June 16th, 1917, as much as 120 millimetres fell at Campden Hill in two hours. A fall of one millimetre yields 1,000 metric tons to the square kilometre, nearly four tons to the acre, or one ton to the rood.

Everyone who is in the habit of looking at rainfall statistics carries a few such standard facts in his head, and some, happily, carry a large number. Once these standard facts have been referred to the new unit, there is no difficulty in appreciating how fresh statistics compare with old ones. The transition stage is undoubtedly irksome to most people, but though we may bemoan our misfortune in having to pass through it, perhaps we should rather congratulate ourselves that meteorologists have had the enterprise to take the step of which many other practical people have fought shy.

OFFICIAL NOTICES.

Meteorological Stations.

Dalkeith.

OBSERVATIONS have been discontinued at Dalkeith, Palace Gardens, where the Duke of Buccleuch had maintained a station for many years. The gardens were recently let to a market gardener, who has acted as a voluntary observer for some months, but who now finds it impossible to continue the work.

Cahir.

SINCE 1911 weekly returns of meteorological observations at Cahir in Tipperary have been received at the Meteorological Office from Mr. R. W. Smith, junior. The series has terminated abruptly and tragically owing to the destruction by fire of Mr. Smith's house, "Bengurragh," through

the action of Sinn Fein. Voluntary meteorological stations in rural Ireland have always been widely separated, and the closure of Mr. Smith's valuable observations is therefore to be deplored.

Crathes.

It was recently announced that with the exception of the sunshine recorder the instruments at Crathes had been moved from Pinewood to the Schoolhouse. It is now to be noted that the sunshine recorder was installed at the new station on June 30th.

Guernsey.

The station maintained by Mr. A. Collenette at Brooklyn, St. Martin's Road, for the last 18 years has been moved to Grange, St. Peter Port; the thermometer and rain gauge are in their permanent places, but the barometer is at present in a temporary position, while the sunshine recorder will remain at St. Martin's Road until the new building is sufficiently advanced to receive it.

The Royal Meteorological Society.

THE last monthly meeting of the session was held on June 15th, Mr. R. H. Hooker (President) in the chair. The first paper was by Mr. G. M. B. Dobson on "The Causes of Errors in forecasting Pressure Gradients and Upper Winds." Since meteorologists picture the wind at moderate heights as the flow of air along isobaric lines, the forecasting of wind depends more or less explicitly on the forecasting of the distribution of pressure. The forecaster starts with the map showing the distribution of pressure at a particular time, and from the information at his disposal he has to estimate what changes are likely to take place in so many hours. He has to estimate not only how the well-marked features will move, but also how the minor details of the map will change. If the strength and the direction of the wind is to be foretold with any accuracy, great precision in these details is necessary, and Major Dobson was sceptical as to whether such precision was likely to be obtained, at any rate in the near future. He put forward as a general principle the view that the merit of a forecast was to be judged, not by how near it was to the truth but by how well the changes from day to day were indicated. If it is showery to-day it is generally safe to forecast showers to-morrow: it is a more severe but better test to be asked to say whether showers will be more or less common or more or less heavy to-morrow than to-day.

Taking the case of wind, Major Dobson discussed the vector change in the wind in the course of so many hours. In his own experience the proportion of successes in such forecasts was very low. Hence the despondent tone of his paper.

Colonel Gold, who opened the discussion, was more optimistic. He thought that forecasting in general terms was of great value. A forecast of a gale from a northerly quarter was justified for practical purposes even if a strong wind from north-west followed, though the error in the forecast as estimated by Dobson's method would be serious.

Sir Napier Shaw gave an amusing but instructive analysis of the innate tendency of humanity to make forecasts of other things besides weather. Mr. Richardson mentioned that his attempts to develop a system of forecasting by computation had been frustrated by the fact that the comparatively small details of the weather map were of so much importance.

Mr. R. Francis Granger gave a paper on "The Physical Structure of Cloud Forms in the Lowest Atmosphere." Mr. Granger is a young and enthusiastic amateur whose intimate study of cloud forms should prove of great value. In his paper he gave details of his observations of the lower clouds from which rain is falling. Special emphasis is given to the hypothesis that actual rain-producing cloud is formed by the ascent *en masse* of an eddy-formed damp layer.

Mr. J. Wadsworth gave an account of a paper by himself and Mr. N. A. Comissopulos on the variability of annual mean temperature over Europe and North America. The authors had worked out the standard deviation of annual mean temperature for numerous stations and plotted the results.

In Europe the maxima of variability occur over north-east Russia and over a belt across western Germany, France and Spain, the minima over the Atlantic and Mediterranean. In the discussion Mr. Brooks pointed out the similarity between the distribution of temperature variability and that of clear skies. North-east Russia, where there are possibilities of very cold winters and of very hot summers, was naturally the part of Europe where the annual mean was most likely to be highly variable.

Correspondence.

To the *Editors*, "*Meteorological Magazine.*"

Units for Meteorological Work.

THE point raised by Mr. E. W. Murphy and others is one of the very greatest importance to meteorological science, and it

would be unwise in the extreme to disregard it. Of all the sciences Meteorology and Astronomy owe most to the voluntary efforts of amateur workers. The former in particular would be badly off indeed if they were withdrawn. Moreover, the constant cry of the Meteorological Office and of the British Rainfall Organization is for more observers and more stations (voluntary ones, of course).

This being so, is it not the height of unwisdom to force upon observers a system of units which are Chinese to the very class from whom alone voluntary workers can be drawn, viz., the average educated middle class? I myself, though I now hold a paid professional post, both meteorological and astronomical, worked for 40 years as an amateur. To the present day I do not know what millibars mean, barely can get roughly the hang of degrees absolute, and am not comfortable with millimetres. The vast majority of English-speaking observers must be in the same case, or more so. Is it too much to ask that the Meteorological Office should give us the temperatures in degrees Fahrenheit and the barometer and rainfall in inches in the Weekly and Monthly reports, side by side with the international units? It would be a move which would pay them. The present policy certainly will not pay, if they want to encourage voluntary observers.

The fact is that the English-speaking world as a whole has no use for the Metric System; the British foot and its subdivisions are too convenient and too deeply rooted to be displaced. As far as the Anglo-Saxon race is concerned the millimetre and its multiples will never be anything but the language of the trained savant and the scientific pedant. The same may be said of the Fahrenheit thermometer scale. It has taken root too deeply to be displaced. No doubt it was founded on a mistaken idea, but so was the Metric System. The British Empire, plus the United States, cover too big a slice of the globe for their ideas to be ignored.

WM. F. A. ELLISON.

Armagh Observatory, June 22nd, 1921.

Visibility at Deal.

DEAL has lately experienced a degree of visibility hardly ever remembered by the present generation. The nearest point of the French coast has been clearly visible for an extent of about eight miles, with the Dover Patrol Memorial distinguishable by the naked eye. Also the land beyond to the south, on which is the Cape Griz Nez Lighthouse, has been visible to the extent of about $1\frac{1}{2}$ miles. It is estimated that objects have been distinguished with the naked eye at a distance of over 25 miles. R. J. DOYLE PARGETER.

Aston Villa, Wellington Road, Deal, June 28th, 1921.

Somerset—Eleven Months of Deficient Rainfall.

THE seriousness of the present shortage of rainfall is much enhanced by the fact that for five months before this year began there had been a great deficiency of rainfall in this district. I give below figures corresponding to those given by Mr. Dansey in the June issue, but for eleven months.

The first six months of 1921 show 8·48 ins. of rain on 68 days, against the previous minima of 9·4 ins. in 1908 and 71 rain-days in 1918.

But it is of far more serious import that the total rainfall of the eleven months August 1920—June 1921 should be only 18·10 ins., against the previous lowest of 23·54 ins. for the corresponding months of 1906–7, or against a previous lowest, for *any* consecutive eleven months, of 20·34 in January–November 1911.

Month.	Average for 24 years.		1919 and 1920 Rainfall.	1920 and 1921.	
	Rainfall.	Rain-days (of ·01).		Rainfall.	Rain-days (of ·01).
	Inches.		Inches.	Inches.	
August	3·29	16·4	3·57	1·60	6
September	2·10	12·5	1·62	1·55	11
October	3·43	18·4	2·01	2·86	12
November	2·53	17·0	2·42	1·37	10
December	4·12	21·2	5·52	2·24	14
January	2·71	16·8	4·48	2·92	22
February	2·40	17·1	1·05	·24	2
March	2·53	17·5	2·19	2·09	19
April	2·27	14·9	4·77	·88	7
May	2·05	13·5	1·55	1·94	16
June	2·42	12·3	2·32	·41	2
	29·85	177·6	31·50	18·10	121
			+1·65	−11·75	−55·4

The only rain to speak of during this parching June was ·40, with a little thunder, in about two hours in the late evening of the 25th. H. A. BOYS, F.R.Met.Soc.

North Cadbury Rectory, Somerset, July 4th, 1921.

The long Dry Period—the Totland Bay Record.

IT may be of interest to note that the June rainfall at Totland Bay was only 0·16 inch, the driest June on record. June is the fifth month in succession below average. The total for the last five months is 3·38 ins.; for a similar period in 1893 the fall was 5·78 ins. The driest period of any

previous five months was 4·53 inches during May 1st to September 30th, 1893.

The driest half year is still January 1st to June 30th, 1892, with 5·99 ins.; the next is January to June 1893, with 7·62 ins.; and then 1921, with 7·88 ins. JOHN DOVER.

Aston House, Totland Bay, I.O.W., July 1st, 1921.

High Temperature in the Wirral Peninsula.

IT may be of interest to some of your readers to know that here in West Kirby on the banks of the River Dee, as it empties itself out into the Irish Sea, the remarkably high temperature of 92° F. in the shade, was recorded by me in my thermometer screen on Saturday, June 25th, at 13 h. 45 m. G.M.T. The readings during the day were as follows:—

Time G.M.T.	9 h. 0 m.	11 h. 0 m.	12 h. 0 m.	13 h. 0 m.
Temperature F.	78	87	89	90
Time G.M.T.	13 h. 45 m.	14 h. 15 m.	14 h. 30 m.	
Temperature F.	92	81	86	

The drop of 11° between 13 h. 45 m. and 14 h. 15 m. was due to a shift of the wind from SE. to N. and with another shift of the wind to NE. the temperature again rose. It is interesting to note that no less than three other thermometers in the area registered a shade reading between 91° F. and 94° F. These are said to be the highest readings yet recorded in this neighbourhood, and Bidston Observatory elevated on Bidston Hill also recorded the very high reading of 86° F., so it is only to be expected that sheltered spots like West Kirby with a land breeze blowing should record even higher readings.

E. F. ROBSON.

St. Andrews Vicarage, West Kirby, Cheshire, July 2nd, 1921.

[For June 25th the maximum temperatures reported to the Meteorological Office from the station nearest to West Kirby are Hoylake 81° F., Bidston Observatory 86° F., Blundellsands 88° F., Hawarden Bridge 86° F., Rhyl 81° F., Macclesfield 86° F. No temperatures above 89° F. were registered officially in the British Isles. The contrast between the 92° F. at West Kirby and the 81° F. at Hoylake less than two miles distant may be explained perhaps by the SE. wind reaching the former station across the flats bordering the Dee and the latter station across open sea.—ED. M. M.]

Sunspots and Weather.

IN your last issue, in an article on sunspots and weather, Mr. C. E. P. Brooks remarks "Solar variations undoubtedly cause marked fluctuations of terrestrial magnetism and auroral

frequency, but there is no evidence that either of these elements is a factor of weather. . . ."

Now in a paper (*Phil. Mag.*, Vol. XXXV., 1918, p. 234) on *Rain, Wind and Cyclones*, I suggest "that the great heating of the upper surface of the atmosphere over the poles is primarily due to the electrons shot out by the sun, which, being caught by the earth's magnetic field, are directed towards the poles, the air in the neighbourhood of which they heat and probably ionise." On this point I may perhaps be allowed to quote from page 169 of Sir Oliver Lodge's book on Electrons: "These early perceptions have been well elaborated of late by Arrhenius and his explanation of the aurora—by means of the catching and guiding of the rapidly moving electrons by the earth's magnetic lines of force, so as to deflect them away from the tropical sunshine, and to guide them in long spirals, along the lines to the poles—there to reproduce the phenomena of the vacuum tube in the rarified upper regions of the atmosphere—is particularly definite and pleasing."

It is scarcely correct, therefore, to say that solar influence, as regards the weather, acts entirely through slight variations in the heat and light rays emitted by the sun. These would affect the equatorial regions mainly. The great difficulty is to account for the two great polar cyclones, and their variations in intensity. My view is that these cyclones are due to the electrons shot out by the sun and caught by the earth's magnetic field. R. DEELEY.

"*Tintagel*," *Kew Gardens Road, Kew, Surrey, July 5th*, 1921.

[Reference to the paper cited by Mr. Deeley shows that he produces no direct evidence which would controvert Mr. Brooks's statement. It is interesting to notice that the energy of the greatest magnetic storm is insignificant compared with that of a cyclone, so that if the phenomena are associated in any way it must be through some trigger-like action.—ED. M.M.]

NOTES AND QUERIES.

The Problem of Forecasting Periods of Drought.

THE issue to farmers of notifications of expected spells of settled fair weather presents a problem rather different from that of ordinary daily forecasting. The occasions when a forecaster would feel justified in predicting absolutely rainless weather for three days in succession are very rare, and if he were to wait for these occasions the farmer who delays cutting his hay until the receipt of a "spell notification" might miss the most favourable opportunity. The problem

for the forecaster is really to find out types of pressure distribution following which the rainfall is generally very much below the average during the next week or so.

As an example, one fair type may be considered, namely, that in which there is an anticyclone nearly due west of Ireland, apparently at no great distance, while the low pressure is all to the east of the British Isles (type X, plate VI, in Geophysical Memoir No. 16), and the weather has become fair over the British Isles. The number of successive days of generally fair weather over southern England (as far north as Nottingham) following such conditions has been tabulated for the months of May and June from 1905 to 1921. No strict definition of a "break" has been made, but a rainfall of about 1 mm. (·04 in.) on one day at a few stations only has not been taken to constitute more than a "temporary break," nor have quite local falls of rather more than this amount due to isolated thunderstorms. The duration of the spell is intended to represent the length of time during which generally favourable weather for haymaking purposes was experienced.

The results are shown in the following table:—

Date of commencement of Fair Spell.	Duration of Spell in Days.	Manner of break up.
May 12th, 1905	18	Slight local breaks 16th and 20th, finally SW. type with thunderstorms.
May 16th, 1907	2	Rain spread westwards from a depression over the Continent.
May 23rd, 1910	6	To westerly type.
May 19th, 1911	7	Col with thunderstorms after fair SW. type. A depression apparently formed over Germany and moved SW.
May 24th, 1912	6	Depression spread westwards from Scandinavia. Thunderstorms.
May 14th, 1914	8	Col with thunderstorms, the result of a secondary to a depression near Iceland, forming over Portugal.
May 28th, 1915	23	Temporary breaks in extreme south-west June 2nd and 10th. Finally wet south-east type.
June 3rd, 1906	12	Depression from Baltic.
June 20th, 1908	13	Thunderstorms spread up from south.
June 8th, 1909	2	Depression from east of the British Isles.
June 9th, 1911	4	Depression formed over the Bay of Biscay.
June 3rd, 1914	2	Depression moved SE. from Iceland.
June 15th, 1916	7	Partial break 20th and 21st. Depression moved east from the Atlantic.
June 2nd, 1919	2	Depression spread back from the Baltic.
June 15th, 1921	10	Temporary break in parts of East Anglia due to thunderstorms, 17th and 20th. Depression spread up from the south, giving thunderstorms, 25th–26th.

It will be seen that the average fair spell lasted about eight days. For individual stations the average would be higher than this.

It is noteworthy that a quick break up under these conditions appears more likely to be caused by the polar current to the east of the British Isles than in any other way. Of the four cases where the fair weather lasted only 2 days, three corresponded with the direct spreading back of this current and one to the fact that a depression moved down from the north and eventually produced the same result. On the other hand, the cases where depressions advanced from the Atlantic gave spells of 18, 6, 23 and 7 days duration.

Generally speaking, the type represents a 2 to 1 chance of at least 6 days fair weather. Extended researches on these lines would almost certainly yield results of practical value. It would be necessary to treat the various districts of the British Isles separately and find out for each the types of weather map on which spell notifications should be issued. It is worth noticing that the best type is not necessarily that which, while it lasts unchanged, gives the driest weather; the possibility of intermediate fair types occurring before a change to unsettled weather takes place is a factor. Thus, the type here considered is especially favourable for the southern Midlands, for the spreading back of wet weather from the North Sea often leaves the inland districts unaffected while giving very bad weather in East Anglia; moreover, thunderstorms sometimes extend up from the Bay of Biscay to the south coast of England without penetrating far inland, and the change to a wet south-westerly type would generally give several days of dry weather in the southern Midlands, lasting perhaps for more than a week if pressure remained high from Spain to Germany. For eastern Scotland one would anticipate that a large anticyclone actually centered over Scotland or somewhat further north would be very favourable for continued fair weather, while one to the west, on the other hand, might not be so effective because of the frequency with which under these conditions depressions form over Scandinavia or arrive there from the Icelandic region, causing rain in Scotland. It is quite possible that for southern England the type considered is better than the case where an anticyclone is actually centered over England, owing to the ease with which a change to a thundery type can take place in the latter case. These and other similar problems can be solved only by careful statistical treatment extended over a period of many years.

E. V. NEWNHAM.

Visibility in London.

LAST month attention was drawn to the exceptional clearness of the atmosphere as shown by the observations of visibility taken from the roof of the Meteorological Office at South Kensington. The records for June are even more striking than those for May. In 30 observations at 9 h. Big Ben (at $2\frac{3}{4}$ miles) was visible 27 times and St. Paul's Cathedral (at $4\frac{1}{4}$ miles) 23 times, and in 22 observations at 15 h. Big Ben was visible 22 times and St. Paul's 20 times.

The Effect of the Coal Crisis upon London Sunshine.

THE scarcity of coal during the past three months might be expected to effect favourably the amount of sunshine enjoyed in large towns. To test the accuracy of such a supposition an analysis has been made of the records from selected stations (*a*) in central London, (*b*) in outer London, and (*c*) near enough to London to be regarded as under the influence of the same general meteorological conditions, but far enough away to be ordinarily free from the effects of London smoke. The results are given in the following table:—

DURATION of SUNSHINE in 1921 expressed as a percentage of the normal for the period 1881–1915.

Station.	April.	May.	June.
(*a*) Westminster	144	130	125
Bunhill Row	138	122	117
(*b*) Greenwich	134	116	110
Kew Observatory	124	114	113
(*c*) Wisley	126	110	117
Tunbridge Wells	123	105	108

In each month the deviation from the normal is greater in central London than in the outer zone, whereas the difference between outer London and the country districts is comparatively small. During the first weeks of the strike the shortage of coal was probably little felt in many cases, thus the figures for April are more uniform than those for May, when the difference between Westminster (130 per cent.) and Tunbridge Wells (105 per cent.) is at its maximum. The subsequent decrease in June may be due in part to the normal decrease during the summer in consumption for household purposes.

It is, however, improbable that the greater deviations in inner London are wholly due to the strike. The values published in the *Monthly Weather Reports* for the same period in recent years indicate that the atmosphere in London has been tending to become clearer, owing, presumably, to the extended use of gas and perhaps to daylight saving. Such conditions may account for half or even more than half the difference, but scarcely the whole. L. DORIS SAWYER.

Radiation from the Sky.

IN the *Meteorological Magazine* for May 1921 observations on radiation from the sky above Benson for the months of January and February, 1921 were published. The results of observations for March, April and May are given in the following table. It is regretted that owing to the illness of the observer there are not observations enough to give reliable averages for June.

RADIATION MEASURED AT BENSON, OXON., 1921.

Unit : one gramme calorie per square centimetre per day.

		March.	April.	May.
ATMOSPHERIC RADIATION only (dark heat rays). Averages for Readings about time of Sunset.				
Cloudless days :—				
Radiation from sky in zenith	πI	434	450	496
Total radiation from sky	J	467	483	525
Total radiation from horizontal black surface on earth.	X	647	660	690
Net radiation from earth	X-J	180	177	165
DIFFUSE SOLAR RADIATION (luminous rays). Averages for Readings between 9 h. and 15 h. G.M.T.				
Cloudless days :—				
Radiation from sky in zenith	πI_0	31	53	70
Total radiation from sky	J_0	52	58	75
Cloudy days :—				
Radiation from sky in zenith	πI_1	123	130	190
Total radiation from sky	J_1	110	165	183

The notation used is explained on page 99. The references to the times of observations are correct in the present table; the earlier one should be amended.

Abnormal July Temperature.

DURING July the weather has become a subject of absorbing interest. Temperatures over 90° F. have been reported in many parts of England on several days, and records for July have been broken. The continued drought is causing great anxiety; the flow in the Thames is so much reduced that the river can be forded at Teddington. Mirage has become a frequent phenomenon in the London streets.

Problems of Cloud Nomenclature.

THE feeling that cloud nomenclature according to the international classification does not meet the needs of meteorologists is widespread, but the remedies proposed are as numerous as the doctors. It is desirable that the views of the United States Weather Bureau as set out by Dr. C. F. Brooks in his paper read before the American Meteorological Society in April 1920, and printed in the *Monthly Weather Review* for September 1920, should be discussed on this side of the Atlantic. Dr. Brooks decides against classifying clouds according to the processes by which they may be supposed to originate, and against the practice of giving detailed descriptions with epithets such as fibrous, smooth, &c., in routine observations. His conclusions are in favour of retaining the ten types of the international classification whilst modifying slightly some of the definitions. It is to be noted that he has not had his article illustrated, as he considers that observers must decide doubtful cases by reference to definitions rather than to pictures.

The principal changes in definition proposed are as follows:—

INTERNATIONAL DEFINITION.	PROPOSED DEFINITION.
Cirro-cumulus—"Mackerel Sky." Small globular masses or white flakes without shadows, or showing very slight shadows, arranged in groups and often in lines.	**Cirro-cumulus.** Small white flakes or tenuous globular masses which produce no diffraction colours near the sun or moon. The cloud units are usually arranged in groups and often in lines, suggestive of one or more sets of small waves. Cirro-cumuli, being composed of ice particles, are usually bright in spite of their tenuity and do not have the solid appearance characteristic of liquid-droplet, alto-cumulus clouds. At times the tops of cirrus tufts or of cirro-stratus sheets are capped with cirro-cumulus.

Alto-cumulus—"Great Waves."

Largish globular masses, white or greyish, partially shaded, arranged in groups or lines, and often so closely packed that their edges appear confused. The detached masses are generally larger and more compact (resembling strato-cumulus) at the centre of the group, but the thickness of the layer varies. At times the masses spread themselves out and assume the appearance of small waves or thin slightly curved plates. At the margin they form into fine flakes (resembling cirro-cumulus). They often spread themselves out in lines in one or two direction.

Alto-stratus.

A thick sheet of grey or bluish colour, sometimes forming a compact mass of dark grey colour and fibrous structure. At other times the sheet is thin, resembling thick cirro-stratus, and through it the sun or the moon may be seen dimly gleaming as through ground glass. This form exhibits all changes peculiar to cirro-stratus, but from measurements its average altitude is about one-half that of cirro-stratus.

Stratus.

A uniform layer of cloud resembling a fog, but not resting on the ground.

Alto-cumulus.

Globular, scaly or wave-like masses, white or greyish, partially shaded, usually arranged in groups or lines, and often so closely packed that their edges appear confused. In the vicinity of the sun or moon diffraction colours are usually visible. At times the tops of large cirrus tufts or of cirro-stratus or alto-stratus masses are capped with rounded domes of alto-cumulus, too large to be called cirro-cumulus.

Alto-stratus.

A sheet of grey or bluish colour, either generally fibrous or presenting a smooth, undulated, mammato, or frayed-hole appearance. Through the fibrous (snow crystal) alto-stratus the sun or the moon may at times be seen dimly gleaming as through ground glass. On thin parts of the other (water droplet) kind diffraction colours appear in the vicinity of the sun or moon. Steady rain or snow may fall for hours from alto-stratus.

Stratus.

A low layer of cloud. Stratus is distinguishable from alto-stratus only by whether or not it appears to be lower than 1,000 metres above the surface.

In other cases minor alterations are suggested. The definition of strato-cumulus begins "large globular masses or rolls of dark clouds." Dr. Brooks would substitute "disc-like or scaly" for "globular," though it will be noticed that he passes "globular" in the definitions of cirro-cumulus and alto-cumulus. The authoritative French text has *petites balles* for cirro-cumulus, *balles plus grosses* for alto-cumulus, *grosses balles* for strato-cumulus. In the translation in "Cloud Forms" we find "small rounded masses," "larger rounded masses" and "large lumpy masses."

It is for the practised observer to say how far the proposed alterations in the definitions would facilitate his task. It is worth consideration, however, whether some far simpler scheme of instructions should not be practicable. Correspondence on this question would be welcomed.

Oxford University Expedition to Spitzbergen.

THE principal object of the Oxford University Expedition to Spitzbergen is the investigation of biological problems such as the modification of the habits of animals in an Arctic climate. The study of the coal measures is expected to indicate what species of timber flourished formerly in the island, and may throw light on the climatic changes that have taken place. The meteorologist of the expedition is Mr. R. A. Fraser, of the National Physical Laboratory.

Owing chiefly to the work of the Norwegian Meteorological Institute, we are well supplied with statistics for low-level stations in the islands, and there are valuable series of upper air observations, but there is scope for pioneer work on the climate of the uplands.

Transmission of Mercurial Barometers by Rail.

BAROMETERS are no longer accepted by the English railway companies for transmission at company's risk, and in order to overcome the difficulty thus created the Meteorological Office now forwards barometers in "doolies," or light wooden frames after the style of sedan chairs, which are arranged to take either two or four barometers each. The instruments are placed in their own boxes, which are secured in vertical pockets provided in the centre of the dooly in such a way that the barometer cisterns are upwards. The whole is sent by passenger train at owner's risk. Many instruments have already been forwarded in this manner and no breakages of tubes have occurred.

This method was adopted in India many years ago, and is still in regular use there.

Further particulars will be sent to anyone interested.

Review.

Amount and Composition of Rain Falling at Rothamsted. By E. J. Russell and E. H. Richards. The Journal of Agricultural Science, London, Oct. 1919, Vol. 9, pp. 309–337.

THIS paper, although of particular interest to the agricultural chemist, contains much of importance for the meteorologist. Estimations of the proportions of nitrogen and of chlorine in rain which have been made at Rothamsted since 1888 and 1877 respectively are dealt with. The annual rainfall of Rothamsted has been increasing on the whole since 1908. It is found that over the whole period the amount of nitrogen fixed as nitrate increased, but the amount fixed as ammonia decreased, the sum remaining fairly constant. The

THAMES VALLEY RAINFALL —— JUNE, 1921.

ALTITUDE SCALE

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

SCALE OF MILES 0 5 10 15 20

H.M.S.O. Press, Kingsway, W.C.2.

Meteorological Magazine.

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

Isohyetals.

chlorine in the rainwater increased from 2–2½ parts to 2½–3 parts per million by weight.

The average values for the constituents mentioned amounted, in lb. per acre per year, to—ammoniacal nitrogen 2·64, nitric nitrogen 1·33, organic nitrogen 1·35, chlorine 16, whilst the corresponding figure for the dissolved oxygen is 66·4. In the winter the rain was richer in chlorine and oxygen and poorer in ammoniacal and nitric nitrogen than in the summer months.

The main sources of the nitrogen are three, viz., the sea, the city smoke, and the soil; it is thought that the soil supplies the major part. Experiments have shown that the ammoniacal nitrogen existing as such at any time in the top 9 inches of soil amounts to at least 5 lb. per acre, and its rate of diffusion into the atmosphere must be fairly rapid. If the rate were greater in wet weather it would account for the renewal of the amount in the air and give an increased quantity with increased rainfall. It is further argued that the greater amount in the summer months is due to the increased biochemical action in the soil which is certainly greatest at that time of the year.

The chlorine is usually attributed mainly to the sea spray blown over the land, which view is consistent with the facts here. The winter gales give high chlorine values in the winter months, and the chlorine from fires is also most in evidence at this season.

The cause of the lower proportion of oxygen in the summer months (about 95 per cent. of saturation compared with 99 per cent. in the winter) is thought to be that in the summer the rain is formed higher up at pressures below that at ground level and in falling has not time to become saturated.

The marked difference in the amounts of the constituents falling in the summer and winter suggests a different origin for the rain.

The winter rain at Rothamsted resembles that collected at Valencia Observatory on the Atlantic coast in its high chlorine and low ammonia contents. The high proportion of chlorine at Rothamsted in winter is probably due in part to the fact that the air in which rain is formed in SE. England has usually been over the Atlantic a few hours previously but also to the fact that the stronger winds of the season carry more spray into the air; the evaporated spray leaves in the air nuclei of salt on which some of the moisture will condense when the air eddies up into cooler regions.

On the other hand, in summer the air has been for longer periods over the land and has had time to become charged

with ammonia before the occurrence of the rainfall of the convectional type for which the ammonia and ammonium salts may serve as nuclei of condensation.

A Correction.

THE radius of the halo described by Mr. R. E. Watson in the *Meteorological Magazine*, April 1921, p. 70, should be given as 23°, not 33°.

The Geophysical Observatory at Lerwick.

THE Geophysical Observatory at Lerwick was opened on June 7th, 1921. It has long been recognised that the establishment of an observatory in the Shetlands was desirable so as to secure observations of aurora under favourable conditions as well as records of magnetic force in the most disturbed region of the British Isles. The invitation of the Norwegian Government to co-operation in geophysical work during the period of Amundsen's Arctic expedition gave a further stimulus for the founding of a northern observatory.

The Lerwick Observatory occupies the premises of the Admiralty Wireless Station, which has been handed over to the Air Ministry for the purposes of the Meteorological Office.

The work of the Observatory will include meteorology, terrestrial magnetism, auroral parallax and atmospheric electricity; and when permanency is ensured further geophysical work will be undertaken. For the present the observations telegraphed for the daily weather service are to be contributed as hitherto by H.M. Coastguard. It should be noted, however, that the telegraphic reporting station which had been at Fort Charlotte since 1911 except for a few months in 1918 and 1919, was transferred to The Nab on April 14th, 1921. The station on this new site has a very free exposure—in fact, there is not sufficient shelter for satisfactory observations of rainfall. The Nab is $\frac{3}{4}$ mile from Fort Charlotte, whilst the Observatory is $1\frac{3}{4}$ miles from the Fort.

News in Brief.

WE regret to learn that Capt. Roald Amundsen has suffered a further delay in his Arctic expedition. His vessel, the *Maud*, lost a propeller off Cape Serge, on the Behring Strait, and is to be towed to Seattle for repairs.

SEÑOR JUAN CRUZ CONDE has been appointed Director of the Spanish Meteorological Service in succession to Señor Jose Galbis. Señor Galbis, who held the directorship from 1900, has been made a member of the Council of the Geographical Service.

DR. JULIUS VON HANN has retired from the editorship of the *Meteorologische Zeitschrift* after 55 years in that capacity. He edited the first number of the Zeitschrift in 1866, and since then has been joint editor with Jelinek, Köppen, Hellmann, and Süring. Drs. F. H. Exner and R. Süring are the present editors. At the meeting of the Austrian Meteorological Society on March 7th, 1921, Dr. Hann was presented with an address in which he was thanked for his services rendered through the medium of the Zeitschrift to the Society and to the science of Meteorology.

THE publication of the twelfth volume of the *Zeitschrift für Gletscherkunde* (Berlin, 1921) is announced. The price is £1 in this country, and the editors appeal for subscriptions in order that the publication of this work, much hindered during the war years, may be continued. A descriptive leaflet and a specimen section of the volume may be obtained post free on application to

Verlagsbuchhandlung Gebrüder Borntraeger,
Berlin, W. 35,
Deutsches Reich. Schoneberger Ufer 12A.

THE Meteorological Office staff at Croydon aerodrome are to be congratulated on the organization of a cricket team, and on a victory in their first match with the score 118 for 5 (Budd, 50 not out).

The Weather of June 1921.

THE weather of June over a considerable part of western and south-western Europe was notable for the exceptional scarcity of rain, due to the predominating effect of the anticyclone over the eastern Atlantic.

At the beginning of the month the Azores anticyclone extended to Scandinavia, while cyclonic conditions prevailed in the extreme north-west, and relatively low pressure over southern Europe and the Mediterranean. The weather was fair or fine in the anticyclonic region, but there was heavy rain in parts of central Europe.

On the 3rd and 4th a shallow depression over France caused rain in the north of France and south-east of England, with local thunderstorms in the Netherlands, whilst the Atlantic anticyclone moved north until it was situated between Iceland and the Hebrides.

A new depression which began to form over Scandinavia, giving strong northerly winds and rain on the Norwegian

(*Continued on* p. 170.)

Rainfall Table for June 1921.

STATION.	COUNTY.	Aver. 1881–1915.	1921.		Per cent. of Av.	Max. in 24 hrs.		No. of Rain Days
		in.	in.	mm.		in.	Date.	
Camden Square	*London*	2·02	·37	9	18	·23	3	5
Tenterden (Ashenden)	*Kent*	1·91	·00	0	0	·00	..	0
Arundel (Patching Farm)	*Sussex*	2·02	·05	1	2	·04	19	2
Fordingbridge (Oaklands)	*Hampshire*	1·85	·26	7	14	·16	25	3
Oxford (Magdalen College)	*Oxfordshire*	2·13	·35	..	16	·18	26	6
Wellingborough (Swanspool)	*Northampton*	2·10	·37	9	18	·20	26	5
Hawkedon Rectory	*Suffolk*	2·07	·29	7	14	·16	3	3
Norwich (Eaton)	*Norfolk*	1·93	·55	14	28	·38	17	7
Launceston (Polapit Tamar)	*Devon*	2·15	·02	1	1	·02	25	1
Sidmouth (Sidmount)	,,	2·10	·80	20	38	·69	25	2
Ross (Chasedale Observatory)	*Herefordshire*	2·15	·41	11	19	·30	25	6
Church Stretton (Wolstaston)	*Shropshire*	2·42	·64	16	26	·27	4	6
Boston (Black Sluice)	*Lincoln*	1·82	·55	14	20	·22	26	6
Worksop (Hodsock Priory)	*Nottingham*	1·98	·44	11	22	·14	20	6
Mickleover Manor	*Derbyshire*	2·39	·51	13	21	·32	4	5
Southport (Hesketh Park)	*Lancashire*	2·17	·46	12	21	·25	25	9
Harrogate (Harlow Moor Ob.)	*York, W. R.*	2·39	·17	4	7	·07	4	4
Hull (Pearson Park)	,, *E. R.*	2·06	·26	7	13	·10	4	6
Newcastle (Town Moor)	*North'land*	2·17	·88	22	41	·17	8	8
Borrowdale (Seathwaite)	*Cumberland*	6·52	1·76	45	27	..	..	..
Cardiff (Ely Pumping Stn.)	*Glamorgan*	2·49	·06	2	2	·03	12	3
Haverfordwest (Gram. Sch.)	*Pembroke*	2·70	·01	0	0	·01	26	1
Aberystwyth (Gogerddan)	*Cardigan*	3·11	·44	11	14	·34	27	3
Llandudno	*Carnarvon*	2·39	·21	5	9	·07	25	8
Dumfries (Cargen)	*Kirkcudbrt.*	3·24	·45	11	14	·21	8	7
Marchmont House	*Berwick*	3·05	·75	19	25	·30	9	8
Girvan (Pinmore)	*Ayr*	2·89	·93	24	32	·39	22	12
Glasgow (Queen's Park)	*Renfrew*	2·31	·56	13	22	·14	12	9
Islay (Eallabus)	*Argyll*	2·62	1·41	36	54	·26	12	13
Mull (Quinish)	,,	2·97	1·64	42	55	·48	22	16
Loch Dhu	*Perth*	4·17	·50	13	12	·10	9,12*	7
Dundee (Eastern Necropolis)	*Forfar*	1·80	·62	16	34	·15	8	11
Braemar (Bank)	*Aberdeen*	1·91	·74	19	39	·16	20	5
Aberdeen (Cranford)	,,	1·80	1·12	28	62	·35	8, 21	14
Gordon Castle	*Moray*	2·04	1·79	45	88	·36	9	15
Fort William (Atholl Bank)	*Inverness*	3·50	1·25	32	36	·29	22	14
Alness (Ardross Castle)	*Ross*	2·26	·84	21	37	·31	21	13
Loch Torridon (Bendamph)	,,	4·08	..	..	..	..	..	..
Stornoway	,,	2·32	1·76	45	76	·42	21	14
Wick	*Caithness*	1·80	1·12	28	62	·16	9	20
Glanmire (Lota Lodge)	*Cork*	2·70	·04	1	1	·04	25	1
Killarney (District Asylum)	*Kerry*	2·91	·06	1	2	·06	27	1
Waterford (Brook Lodge)	*Waterford*	2·69	·08	2	3	·08	27	1
Nenagh (Castle Lough)	*Tipperary*	2·45	·76	19	31	·57	26	4
Ennistymon House	*Clare*	3·05	·64	16	21	·21	12	9
Gorey (Courtown House)	*Wexford*	2·43	·74	19	30	·63	25	5
Abbey Leix (Blandsfort)	*Queen's Co.*	2·59	3·69	94	142	3·10	26	8
Dublin (FitzWilliam Square)	*Dublin*	1·95	·19	5	10	·06	26	7
Mullingar (Belvedere)	*Westmeath*	2·60	·20	5	8	·11	11	4
Woodlawn	*Galway*	2·79	·39	10	14	·13	12	8
Crossmolina (Enniscoe)	*Mayo*	3·00	·64	16	21	·18	11	7
Collooney (Markree Obsy.)	*Sligo*	2·94	·49	12	17	·12	11	8
Seaforde	*Down*	2·76	·44	11	16	·13	11	5
Ballymena (Harryville)	*Antrim*	2·91	·67	17	23	·19	11	10
Omagh (Edenfel)	*Tyrone*	2·82	·58	15	21	·16	20	7

* and 19.

Supplementary Rainfall, June 1921.

Div.	STATION.	RAIN. in.	RAIN. mm.	Div.	STATION.	RAIN. in.	RAIN. mm.
II.	Ramsgate	·19	5	XIII.	Ettrick Manse	·52	13
,,	Sevenoaks, Speldhurst	·12	3	,,	North Berwick Res	·57	15
,,	Hailsham Vicarage	·00	0	,,	Edinburgh, Royal Ob.	·35	9
,,	Totland Bay, Aston	·16	4	XIV.	Biggar	·50	13
,,	Ashley, Old Manor Ho.	·11	3	,,	Leadhills	1·10	28
,,	Grayshott	·13	3	,,	Maybole, Knockdon	·78	20
,,	Ufton Nervet	·31	8	XV.	Dougarie Lodge	·69	17
III.	Harrow Weald, Hill Ho.	·17	4	,,	Inverarav Castle	2·00	51
,,	Pitsford, Sedgebrook	·38	10	,,	Holy Loch, Ardnadam	·59	15
,,	Chatteris, The Priory	·41	10	XVI.	Loch Venachar	·30	8
IV.	Elsenham, Gaunts End	·90	23	,,	Glenquey Reservoir	·20	5
,,	Lexden, Hill House	·10	3	,,	Loch Rannoch, Dall	·50	13
,,	Aylsham, Rippon Hall	·38	10	,,	Trinafour	·35	9
,,	Swaffham	·51	13	,,	Blair Athol	·61	15
V.	Devizes, Highclere	·26	7	,,	Coupar Angus	·63	16
,,	Weymouth	·30	7	,,	Montrose Asylum	1·00	25
,,	Ashburton, Druid Ho.	·11	3	XVII.	LogieColdstone,Loanh'd	1·21	31
,,	Cullompton	1·02	26	,,	Fyvie Castle	1·51	38
,,	Hartland Abbey	·01	1	,,	Grantown-on-Spey	1·29	33
,,	St. Austell, Trevarna	·10	3	XVIII.	Cluny Castle	·97	25
,,	North Cadbury Rec.	·41	10	,,	Loch Quoich, Loan	5·00	127
,,	Cutcombe,Wheddon Cr.	·56	14	,,	Fortrose	·75	19
VI.	Clifton, Stoke Bishop.	·20	5	,,	Faire-na Squir	2·12	54
,,	Ledbury, Underdown.	·72	18	,,	Skye, Dunvegan	2·29	58
,,	Shifnal,HattonGrange	·50	13	,,	Glencarron Lodge	2·46	63
,,	Ashbourne, Mayfield	·30	8	,,	Dunrobin Castle	1·08	27
,,	Barnt Green, Upwood	·55	14	XIX.	Tongue Manse	1·77	45
,,	Blockley, Upton Wold	·46	12	,,	Melvich Schoolhouse	1·62	43
VII.	Grantham, Saltersford	·89	23	,,	Loch More, Achfary	4·29	109
,,	Louth, Westgate	·42	11	XX.	Dunmanway Rectory	·08	2
,,	Mansfield, West Bank	·80	20	,,	Mitchelstown Castle	·32	8
VIII.	Nantwich, Dorfold Hall	·44	11	,,	Gearahameen	·00*	0
,,	Bolton, Queen's Park.	·43	11	,,	Darrynane Abbey	·13	3
,,	Lancaster, Strathspey.	·61	15	,,	Clonmel, Bruce Villa	1·07	27
IX.	Rotherham	·36	9	,,	Cashel, Ballinamona	·22	6
,,	Bradford, Lister Park.	·05	1	,,	Roscrea, Timoney Pk.	1·03	26
,,	West Witton	·36	9	,,	Foynes	·60	15
,,	Scarborough, Scalby	·31	8	,,	Broadford, Hurdlesto'n	·45	11
,,	Middlesbro', Albert Pk.	·36	9	XXI.	Kilkenny Castle	·26	7
,,	Mickleton	·20	5	,,	Rathnew, Clonmannon	·55	14
X.	Bellingham	·86	22	,,	Hacketstown Rectory	1·01	26
,,	Ilderton, Lilburn	·53	13	,,	Balbriggan, Ardgillan	·11	3
,,	Orton	·26	7	,,	Drogheda	·05	1
XI.	Llanfrechfa Grange	·20	5	,,	Athlone, Twyford	·94	24
,,	Treherbert,Tyn-y-waun	1·13	29	XXII.	Castle Forbes Gdns	·31	8
,,	Carmarthen Friary	·03	1	,,	Ballynahinch Castle	·83	21
,,	Fishg'rd,Goodwick Stn.	·05	1	,,	Galway Grammar Sch.	·44	11
,,	Lampeter, Falcondale	·27	7	XXIII.	Westport House	·68	17
,,	Cray Station	1·00	25	,,	Enniskillen, Portora	·35	9
,,	B'ham W.W.,Tyrmyndd	·77	20	,,	Armagh Observatory	·28	7
,,	Lake Vyrnwy	·31	8	,,	Warrenpoint	·20	5
,,	Llangynhafal, P. Drâw	·50	13	,,	Belfast, Cave Hill Rd.	·41	10
,,	Oakley Quarries	·96	24	,,	Glenarm Castle	·29	7
,,	Dolgelly, Bryntirion	·54	14	,,	Londonderry, Creggan	·75	19
,,	Lligwy	·10	3	,,	Sion Mills	·30	8
XII.	Stoneykirk,ArdwellHo.	·28	7	,,	Milford, The Manse	·57	15
,,	Carsphairn, Shiel	1·19	30	,,	Narin, Kiltoorish	·52	13
XII.	Langholm, Drove Rd.	·73	19	,,	Killybegs, Rockmount	1·23	21

* Read to nearest ·1 inch.

Climatological Table for the

STATIONS	PRESSURE		TEMPERATURE							
			Absolute				Mean Values			
	Mean of Day M.S.L.	Diff. from Normal	Max.	Date	Min.	Date	Max.	Min.	½ max. and min.	Diff. from Normal
	mb.	mb.	°F.		°F.		°F.	°F.	°F.	°F.
London, Kew Obsy..	1016·2	+1·0	79	May 25	21	Dec. 13	57·4	44·0	50·7	+1·0
Gibraltar.....	1018·2	+1·7	95	Aug. 6	37	Mar. 11	70·4	57·6	64·0	−0·1
*Malta.....	1015·7	+0·9	97	Aug. 24	47	Jan. 21	..	..	66·3	+1·1
Sierra Leone,.....	1012·6	+0·8	99	Feb. 24	65	May 22	87·1	72·8	79·9	−1·0
				Mar. 7						
Lagos, Nigeria	1012·9	+1·5	99	Mar. 24	68	Dec. 28	85·8	74·9	80·4	+0·2
Kaduna, Nigeria...	1014·2	+4·1	100	Mar. 19,	49	Dec. 14	86·7	64·3	75·5	−1·3
				20						
Zomba, Nyasaland .	1012·5	+0·4	97	Oct. 7	42	June 3	79·6	60·4	70·0	+0·9
Salisbury, Rhodesia	1013·0	−1·6	95	Nov. 25,	35	June 4	79·9	53·6	66·8	+1·7
				26						
Cape Town.....	1016·7	−0·3	96	Mar. 19	38	June 23	71·8	54·6	63·2	+1·2
				Apr. 14						
Johannesburg	..	..	90	Jan. 5	25	June 24	71·3	49·7	60·5	+1·0
Mauritius	..	..	..	..	..	..	..	..	..	..
‡Bloemfontein.....	..	..	97	Jan. 23	18	June 14	..	..	61·2	−0·2
Calcutta, Alipore Obsy.	1006·9	−0·6	105	June 1	50	Dec. 30	87·7	71·7	79·7	+1·0
Bombay	..	..	94	June 7	62	Feb. 7	87·2	76·1	81·7	+1·2
Madras	..	..	109	May 6	63	Dec. 3	92·0	76·0	84·0	+1·1
Colombo, Ceylon...	1010·3	+0·9	93	Mar. 26	63	Dec. 5	86·2	74·8	80·5	−0·7
Hong Kong	1011·6	−1·0	93	July 25	45	Jan. 5	76·2	68·6	72·4	+0·1
Sydney	1016·0	+0·1	98	Nov. 24	38	June 5	71·0	55·5	63·2	+0·2
†Melbou ne.....	1015·7	−0·4	106	Dec. 23	34	July 17	..	..	58·2	−0·2
Adelaide	1016·6	−0·4	110	Dec. 24	37	June 5	72·5	53·2	62·8	−0·2
‡Perth, W. Australia	1015·5	−0·9	107	Jan. 27	35	June 30	..	..	65·1	+1·1
Coolgardie	1015·1	−0·9	108	Jan. 13	29	July 1	77·0	51·3	64·2	−0·3
‡Brisbane.....	1016·0	+0·3	93	Feb. 24	41	July 13	..	..	68·5	−0·4
Hobart, Tasmania..	1013·2	+0·7	102	Dec. 24	33	June 15	62·6	47·0	54·8	+0·5
Wellington, N.Z....	1014·9	+0·8	80	Feb. 9	29	July 25	60·3	48·7	54·5	−0·9
Suva, Fiji.....	1010·5	−0·9	91	Mar. 4	55	July 3	81·1	70·7	75·9	−1·1
Kingston, Jamaica..	1013·8	−0·1	95	July 15	64	Feb. 7	88·6	71·7	80·1	+0·8
§Grenada, W.I.	1012·8	+0·4	90	Nov. 27	69	sev.	..	..	78·8	+0·1
Toronto.....	1016·3	−0·1	93	June 10	−18	Jan. 31	54·6	37·1	45·9	+1·5
Winnipeg.....	..	..	..	..	..	..	..	..	..	..
St. John, N.B.	1014·1	−0·6	83	July 9	−20	Jan. 31	48·4	33·5	40·9	−0·3
Victoria, B.C.....	1016·7	+0·3	91	July 7	25	Jan. 22	55·0	43·2	49·1	−0·4
					Mauritius.					
September 1920 ...	1019·6	−0·6	80	28	56	5	77·2	61·0	69·1	−1·0
October 1920.....	1018·2	0·0	84	31	61	4 & 11	79·9	64·9	72·4	−0·8

September, 1 day with thunder heard.

* March and April missing; normal values for these months used for pressure and temperature.
† April and Nov. " " " " " " " "

LONDON, KEW OBSERVATORY.—Mean speed of wind 7·7 mi/hr.; 8 days with snow, 13 with thunder heard, 66 with fog. 1 thunder in September previously unrecorded.

GIBRALTAR.—6 days with thunder heard, 16 with fog, 21 with gale.

MALTA.—Prevailing wind direction NW.; mean speed of wind 7·3 mi/hr.

SIERRA LEONE.—Prevailing wind direction SW.; 41 days with thunder heard, 9 with gale

SALISBURY, RHODESIA.—Prevailing wind direction easterly; 2 days with thunder heard.

British Empire, Year 1920.

TEMPERATURE Absolute Max. in Sun °F.	TEMPERATURE Absolute Min. on Grass °F.	Relative Humidity %	Mean Cloud Am'nt 0–10	PRECIPITATION Amount in.	PRECIPITATION Amount mm.	PRECIPITATION Diff. from Normal mm.	PRECIPITATION Days	BRIGHT SUNSHINE Hours per day	BRIGHT SUNSHINE Percentage of possible	STATIONS
140	10	78	6·9	23·62	601	− 5	160	3·5	29	London, Kew Obsy.
153	32	76	3·9	27·20	691	− 219	71	..	..	Gibraltar.
153	..	77	4·1	..	..	..	..	7·6	61	Malta.*
..	..	73	5·1	106·85	2714	−1227	138	..	..	Sierra Leone.
165	42	74	6·6	53·10	1349	− 471	120	..	..	Lagos, Nigeria.
..	..	68	..	54·81	1392	+ 46	121	..	..	Kaduna, Nigeria.
..	..	82	5·5	65·77	1671	+ 260	129	..	..	Zomba, Nyasaland.
153	29	58	4·0	28·40	721	− 124	83	..	..	Salisbury, Rhodesia.
..	..	70	4·4	26·98	685	+ 36	104	..	..	Cape Town.
..	22	61	3·8	27·96	710	− 90	91	8·6	72	Johannesburg.
..	..	..	..	..	..	..	..	..	..	Mauritius.
..	..	59	3·3	..	..	..	..	..	..	Bloemfontein.‡
..	41	60	4·6	63·75	1619	+ 51	71	..	..	Calcutta, Alipore Obsy.
139	53	73	3·5	41·05	1043	− 783	98	..	..	Bombay.
..	..	72	4·7	63·89	1623	+ 368	80	..	..	Madras.
163	55	75	6·9	90·73	2305	+ 149	189	..	..	Colombo, Ceylon.
..	..	78	7·4	107·88	2740	+ 627	161	4·7	39	Hong Kong.
148	33	67	4·8	43·42	1103	− 116	159	..	..	Sydney.
156	30	67	5·6	..	..	..	..	..	..	Melbourne.†
164	26	57	4·5	26·70	678	+ 143	119	..	..	Adelaide.
172	25	61	4·6	..	..	..	..	..	..	Perth, W. Australia.‡
169	25	43	3·8	7·63	194	− 64	60	..	..	Coolgardie.
155	34	64	4·7	..	..	..	..	..	..	Brisbane.‡
161	27	67	6·2	18·00	457	− 145	182	..	..	Hobart, Tasmania.
152	18	77	6·5	49·28	1252	+ 20	150	5·2	43	Wellington, N.Z.
..	..	87	5·9	109·14	2772	− 82	263	..	..	Suva Fiji.
..	..	74	4·5	9·11	231	− 630	55	..	..	Kingston, Jamaica.
144	..	75	4·8	..	..	..	..	..	..	Grenada, W.I.§
147	? − 20	73	5·3	29·91	760	− 90	145	..	..	Toronto.
..	..	..	..	..	..	..	..	..	..	Winnipeg.
139	? − 21	80	5·9	51·58	1310	+ 90	148	..	..	St. John, N.B.
145	? 19	83	5·8	30·29	769	− 58	155	..	..	Victoria. B.C.
					Mauritius.					
..	50	76	5·2	1·93	49	+ 16	22	7·8	65	September 1920.
..	54	71	5·2	1·87	48	+ 13	15	9·1	73	October 1920.

‡ December missing; normal values for these months used for pressure and temperature.
§ October " " " " " " " "

COLOMBO, CEYLON.—Prevailing wind direction SW.; mean speed 5·0 mi/hr.; 52 days with thunder heard.

HONG KONG.—Prevailing wind direction E.: mean speed 12·0 mi/hr.; 31 days with thunder heard, 32 with fog.

WELLINGTON.—1 day with thunder heard, 2 days of fog.

SUVA, FIJI.—41 days with thunder heard.

Climatological Table for the

STATIONS	PRESSURE		TEMPERATURE							
			Absolute				Mean Values			
	Mean of Day M.S.L.	Diff. from Normal	Max.	Date	Min.	Date	Max.	Min.	½ max. and min.	Diff. from Normal
	mb.	mb.	°F.		°F.		°F.	°F.	°F.	°F.
London, Kew Observatory	1015·7	−1·6	56	9	26	16	50·4	41·5	46·0	+7·1
Gibraltar	1026·8	+7·3	71	4	42	15, 16	61·5	47·5	54·5	−0·2
Malta	1019·2	+3·0	64	2	45	20	59·5	51·9	55·7	+1·4
Sierra Leone	1011·8	+0·7	93	12,20, 23	65	4	89·7	70·5	80·1	−1·3
Lagos, Nigeria	1013·1	+3·2	90	16	65	29	88·0	71·5	79·7	−1·3
Kaduna, Nigeria	1014·4	+4·6	94	12	54	3, 24, 31	87·0	57·7	72·4	−1·9
Zomba, Nyasaland	1007·7	−0·2	90	5, 6	62	9, 19, 29	81·2	65·3	73·3	+0·9
Salisbury, Rhodesia	1007·4	−3·3	92	3	55	19	81·8	60·7	71·3	+1·8
Cape Town	1013·4	0·0	98	31	53	10	77·2	58·8	68·0	−1·8
Johannesburg	1011·0	−0·1	89	21	50	17	77·3	56·0	66·7	+0·5
Mauritius	..	..	..	..	..	..	..	..	..	..
Bloemfontein	..	..	95	26	49	16	88·2	58·7	73·5	+0·3
Calcutta, Alipore Obsy.	1014·9	−0·3	86	19	49	4	78·0	58·1	68·1	+1·7
Bombay	1012·4	−0·8	91	4	61	22	83·9	67·9	75·9	+0·7
Madras	1013·0	−0·9	88	2	65	31	84·4	71·4	77·9	+1·8
Colombo, Ceylon	1010·7	−0·1	92	26	69	6	86·1	73·4	79·7	−0·1
Hong Kong	1021·2	+1·8	76	26	45	14	64·2	54·1	59·1	−1·2
Sydney	1016·4	+3·9	89	2	57	13	77·0	64·0	70·5	−1·2
Melbourne	1015·6	+2·9	107	24	49	4	80·8	59·9	70·3	+2·9
Adelaide	1015·1	+2·1	110	23	53	4	88·3	64·7	76·5	+2·4
Perth, Western Australia	1012·8	+0·3	108	28	50	1	86·3	64·0	75·1	+1·4
Coolgardie	1011·7	+0·3	112	21	48	2	93·4	62·1	77·7	+0·3
Brisbane	1013·4	+2·1	89	11, 12	64	18	82·5	68·1	75·3	−2·0
Hobart, Tasmania	1015·6	+5·3	96	1	45	3	72·9	54·0	63·5	+1·2
Wellington, N.Z.	1017·2	+4·4	82	2	45	17	69·8	54·7	62·3	−0·4
Suva, Fiji	1005·5	−2·2	90	5	71	2	86·5	73·2	79·9	0·0
Kingston, Jamaica	1015·4	+0·1	89	29	66	25	85·9	69·5	77·7	+0·9
Grenada, W.I.	..	..	..	..	..	..	..	..	..	..
Toronto	1020·2	+2·8	53	20	− 5	18	35·4	20·2	27·8	+5·7
Winnipeg	1018·6	−1·2	33	6	−33	17	16·5	−2·2	7·1	+11·5
St. John, N.B.	1015·7	0·0	47	15	− 5	19	29·4	12·6	21·0	+1·8
Victoria, B.C.	1013·4	−1·9	52	14	29	10	43·9	36·4	40·1	0·0

LONDON, KEW OBSERVATORY.—Mean speed of wind 10·2 mi/hr ; 4 days with fog.
GIBRALTAR.—1 day with thunder heard, 3 days with fog.
MALTA.—Prevailing wind direction NW. ; mean speed 7·9 mi/hr.
SIERRA LEONE.—Prevailing wind direction NE.
COLOMBO, CEYLON.—Prevailing wind direction NNE. ; mean speed 5·3 mi/hr ; 7 days with thunder heard.

British Empire, January 1921.

TEMPERATURE		Relative Humidity	Mean Cloud Am'nt	PRECIPITATION				BRIGHT SUNSHINE		STATIONS
Absolute				Amount		Diff. from Normal	Days	Hours per day	Percentage of possible	
Max. in Sun ° F.	Min. on Grass ° F.	%	0–10	in.	mm.	mm.				
84	21	85	8·3	2·04	52	+ 7	19	0·9	11	London, Kew Observatory.
126	35	78	3·8	1·17	30	−100	8	..	..	Gibraltar.
116	..	83	6·2	2·73	69	− 6	13	5·5	56	Malta.
..	..	66	2·2	0·00	0	− 11	0	..	..	Sierra Leone.
145	52	73	6·6	0·31	8	− 20	2	..	..	Lagos, Nigeria.
..	..	38	..	0·00	0	0	0	..	..	Kaduna, Nigeria.
..	..	87	7·4	10·16	258	− 27	16	..	..	Zomba, Nyasaland.
158	50	73	6·5	6·41	163	− 38	15	..	..	Salisbury, Rhodesia.
..	..	59	4·0	0·77	20	+ 3	5	..	..	Cape Town.
..	49	66	5·7	4·77	121	− 38	11	8·5	63	Johannesburg.
..	..	..	..	..	..	..	..	..	..	Mauritius.
..	..	45	2·5	1·08	27	− 75	7	..	..	Bloemfontein.
..	39	54	3·3	2·09	53	+ 43	3	..	..	Calcutta, Alipore Obsy.
133	49	61	0·7	0·00	0	− 2	0	..	..	Bombay.
..	..	85	50	5·46	139	+116	9	..	..	Madras.
166	63	73	7·2	7·55	192	+101	18	..	..	Colombo, Ceylon.
..	..	66	5·3	0·19	5	− 32	5	5·9	54	Hong Kong.
146	51	69	4·9	3·15	80	− 7	14	7·5	53	Sydney.
159	43	55	4·7	4·49	114	+ 67	11	..	..	Melbourne.
163	38	38	3·0	1·59	40	+ 22	1	10·9	77	Adelaide.
169	40	48	3·1	0·04	1	− 8	3	..	..	Perth, Western Australia.
173	44	31	3·1	1·22	31	+ 19	4	..	..	Coolgardie.
155	60	67	6·7	4·04	103	− 62	21	..	..	Brisbane.
158	39	57	6·5	2·18	55	+ 9	11	8·9	59	Hobart, Tasmania.
145	33	70	6·0	3·14	80	− 6	11	7·7	52	Wellington, N.Z.
..	..	87	6·2	20·49	520	+248	23	..	..	Suva, Fiji.
..	..	73	5·4	1·40	36	+ 12	11	..	..	Kingston, Jamaica.
..	..	..	..	..	..	..	..	..	..	Grenada, W.I.
90	−9	58	5·5	0·67	17	− 56	11	..	..	Toronto.
..	..	92	4·1	1·15	29	+ 10	6	..	..	Winnipeg.
103	−6	56	5·8	3·16	80	− 42	9	..	..	St. John, N.B.
101	26	89	8·1	5·55	141	+ 26	22	..	..	Victoria, B.C.

HONG KONG.—Prevailing wind direction ENE.; mean speed 9·1 mi/hr.

PERTH.—Absolute max. the highest ever recorded at Perth, and absolute min. the lowest on record for January.

SUVA, FIJI.—15 days with thunder heard.

coast, moved to central Europe, causing dull weather with slight rain in many parts and heavy rain at Zürich, but by the 6th the large anticyclone over the eastern Atlantic extended across Denmark to Russia, and fair weather prevailed over a large part of Europe.

On the 8th there was a depression near Iceland with a shallow trough extending over the British Isles. The depression moved north-eastward and a shallow low moved north over France and the Netherlands, causing rain in parts of the British Isles, France, Germany, Denmark and Switzerland.

For some days depressions over Iceland and southern Scandinavia maintained unsettled conditions in north and north-west Europe, 44 mm. of rain being recorded at Saerna in Sweden on the 10th, while in the south of the British Isles and south-west Europe generally fair weather prevailed, pressure meanwhile continuing low over the eastern Mediterranean with rather unsettled weather in Italy and central Europe.

On the 17th a depression near Spitzbergen spread southward over Scandinavia, and by the 18th it was over the Baltic, giving strong northerly winds and causing a considerable fall of temperature over the British Isles and the more northerly parts of Europe; the maximum temperatures on the 17th in south England exceeded 80° F. at several stations, while on the 18th temperatures in the same district only reached about 60° F. The maximum temperatures at Ross-on-Wye were 87° F. on the 17th, 64° F. on the 18th. Local thunderstorms, although accompanied by only slight rain, were experienced at Gorleston and at Croydon during the night of the 17th–18th. The next night screen temperatures fell below 40° F. at several stations in England. At Benson the screen minimum was 34° F. and at South Farnborough 35° F., and ground frosts were recorded at some stations, the grass minimum being as low as 22° F. at Greenwich, at Benson 26° F., at Howden 28° F., and at Kew Observatory 29° F.

The Baltic depression persisted and secondaries stretched from it to Iceland, causing cloudy weather and rain in north-west Europe. Although the rainfall was mostly slight, it was heavy in parts of Sweden and locally elsewhere. On the 18th, 19th, and 20th Stockholm reported 23 mm., 19 mm., and 10 mm. of rain respectively, while on the 20th Berlin had 26 mm. and Kronstadt 22 mm.

On the same date a depression over Italy caused a fall of 53 mm. at Rome.

The Atlantic anticyclone moved slowly across the southern part of the British Isles on the 23rd and 24th, and temperature

became very high, reaching the maximum at most places on the 25th.

On that day, Nottingham recorded a screen temperature of 88° F., Ross 86° F., Kew 83° F. and Aberbeen 80° F. The anticyclone was now over the Netherlands, moving slowly east and a trough of low pressure extended over the British Isles. Thunderstorms occurred at night over the South and Midlands of England, with particularly brilliant displays of lightning. The amount of rainfall was, however, generally small, although Jersey had 15 mm. and Bournemouth 11 mm.

On the 26th another anticyclone spread down from Iceland, and, after extending over the British Isles, took up its position to the westward of these Islands, where it still remained at the end of the month. Fair settled weather set in again over the British Isles and most of western Europe, although an area of low pressure over the Bay of Biscay caused local thunderstorms and rain in western France, while the Scandinavian depression maintained unsettled weather in northern Europe. On the night of the 27th–28th ground frosts were experienced at some English stations, Howden recording a grass minimum of 24° F.

Visibility was good throughout the month over the British Isles, apart from a few cases of local fog on the west and north-west coasts, and a large number of cases were reported where the range of visibility exceeded eighteen miles.

W. C. K.

THE prolonged dry spell in France, following an unusually dry winter, is causing anxiety as to crops and cattle. Switzerland has also experienced a hot, dry month, the rivers being six feet lower than usual, but falls of snow at altitudes above 4,500 feet have been reported. The Atlantic Ice Patrol reports that ice conditions in the North Atlantic are worse than they have been for many years, large numbers of icebergs being scattered over a wide area.

Serious floods following heavy rainfall have affected the cotton and wheat crops in the north-eastern part of the Egyptian delta, and similar floods have resulted in grave damage in the Fukuoka district of Kinshin, Japan.

The Indian monsoon broke later than usual this year, but by the 22nd of the month it was extending normally, with excess of rain in some regions. Early in the month heavy rain was reported at many stations in Queensland and New South Wales.

Timely rainfalls have occurred in Northern Alberta, Manitoba and Saskatchewan, and throughout the dominion of Canada crop prospects are exceptionally favourable.

A violent storm on June 3rd at Pueblo, Colorado, caused extensive damage to life and property. The subsequent

bursting of the neighbouring dams caused reflooding of the city, wholesale destruction of crops and the wasting of the irrigation supply for the summer.

The Belize district of British Honduras was suffering from severe drought, but floods following a heavy storm were reported from San Salvador on the 11th.

The month was again one of widespread deficiency of rainfall, less than half the average falling everywhere except in the north and west of Scotland and in Queen's County. In the last mentioned a local fall of 3·10 inches fell on the 26th at Blandsfort, bringing the total to 42 per cent. above the average. The areas in which the deficiency was most marked were the north-east and south of Ireland, the west and south of Wales, and the south of England. In all these districts less than 10 per cent. of the average rainfall was observed. In parts of Sussex no rain fell during the month, and an extremely large area had less than ·25 inch. More than 1 inch fell to the north of Banbury, in Central Wales, in the Lake District, and in the north and north-west of Scotland generally, as well as in small isolated patches in Ireland. Following on the exceptional dryness of the preceding four months, which was most marked in the Midlands and south of England, the dryness of June has created a widespread deficiency which has now reached serious proportions. The rainfall of the five months was less than half the average over most of England, and fell to less than 40 per cent. of the average in Northamptonshire. The amount increased towards the north-west, and the West Highlands experienced no general shortage, March and May having been wet in these districts. So far as it is possible to ascertain, the deficiency of rainfall has been at least as severe as that observed in the notably dry springs of 1893, 1895, and 1896. There was almost certainly no drier period of five months in 1887, the driest year known to have occurred in the British Isles.

The general rainfall for June, expressed as a percentage of the average, was:—England and Wales, 17; Scotland, 40; Ireland, 24; British Isles, 26.

In London (Camden Square) the month was remarkably fine, sunny, and dry. The total rainfall was the least recorded in June since 1895, when only ·30 inch fell. In the five months February to June the total was 4·06 inches. Only once in 64 years' record has a smaller total been recorded in five consecutive months, viz., February to June 1895, when the total only reached 3·52 inches. Mean temperature, 61·8° F., or 1·6° above the average. Duration of rainfall, 7·9 hours. Evaporation, 3·66 inches.