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METEOROLOGY AT THE BRITISH ASSOCIATION.

Section A.

By E. GOLD, M.A.

In an account of the proceedings at the Birmingham meeting it is natural to comment on the absence of all the heads of the three great Meteorological Organisations of the country from one of the largest and most successful gatherings of natural philosophers which recent years have witnessed.

Mr. J. I. Craig, whose new duties in Egypt did not permit him to remain in England for the meeting, contributed a very important paper entitled "A Temperature See-Saw between England and Egypt." The history of the investigation is an interesting one. Sir Edward Fry wrote a letter to *Nature* in 1911 asking if the abnormal warmth of that year in Europe had been experienced in other parts of the globe. Mr. Craig replied that in Egypt the summer had been much cooler than usual but with characteristic thoroughness he began to investigate the relation between temperature in the two countries in previous years. He found, from an examination of the values for 34 years, that the correlation co-efficients indicated that the temperature swung in opposite directions in the two countries; when one was up, the other was down and *vice-versa*. Examining different seasons separately, he found that the correlation was most marked in the first and last quarters of the year when the values of r were —·72 and —·43 respectively for Cairo and South-west England. He then calculated the values of r between Egypt and other European stations and by using the results obtained he drew *lines of equal correlation* for January, April, July and October. The method is of fundamental importance in the treatment of the problem of "centres of action," and we may look forward to the time when each country will have its own set of monthly or seasonal iso-correlational lines, and will issue seasonal forecasts based upon them and upon the up-to-date information for the places which they indicate as "centres of action." Mr. Craig's charts show that for Egypt a "centre of action" is probably situated to the N.W. of South-west England in winter and to the West of France and Spain in summer.

It is interesting to note that Mr. R. C. Mossman was being led to the method of iso-correlational lines in his studies recently published in *Symons's Meteorological Magazine*, and that Prof. Exner of Innsbruck has recently adapted this method in an important paper published in the *Sitzungsberichten* of the Vienna Academy.

Mr. E. Gold and Mr. F. J. W. Whipple showed some curves of frequency of maximum and minimum temperature for Kew and Valencia Observatories for different months, and in the case of maximum temperature at Kew, for the year also. The monthly curves were steeper on the side of higher temperature in winter and of lower temperature in summer, indicating the opposite effect of the ocean in the two seasons. The curves for maximum temperature in April at the two places were remarkably different; for Kew the curve was wide and flat, indicating a variable day temperature with no value that could fairly be called "normal"; for Valencia the curve was narrow and steep with a well defined maximum at the "normal value." The differences between the curves show real differences of climate, and it is essential for the proper representation of the climate of a place that its frequency curves should be specified, possibly by reference to a set of typical curves. In the annual curves a double maximum occurs, *i.e.*, there are two values of the temperature which occur more frequently during the year than any others; these two temperatures are situated on either side of the mean value; in the case of maximum temperature at Kew, one value is 4° or 5° F. above the mean, and the other 4° or 5° F. below it. As regards temperature the year may be divided into three seasons, winter, summer and equinoctial, each season including four months. The slightly cool days of the equinoctial season reinforce the warm days of the winter season and produce the lower maximum; the slightly warm days of the equinoctial season reinforce the cool days of the summer season and produce the upper maximum. If the temperature of a particular day of the year were always the same in different years, the annual variation remaining as at present, there would be a relatively large number of *cold* days and of *hot* days; the effect of the variability is to bring the positions of the maxima closer together and to give large numbers of *cool* days and of *warm* days. The mathematical investigation of Mr. Whipple, which has brought out these points, shows that the maxima approach one another and diminish in intensity, as the daily variability increases, until the curve has a flat top; after which only one maximum occurs which becomes sharper as further increase takes place in the daily variability.

In one of the smaller lecture rooms of Mason College was placed an exhibit of meteorological charts and diagrams, selected for the information, which they gave, of the meteorological conditions between England and Australia at the time of year of the visit of the Association to Australia next year. The advice to be deduced from the exhibit appears to be that if the journey is to be made by separate routes (of which the Suez Canal route is one), going and returning,

"go by the other route and come back by the Suez route." The exhibit was found to be of interest to teachers and others, as well as to those who are travelling to Australia next year.

The report of the Joint Committee for the Investigation of the Upper Air was presented at the meeting. The ascents at Mungret College, Limerick, have been continued with funds provided by the Royal Meteorological Society, and with the co-operation of the Rev. W. O'Leary, S.J., to whom meteorologists are greatly indebted for providing them with the data for the investigation of the vertical structure of a stationary British cyclone which had its centre near Limerick at the time of the International Ascents last May. The British Association grant of £50, made at Dundee, was allocated to the purchase of equipment for upper air work on the "ice ship" *Scotia*. Mr. G. I. Taylor, who had charge of the work, returned at the end of August and reported that balloon work had not been possible owing to cloud, wind and other unfavourable conditions, but that he had obtained interesting results with kites, especially over fog. On one occasion, while those on board the *Scotia* were experiencing the unpleasantness of a fog at a temperature of 45° F., the instrument (properly ventilated) on the kite above, was recording 75° F., semi-tropical warmth on the cold north Atlantic. The Committee asked for re-appointment with a grant of £25, which has been allocated to them.

METEOROLOGICAL NEWS AND NOTES.

PROF. CHARLES F. MARVIN, professor of meteorology, has been appointed to succeed Dr. Willis L. Moore as chief of the U.S. Weather Bureau. Prof. Marvin is well known for his contributions to meteorology, and was one of the pioneers in the exploration of the air by kites.

PROF. MOHN, who has been Director of the Norwegian Meteorological Institute for close on half a century, has resigned, and is succeeded by Mr. Akel S. Steen.

THE NORFOLK RAINFALL ORGANIZATION'S admirable tables, edited since 1899 by Mr. Arthur W. Preston, which have appeared for nearly 50 years in the *Norfolk Chronicle*, are now appearing in the *Eastern Daily Press*, through the courtesy of Mr. Cozens-Hardy.

THE OBSERVATORY AT UCCLE, by Royal Decree of 31st July, is now divided into two distinct establishments, designated the Royal Observatory of Belgium, and the Royal Meteorological Institute of Belgium, under the Directorship of M. Lecointe and M. Vincent respectively.

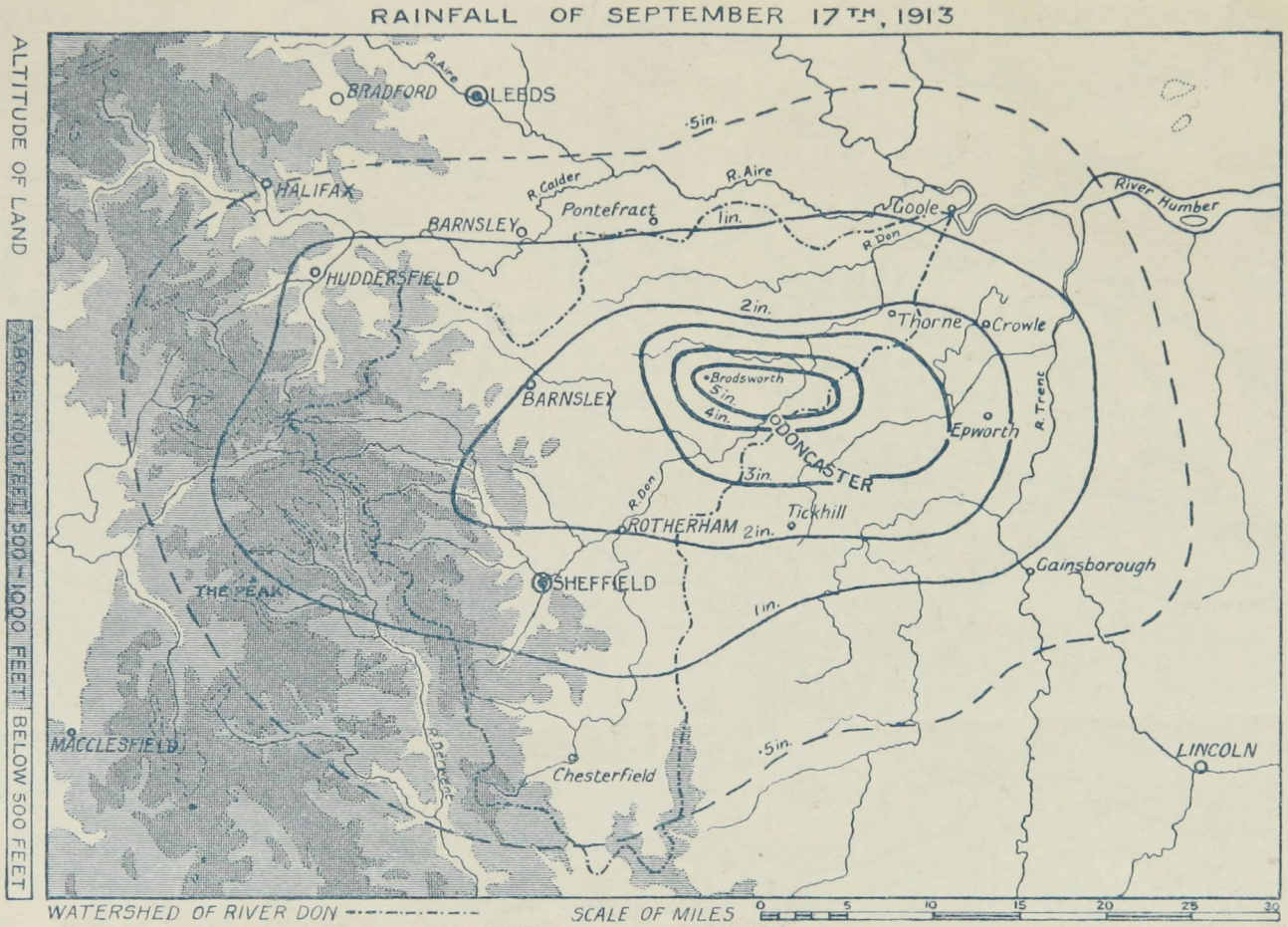
MR. W. H. DINES, F.R.S., has been awarded the Symons Gold Medal by the Council of the Royal Meteorological Society in recognition of the important work which he has carried out in connection with meteorological science. The medal will be presented on January 21st, 1914, at the annual meeting of the Society.

EXCEPTIONAL RAIN-STORM AT DONCASTER.

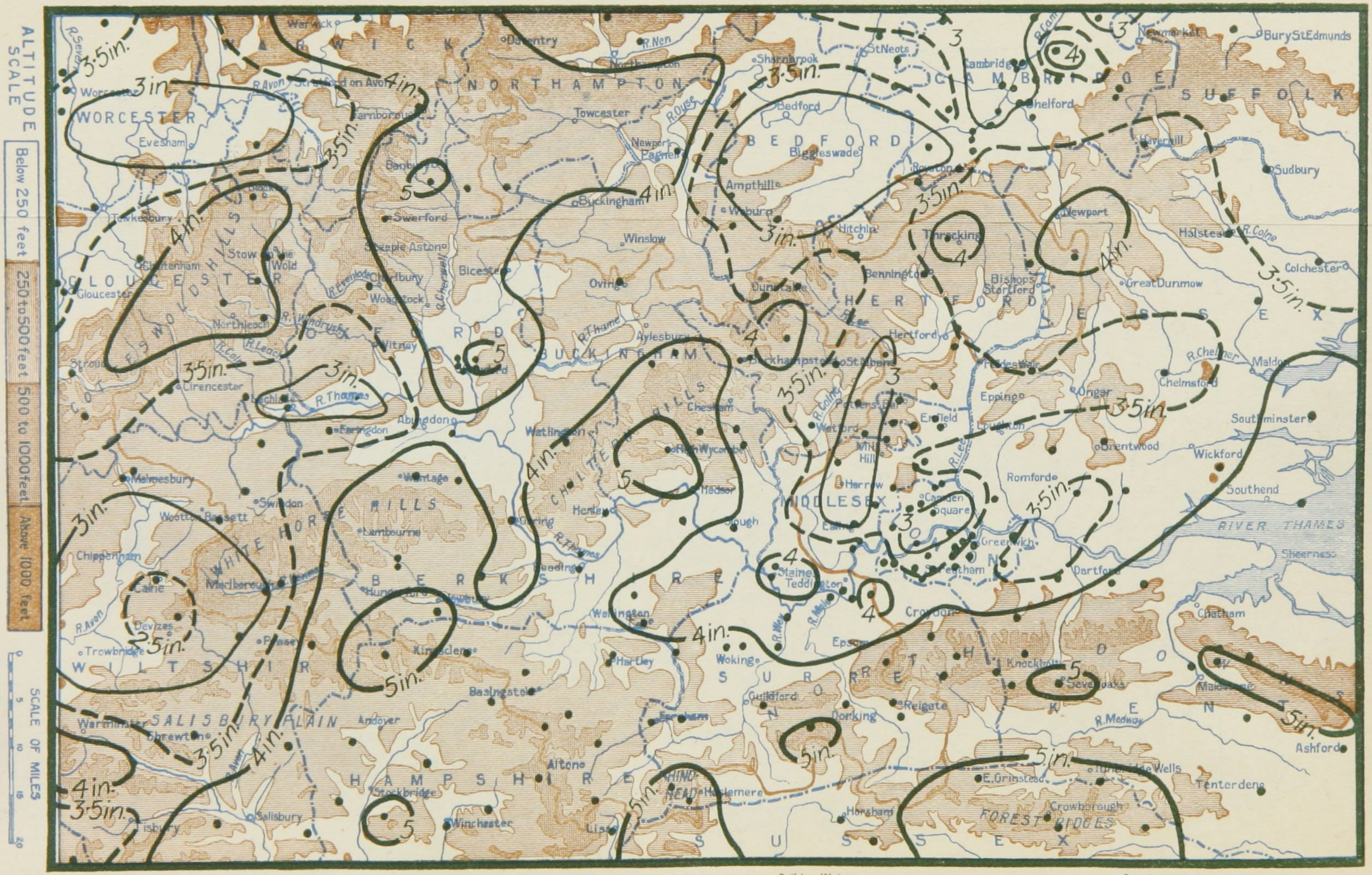
In last month's Magazine a passing reference was made to a heavy rainfall which took place in the vicinity of Doncaster on September 17th. Subsequent investigation having shown that the rainfall was one of the first magnitude, we accordingly give a brief account of it, based on the accompanying preliminary map of the district surrounding Doncaster. Little light is thrown on the cause of the downpour (which lasted some 14 hours, and was restricted to a very small area) by an inspection of the Daily Weather Maps issued by the Meteorological Office. These indicate a very irregular distribution of pressure over north-western Europe, with many ill-defined "lows" and "highs." The most prominent feature of the maps, in so far as they bear on the Doncaster rain-storm, was the presence at 7 a.m. of two low-pressure areas, one over the south of England and Bay of Biscay, the other over Germany, which are shown on the 6 p.m. chart as one large shallow depression. The greatest rainfall seems to have been in Doncaster itself, but the maximum of 6·08 in. at the Pumping Station is undoubtedly too high, as Mr. Salter, who visited Doncaster to inspect the gauges, found the gauge defective, allowing water to enter otherwise than through the funnel. At least three gauges in Doncaster overflowed, and once again we emphasize the necessity for Observers providing themselves with gauges capable of holding at least 6 inches of rain. Some Observers fortunately took the precaution to visit their gauges in the course of the afternoon while the downpour was in progress, otherwise several other records would have been lost. At Avenue Road, Doncaster, Mr. M. H. Stiles noted that rain began to fall at 6 a.m., and at 9 a.m. ·41 in. was measured. From 9 a.m. to 4.15 p.m. 3·48 in. fell, and between that hour and 8 p.m. 1·75 in. From 8 p.m. on the 17th to 9 a.m. on the 18th ·03 in. fell, a total for the whole period of 5·67 in., of which 5·64 in. fell in 14 hours and 5·26 in. during the rainfall day. A thunderstorm prevailed during the whole day of the 17th, from sunrise to sunset. From a large number of returns received, the following cases of more than 3 50in. during the rainfall day of September 17th are reported:—

	in.
Doncaster Pumping Station	6·08 ?
Brodsworth Gardens.....	5·50
Doncaster (Avenue Road)	5·26
Wyndthorpe	5·00
Carr House Hospital.....	4·27
Hexthorpe Hall	3·70

At most of the above stations from ·40 in. to ·76 in. fell before 9 a.m. on the 17th, and as the storm was over by 8 p.m. of that day, practically the whole of the rain fell in 14 hours. There was no recording gauge at work within the area of heavy fall, but at Huddersfield rain began at 10.15 a.m. and concluded at 11 p.m., the hourly values showing nothing exceptional.


RAINFALL OF SEPTEMBER 17TH, 1913
ALTITUDE OF LAND
ABOVE 1000 FEET
500 - 1000 FEET
BELOW 500 FEET
BRADFORD
LEEDS
R. Aire
.5in.
HALIFAX
R. Calder
Pontefract
R. Aire
River Humber
Goole
BARNSLEY
1in.
R. Don
HUDDERSFIELD
2in.
Thorne
Crowle
Brodsworth
5in.
4in.
BARNSLEY
DONCASTER
Epworth
R. Trent
3in.
R. Don
ROTHERHAM
2in.
Tickhill
Gainsborough
SHEFFIELD
THE PEAK
1in.
MACCLESFIELD
R. Derwent
Chesterfield
.5in.
LINCOLN
WATERSHED OF RIVER DON
SCALE OF MILES
0
5
10
15
20
25
30

THAMES VALLEY RAINFALL — OCTOBER, 1913.



Symons's Meteorological Magazine.

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

Rainfall Stations reporting

Isohyetals.

The following provisional statement of the area involved in the rain storm will, of course, be slightly modified when the subject is treated in *British Rainfall* from more ample material, but the values given, based on the accompanying map, may be looked upon as close approximations.

	Area, sq. miles.	General Rainfall, inches.	Volume of Rain, sq. miles x inches.
More than 5 inches ...	21	5·33	112
4—5 inches	24	4·42	106
3—4 ,, ...	80	3·48	278
2—3 ,, ...	254	2·41	613
1—2 ,, ...	699	1·45	1,014
·50—1 inch	1,024	·74	753
Total more than ·50 in.	2,102		2,876

The general rainfall of the area with more than ·50 in. was 1·37 in., while the general rain over the Don Valley was 1·83 in., and the volume of rainfall which drained into that river was 1,236 square mile-inches, or 17,890 millions of gallons of water. Practically every basement in the town of Doncaster was flooded.

The only Yorkshire rain-storm of which we have any record comparable with that under consideration was the Ilkley Flood of July 12th, 1900 (see *British Rainfall*, 1900, p. 16). On this occasion 5·40 in. was the maximum fall reported, and one Observer who recorded 4·01 in., measured 3·75 in. in one hour and a quarter, or at the rate of 3·00 in. per hour, whereas in the Doncaster storm the average fall per hour was about ·40 in. We have no information, however, as to the maximum intensity, though this does not appear to have been excessive.

THE WEATHER OF OCTOBER.

During the first ten days of the month the weather was of an unsettled type, heavy rains were frequent and temperature was considerably above the normal. During this time a succession of cyclonic disturbances from the south-west moved eastwards, with their centres, as a rule, over the south of England.

The month opened with anti-cyclonic conditions in the north of the British Islands, while the southern part was under the influence of a cyclonic area central in the Bay of Biscay. Temperature was in excess of the average, rising to a maximum of 68° on the 1st at Spurn Head. On the 2nd torrential rains were recorded in Buckinghamshire, Hedsor reporting 1·57 in., of which 1·08 in. fell in an hour; and Newport Pagnell 1·60 in., of which 1·30 in. fell in half an hour; while at Upton Wold, near Blockley, 2·00 in. fell. Rains of much the same character were noted on the 3rd when 2·00 in. fell at Dilham, in Norfolk, during a thunderstorm, in an hour; 1·25 in. at Norwich in half an hour; and 1·80 in. at Leamington between 6.30 and 9 p.m.

On the 4th a heavy rain occurred in the south-west of Ireland; 2·18 in. at Kenmare; and 2·12 in. at Killarney. On the 5th, when a large low pressure area lay over the south of the country, heavy rains were reported in Lincoln, Notts, Shropshire and Denbigh: Boston having as much as 3·14 in.; Horncastle, 2·30 in.; while at Southwell on this and the day following 3·47 in. fell within 24 hours.

On the 10th a large area of high pressure appeared in the north-east, between Faeröe and Norway, which was associated with low temperatures over many parts of Scotland and the north of England, readings of 28° being noted at West Linton, 30° at Fort Augustus and 31° at Durham; while at Holyhead, on the other hand, the minimum was 48°. On the 11th strong south-east winds or gales occurred at many exposed points on our coasts, accompanied by a marked rise of temperature, which became general over the country on the 12th and 13th. Heavy rain fell over the west of Scotland on the 13th, Bendamph reporting 2·35 in.; Ballachulish House, 2·11 in.; and Dunvegan, in Skye, 1·72 in. This mild type of weather continued for some days, temperature on the 16th rising to 68° at Guernsey, and on the 17th, in the north of Scotland, Gordon Castle and Strathpeffer reported 66°.

During the second half of the month the British Isles were largely under the influence of cyclonic disturbances whose centres on many days lay between the north of Scotland and the south of Iceland, but which were occasionally located to the south-east or south-west of Ireland. The cyclonic type was interrupted from the 23rd to 25th by the passage of an anti-cyclone across the country from west to east, during which temperature on the 24th fell at Birr Castle and Cahir to 24°, and to 25° at Kilkenny, West Linton, Cally, and Newton Reigny. Heavy rain fell in the north-west of Scotland on this day, Glencarron reporting 2·69 in., and Loch Stack, 1·86 in.

During the last five days of the month strong southerly winds, reaching gale force at times, were of daily occurrence at exposed parts on our coasts, temperature continuing very high for the season. A remarkable whirlwind of great violence swept down the Taff Valley in Wales on the afternoon of the 27th, which wrecked many buildings and was associated with loss of life. About the same time (4 p.m.) a severe thunderstorm with heavy hail and rain was experienced in the vicinity of Exeter, while at 8 p.m. the immediate neighbourhood of Church Stretton was visited by a whirlwind of great fury accompanied for a least 20 minutes by a thunderstorm of tropical intensity, and a fall of exceptionally heavy rain and hail. The diameter of the wind swept area, which traversed a valley close to Wolstaston Rectory, 3 miles from Church Stretton, was estimated at 200 yards, and much damage was done to some farms in the track of the cyclone.

The general rainfall of the month expressed as a percentage of the average was: England and Wales, 98; Scotland, 72; Ireland, 106; British Isles, 93.

THE "BRITISH" RAIN GAUGE.

THE attention of the British Rainfall Organization has been for many years directed towards inducing instrument makers to reduce the cost to the public of standard pattern rain gauges whilst at the same time discouraging the sale of badly constructed gauges.

The standard Snowdon rain gauge is now constructed almost exclusively either of copper or of galvanized iron, the funnel being fitted with a ring of turned brass, and the use of zinc or of japanned tin has been abandoned as a general rule. The cost of the instrument depends largely upon the cost of the metal used, and the problem of reducing the price therefore becomes in great measure a problem of the substitution of a cheaper metal for the body of the gauge without sacrificing the accuracy of the instrument. Provided that a rain gauge is used with a correctly graduated measuring jar, its accuracy depends solely upon the proper construction of the funnel and the diameter of the brass ring which determines the area of the receiving surface. The lower part of the gauge, however, has a far less important function to perform, being merely a shell over which the funnel is fitted, and a container for the glass bottle in which the water is collected. This glass bottle stands within a loose inner can which can hold the water in case of overflow or breakage of the bottle. As far as the utility of the rain gauge is concerned, the outer vessel might as well be made of wood, varnished papier-maché, or other cheap substance, and a great saving in cost of material thus effected.

Following this line of reasoning, Messrs. Negretti & Zambra, of Holborn, have recently introduced a gauge in which the funnel, with its brass ring, the inner can and the glass bottle are identical with those of their standard Snowdon gauge, but in which the outer can is made of a cheap combination of lead and iron. This outer can is of serviceable strength and with careful handling will last for many years, and it can be replaced at a very small cost when necessary. Should this outer can become damaged or leaky the efficiency of the gauge is in no way impaired, provided the other parts of the instrument are kept in proper order.

The British Rainfall Organization having arranged to reduce the charge of 2s. 6d. hitherto made for testing the accuracy of a Snowdon rain gauge to 1s. 6d., Messrs. Negretti & Zambra are able to offer the gauge, including measuring jar and certificate of accuracy, at the inclusive price of 10s., a reduction of 33 per cent. on the cost of the cheapest Standard gauge in their price list.

We are happy to call the attention of those Observers, to whom cost is a matter for consideration, to this important cheapening, though it should be borne in mind that the "British" rain gauge does not pretend to compete on equal terms with the ordinary Snowdon gauge constructed throughout of the same material, and that the few extra shillings charged for the Snowdon are always well expended.

WEATHER FALLACIES.

By A. O. Walker, F.L.S.

Concluded.

Effect of Low Temperature on Vegetation.

Mean minima are useless in relation to this: it is the one or two nights of intense frost that kill tender plants. On the S. and W. coasts of the British Isles, owing partly to the relatively greater amount of humidity in the air and partly to the greater prevalence of wind, the winter minima are generally high compared with inland and east coast stations, and shrubs and plants can be grown which would not survive a moderately severe winter in most inland or east coast localities. But, as regards the comfort of visitors to the S. and W. seaside resorts, the relatively high night temperatures are more than balanced by the greater amount of wind. Every one knows that a temperature of 40° with even a moderate breeze is more disagreeable than a calm at 30°.

There is no greater fallacy than the belief that a locality with high winter minima will have high summer maxima—the reverse is the case. Moist climates in the temperate zone have temperate winters and summers—dry climates have cold winters and hot summers.

In inland places there are great local differences in temperature, even within a comparatively small distance, owing to variations in the configuration of the land, of which the following table will serve as an example, the distance between Maidstone and Ulcombe being only 7 miles.

Minimum Temps. on Grass.

1912.	Maidstone.	Ulcombe.
October 6	24°	34°
,, 7	26	33
,, 8	28	38
,, 9	30	39
,, 10	32	46

The explanation of which is that the Maidstone station is nearly at the bottom of the deep Medway valley, while the Ulcombe station is half-way up the S. slope of the Lower Greensand ridge, which is here about 300 feet high.

It is a common belief that temperature falls as the height increases; this, within such limits as are found in the southern counties, is both true and untrue! It is generally true as regards day temperature but untrue as to night temperature, which is proved on the one hand by the earlier flowering of plants in spring at the foot of the hill, and on the other by the greater immunity of tender shrubs and plants half-way up it, from injury by frost compared with those at the foot.

This is a fact of considerable economic importance to fruit growers, the orchards in the former position both flowering earlier and being

liable to more severe frost than those higher up. But if they are planted at or near the top of the hill they seem to suffer too much from their greater exposure to cold winds, which appear to be very injurious to the blossoms even when the temperature is considerably above 32°.

Snow.

It is commonly believed that snow supplies more water to the land than its equivalent in rain. In other words, that the land and springs will receive more from 1 ft. of snow than from its approximate equivalent 1 inch of rain. It is difficult to see how this can be the case at any time, and when fine sunny weather follows the fall of snow, with cold winds, the evaporation from its surface is so great that the amount absorbed by the land is greatly reduced. It is even believed by some that snow has actual fertilizing effect! No doubt in times of severe frost it does protect the roots of plants, but that is all that can be said for it.

Wind.

It is commonly supposed that the S.W. wind is warm and the E. cold, especially in the spring. But at Ulcombe at 9 a.m. on May 7th, 1913, with wind S.W. 5 and occasional sunshine, the shade temp. was 48°·5, and on the following morning, with the wind E. 5 and sky completely overcast all morning, it was 51°·5. And on February 6th, 1895, at Colwyn Bay a strong S.S.W. wind did probably more damage to tender shrubs than even the severe frosts of that terrible winter, the day's *maximum* being 24°·7 !

Correspondence.

To the Editor of Symons's Meteorological Magazine.

MILDNESS OF THE AUTUMN.

It may be of interest to put on record that in the garden here strawberries are now flowering freely, and fruit has set. Fruit has also ripened a second time on the raspberries. In a garden close by a second crop of Victoria plums has ripened; though small they are sweet and of good flavour.

The rainfall for the past month has been 5·47 in.; the average for the past six years being 5·11 in. Last Sunday, the 26th, rain began to fall at 10 o'clock and fell continuously till 7 p.m., when 1·11 in. had fallen. The total next morning was 1·18 in. The gauge is 500 feet above sea level.

J. F. LEIGH CLARE.

The White Cottage, Heathfield, Sussex, 2nd Nov., 1913.

THE METEOR OF SUNDAY, AUGUST 3rd, 1913.

On the evening of Sunday, August 3rd, I crossed from Kingstown to Holyhead on board the City of Dublin Steam Packet Company's Royal Mail S.S. "Leinster." The night was fine, with a brisk N. wind, and streaks of cirrus and cirro-stratus across the sky. When some 15 miles off Holyhead harbour, I was sitting on the leeward side of the steamer. Quite suddenly the sky became brilliantly illuminated with an emerald light, and a splendid meteor of dazzling beauty was seen to glide majestically across the south-western sky, gradually falling towards the south-western horizon. The same resplendent object was seen at the same moment of time (10.55 p.m. Dunsink Observatory—that is "Irish"—mean time) by members of my family resident at Greystones, Co. Wicklow—some 50 miles W. by S. of my position.

This wonderful meteoric fireball apparently began its visible aerial flight over South Wales at a height of 87 miles approximately. At the moment of disappearance it was vertically over Waterford at an estimated height of 18 miles. These figures have been arrived conjointly at by Mr. W. F. Denning, F.R.A.S., of Bristol, and by the Astronomical Correspondent of the *Irish Times* newspaper. The latter observed the meteor from Fethard-on-Sea, Co. Waterford, and gives a graphic description of it in letters addressed to that newspaper under the dates August 4th and 7th. He considers that the meteor was near its "radiant point," its course, therefore, being directed downwards at a very steep angle, nearly vertical. "It would, therefore," he writes, "encounter an atmosphere rapidly increasing in density, and as it was travelling at a speed of about 15 miles per second, or 40 times the pace of a Lee-Metford rifle bullet, it was no wonder that it made a sensational blaze."

JOHN W. MOORE, M.D.

40, Fitzwilliam Sq., Dublin, Sept. 10th, 1913.

RAINSTORM AT KINGTON, ON 6th OCTOBER, 1913.

1·08 inches of rain fell between 20 minutes to 5 p.m. and 5 minutes past 5, or in half-an-hour.

I was out walking in the afternoon without overcoat or umbrella, and the sky clear with sunshine. At about 15 minutes after 4 o'clock a slight drizzle of rain began and I started for home, and got into the house just after 4.40 p.m., my coat then being well wetted, but it was not wet through. The heavy rain ceased about 5 p.m., and at 5.5 p.m. had practically ceased, and 1·08 in. of rain was measured in the gauge, so that except a few hundredths the whole downpour occupied only about 18 or 20 minutes. ·27 in. more fell during the night. There was practically no fall in the barometer till *after* the storm, when it fell about three-tenths of an inch. My daughter noted the times.

G. F. PEARSON.

Kington, Herefordshire, 7th October, 1913.

THE CLIMATE OF TORQUAY.

I DO not see that Sir John Edwards-Moss makes much headway with his figures.

It is hardly permissible to compare a fifty years' average of rainfall at Greenwich with a four winters' average of Torquay, three of them very wet. If application had been made to Mr. March for the averages of 37 years, he would have found the Torquay winter to have 9·96 in., which is less than twice the Greenwich average, 5·24 in. (He represents Torquay to have three times as much.)

While Greenwich has about 24 inches in the year, Torquay has about 33 in., which is far from an extreme amount in Britain.

Your correspondent has always heard July and August spoken of as the wettest months of the year, whereas Torquay has most rain in (1) October, (2) December, Greenwich in (1) October, (2) July.

The affirmed low humidity of Torquay air, Sir John lightly brushes aside as irrelevant. This seems to need explanation.

As to summer temperature, it is true, and perhaps surprising to some, that the shade readings at Cary Green near the harbour very rarely get into the eighties. I am inclined to think there are some spots where it does so less rarely, but I have no figures in proof of this.

Running through all Sir John writes is the fallacy that Roby Hall may be taken to represent Torquay, which in several respects it does not.

ALEX. B. MACDOWALL.

Torquay, October 22nd, 1913.

"FEBRUARY FILLDYKE."

I THINK there is something to be said in defence of this old saying, which Mr. A. D. Walker, in his paper on "Weather Fallacies," treats rather scornfully.

It is when springs have been replenished, and ponds refilled, by the rains of late autumn and winter that ditches begin to run. Till then many of them are dry, but afterwards any considerable quantity of rain finds its way into them at once. Consequently an amount of rain which at this time of the year would produce very little visible effect, will in February fill ditches, and rivers too, to overflowing.

There is also the possibility of a heavy snowfall to be considered, for the correct version is, I believe,

"February Filldyke,
Black or White."

H. S. TABOR, F.R.Met.Soc.

Fennes Braintree, Fennes, Oct. 28th, 1913.

NOTE ON FROZEN PRECIPITATION.

By L. C. W. Bonacina.

An Italian writer has recently published a pamphlet dealing with the subject of glazed frost (gelicidis), in which he discusses some observations of the Rev. R. P. Dansey in Herefordshire, and of Dr. Hellman in Germany, which confirm his theory that rain falling in a temperature below the freezing point to produce the phenomenon of the "glazed frost," or "silver thaw," is due to the presence of a warm stratum above the cold surface air, and is not in any way an instance of super-cooling. The author observes that there are naturally fewer opportunities of studying this generally rather infrequent phenomenon in Italy than in the northern countries of Europe, and this, perhaps, explains why the author, who appears to have been the first in print to assign its cause to inversions of temperature, should have thought it worth while going into the subject so fully. Having seen the phenomenon so frequently in the south of England I must confess I have never postulated any other cause than that of a warm layer overhead. In England a warm southerly current will often climb over the shoulders, as it were, of a cold surface easterly current, ultimately replacing it, and in such cases the premonitory symptom of a thaw is liquid rain, or ice-rain, falling while the surface temperature is still well below the freezing point. In this manner we are robbed of many an expected snow-storm. The cold surface air, of course, tends to freeze the rain, and so instead of liquid rain we may get ice-rain. And this leads us on to recognize five distinct species of frozen precipitation. These, excluding rime or hoar-frost, which is of the nature of deposition rather than precipitation, are :—*snow*, *hail*, *graupel*, *sleet*, and *ice-rain*. Snow is by far the most important in the economy of nature and is produced by the direct passage of aqueous vapour into the frozen state ; it is, indeed, next to rain, the most important of all forms of atmospheric precipitation. Hail (hard or true hail), is apparently a product of thunderstorm activity, and this, together with its peculiar alternate structure, leads one to suppose that the freezing rain drops are carried up and down by currents many times before they finally strike the ground. Graupel (soft hail), are the little white pellets so frequent in moderately cold weather ; as it does not occur in severe cold it seems reasonable to ascribe its origin to the passage of aqueous vapour first into liquid drops which freeze before falling. Sleet is the well known mixture of rain drops and snow flakes. Finally we have the form referred to above as being associated with glazed frost and being symptomatic of thaws. It takes the form of plain pellets of colourless ice, and, being the result of the direct freezing of falling rain drops, may be called simply, for want of a more distinctive name, ice-rain. This form fell in London on 11th January, 1913, in the same east wind that brought much snow in the north of England and south of Scotland.

INTERNATIONAL BALLOON ASCENTS.

By W. H. DINES, F.R.S.

December 1st, 1910.

Starting Point.	Country.	A (H_c.) miles.	B (T_c.) ° F.	C miles.	D ° F.	E miles.	F
Pyrton Hill.....	England ..	5·7	—69	8·1	—71	38	N.W.
Brussels	Belgium ..	7·4	—86	9·5	—74	79	N. by W.
Lindenberg.....	Germany..	7·6	—79	9·4	—72	9	E.S.E.
Strassburg	,, ..	6·0	—69	7·2	—73	40	N.N.W.
Vienna.....	Austria ...	8·0	—87	12·6	—77	9	E. by S.
Pavlovsk	Russia	6·5	—88	8·5	—79	44	N.E.
Nishni Olchedaeff	,, ...	6·6	—56	9·6	—67	39	S.S.E.

A low pressure area lay over the Channel that by the next day had moved towards Spain, and an extensive anticyclone covered Russia.

January 5th, 1911.

Manchester.....	England ..	6·5	—67	10·5	—62	80	S.
Pyrton Hall	,, ..	5·2	—58	6·6	—62	27	S.S.W.
Brussels	Belgium ..	5·9	—70	10·7	—56	64	S.W.
Hamburg	Germany..	5·4	—62	9·2	—62	39	W. by S.
Lindenberg.....	,, ..	6·1	—62	9·7	—59	32	N W.byW.
Paris	France ...	5·5	—70	6·4	—62	31	S.S.W.
Strassburg	Germany..	5·6	—71	6·1	—65	27	W.S.W.
Munich	,, ..	5·6	—77	6·0	—69	14	N.W.
Vienna.....	Austria....	5·4	—63	8·6	—63	44	N. by W.
Pavia	Italy	5·3	—73	17·5	—58	29	W. by N.
Pavlovsk	Russia	6·3	—78	8·3	—73	10	N.W.by N
Nishni Olchedaeff	,, ..	6·6	—74	7·4	—66	46	N.E.

A Height in miles of commencement of isothermal column.
B Temperature, F°., at bottom of column.
C Greatest height of reliable record in miles.
D Temperature, F°., at greatest height.
E Distance in miles of point where balloon fell.
F Bearing of falling point from starting point.

On January 4th a low pressure area (29·60) lay over the western part of the Mediterranean and a high pressure (30·80) over Finland. To the west of Iceland there was a deep cyclone (28·00), which by the 6th had moved to the east of the island. In the meantime the pressure over parts of Russia had reached 31·00 in. The depression over the Mediterranean remained unaltered, and local depressions formed over southern England and Germany.

The figures for January 5th are very uniform if we consider the distribution of pressure, and the drift was mostly towards the west, in agreement with the surface gradient.

The maximum height of 17·5 miles is correctly transposed from the printed figures, and is equivalent to a pressure of ·45 inches of mercury. It means that the diameter of the balloon at bursting was nearly four times as large as at starting, and twice the usual diameter. Personally I am inclined to doubt the accuracy of the instrument in such cases.

REVIEWS.

Anuario Meteorologico de Chile 1911. Publications bajo la direccion del Dr. Walter Knoche No. 3. (Chilian Meteorological Annual 1911 by Dr. Knoche director.) Santiago de Chile 1912. Size 15 × 10½. Pp. 504 and plates.

Valores Honorias de los Elementos Meteorologicos en Santiago 1911. Publicaciones bajo la direccion del Dr. Walter Knoche No. 5. (Hourly Meteorological Values at Santiago during 1911 by Dr. Knoche director.) Santiago de Chile 1913. Size 15 × 10½. Pp. 68 and plates.

In 1910 the Provincial and the Maritime Weather Services of Chile were amalgamated with others to form the Central Meteorological and Geophysical Institute under the direction of Dr. Walter Knoche. In the above volumes we have a foretaste of the important results which will accrue from the vastly improved and enlarged system of observations now in course of operation. The work of reorganising the service has been one of great difficulty since it involved a complete change of hours which are now 7 a.m., 2 p.m. and 9 p m., in conformity with International recommendations. Formerly the hours of observation were 7.26 a.m., 10 a.m., 4 p.m, for the Maritime branch of the service, and 3 p.m. for the Provincial. The instrumental equipment of all the stations has been overhauled and renovated by a system of thorough inspection. The annual for 1911 opens with a description of the 33 stations and of the surrounding orographical and other conditions, then are given *in extenso* the tridaily observations for each station. We are glad to see that the records of evaporation deduced from the Piche instrument have been suppressed. In pages 389 to 461 are given the mean daily values of pressure, humidity, shade temperature and cloud for each station grouped by months of the year, and a complete summary of the mean monthly and mean annual values follows. As the stations extend through 35° of latitude all varieties of climate are to be found. A notable phenomenon of the year was the occurrence of a severe rainstorm, from June 22nd to 25th, in the arid northern region where rain rarely falls. This storm of wind and rain appears to have commenced in Southern Peru on June 20th and at Arica (lat. 18½° S.) on June 22nd, at 1.30 a.m. At Iquique (lat. 20° S.) the rain set in at 10.20 p m. of the same day and at Antofagasta (lat. 23½°) at 2 a.m. on the 24th. At Iquique the temperature during the night of the 23rd rose to 86°, and at Tacna (lat. 18° S.) the wind was so warm that it burnt the face and made respiration difficult. Soon after, the temperature fell rapidly below freezing point, accompanied by a violent wind that did much damage to buildings. On the day following (the 24th) the storm was repeated, with rain. There is no record of a previous visitation of this nature in Northern Chile. The phenomenon embraced over 20° of latitude, extending from lat. 10° S. in Peru to lat. 30° S. in

Chile. The wind blew off the land, and it is of interest to note that on the night of the 24th the captain of the "Quillota," then 50 miles west of Mejillones (lat. 20°), reported a rain of red sand, which covered the decks.

The amount of rain which fell during this storm is not given for Arica and Iquique but at Antofagasta 1·77 in. fell in six hours, and on July 2nd, 2·16 in. fell in two hours, the year's fall being thus 3·93 in. in eight hours, and this at a station where the mean annual rainfall is only ·10 in., and the heaviest daily fall previously experienced ·20 in. Evangelists Island, in lat. 52½°, had the maximum rainfall of 119·25 in. on 281 days, with a maximum daily fall, however, of only 2·26 in. The heaviest daily fall reported for any station, 6·09 in. on May 5th, occurred at Point Carranza, amounting to 19 per cent. of the annual total.

With the exception of the excess noted above in the far north of Chile, and a slight excess in the extreme south, the annual rainfall of the year 1911 was well below the normal, and in Santiago less than half the average fell.

The volume (No. **5**) gives for the first time *in extenso* complete hourly values of the principal elements at the capital, Santiago. The daily range is well marked in each case, that of rainfall showing a maximum from 1 a.m. to 4 a.m., and a minimum from 8 a.m. to noon.

Both the above volumes are well supplied with plates giving the principal results in graphic form. Dr. Knoche is in every way to be congratulated on his first annual reports, which deal with so important a part of the globe from the point of view of world-meteorology as Chile.

Indian Meteorological Memoirs. Vol. **22,** Part II. *Monthly and Annual Normals of Number of Rainy Days*, by Gilbert T. Walker, C.S.I., M.A., Sc.D., F.R.S. Calcutta, 1913. Size 12 × 9½. Pp. 200. Price 1 Rupee 8 Annas.

THIS volume contains the averages of the monthly and annual number of rainy days at all stations maintained by the Imperial and Provincial Governments where records of not less than five years are available. A rainy day has been defined as one on which ·10 in. or more of rain is recorded. No discussion of the data appears in this volume, but from an inspection of the values for stations possessing records of 20 or more years, the maximum number of rainy days per annum is 159 at Cherrapunji, Assam, and also at the Peermode Residency, one of the Travancore Hill Stations in Madras, and the minimum 6 days at Jhatput in Baluchistan.

At the end of the memoir data are given for 24 stations outside the Indian land area, the extremes varying from 165 days, based on 12 years' observations at Garigtok, Tibet, to 4 days per annum at Aden, where the average is based on data covering 29 years.

RAINFALL TABLE FOR OCTOBER, 1913.

STATION.	COUNTY.	Lat. N.	Long. W. [-E.]	Height above Sea. ft.	RAINFALL OF MONTH.	
					Aver 1875—1909. in.	1913. in.
Camden Square	*London*	51 32	0 8	111	2·72	3·11
Tenterden	*Kent*	51 4	*0 41	190	3·48	4·57
Arundel (Patching)	*Sussex*	50 51	0 27	130	4·01	4·48
Fawley (Cadland)	*Hampshire*	50 50	1 22	52	4·07	3·81
Oxford (Magdalen College)	*Oxfordshire*	51 45	1 15	186	2·82	4·36
Wellingborough (Croyland Abbey)	*Northampton*	52 18	0 41	174	2·61	3·50
Shoeburyness	*Essex*	51 31	*0 48	13	2·31	4·57
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	2·72	3·25
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	2·84	3·36
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	4·84	4·72
Rousdon [Lyme Regis]	,,	50 41	3 0	516	3 81	3·61
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	3·21	3·80
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	3·77	5·48
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	3·20	2·62
Boston	*Lincolnshire*	52 58	0 1	11	2·75	5·89
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	2·77	3 58
Macclesfield	*Cheshire*	53 15	2 7	501	3·53	2·12
Southport (Hesketh Park)	*Lancashire*	53 38	2 59	38	3·74	2·32
Arncliffe Vicarage	*Yorkshire, W.R.*	54 8	2 6	732	6·48	2·22
Wetherby (Ribston Hall)	,, ,,	53 59	1 24	130	3·18	2·85
Hull (Pearson Park)	,, *E.R*	53 45	0 20	6	3·19	2·87
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	3·20	1·81
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	12·71	7·46
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	4·87	5·24
Haverfordwest	*Pembroke*	51 48	4 58	90	5·51	6·57
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	5·38	4·88
Llandudno	*Carnarvon*	53 20	3 50	72	3·78	2·07
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	4·45	3·87
Marchmont House	*Berwick*	55 44	2 24	498	3·83	2·09
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	5 38	3·16
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	3·36	1·64
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	6·50	5·32
Mull (Quinish)	,,	56 34	6 13	35	5·87	5 44
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·81	1·53
Braemar	*Aberdeen*	57 0	3 24	1114	3·88	2·32
Aberdeen (Cranford)	,,	57 8	2 7	120	3·23	1·75
Cawdor	*Nairn*	57 31	3 57	250	2·95	1·20
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	4·14	3·31
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	8·38	9·60
Dunrobin Castle	*Sutherland*	57 59	3 50	14	3·15	1·04
Wick	*Caithness*	58 26	3 0	77	3·14	1·94
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	5·59	7·13
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	4·00	5·30
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	3·48	3·40
Ennistymon House	*Clare*	52 57	9 18	37	4·40	5·77
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	3·75	3·43
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	3·53	5·77
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·88	3·76
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	3·19	3 50
Crossmolina (Enniscoe)	*Mayo*	54 4	9 16	74	5·27	5·40
Cong (The Glebe)	,,	53 33	9 16	112	4·60	4·08
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	4·21	3·07
Seaforde	*Down*	54 19	5 50	180	3·65	3·49
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	3·60	2·20
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	3·76	3·19

RAINFALL TABLE FOR OCTOBER, 1913—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1875–1909. in.	1913. in.	Diff. from Aver. in.	% of Av	Mean Annual 1875–1909. in.	STATION.
+ ·39	114	·71	26	15	20·64	19·27	—1·37	93	25·11	Camden Square
+1·09	131	·71	26	18	21·80	21·60	— ·20	99	27·64	Tenterden
+ ·47	112	·84	21	18	24·03	31·15	+7·12	130	30·48	Patching
— ·26	94	·65	29	23	25·25	26·41	+1·16	104	31·87	Cadland
+1·54	155	1·35	2	17	20·27	18·76	—1·51	93	24·58	Oxford
+ ·89	134	·74	5	15	20·81	19·61	—1·20	94	25·17	Croyland Abbey
+2·26	198	1·00	26	19	15·48	16·26	+ ·78	105	19·28	Shoeburyness
+ ·53	120	·60	26	15	20·86	19·70	—1·16	94	25·40	Westley
+ ·52	118	·78	5	24	19·17	19·40	+ ·23	101	23·73	Geldeston
— ·12	98	·86	7	19	29·74	33·11	+3·37	111	38·27	Polapit Tamar
— ·20	95	·75	6	21	26·35	26·07	— ·28	99	33·54	Rousdon
+ ·59	118	1·09	4	20	24·33	25·50	+1·17	105	29·81	Stroud
+1·71	145	1·93	5	18	26·48	31·11	+4·63	118	32·41	Wolstaston
— ·58	82	·42	5	15	23·71	21·70	—2·01	92	28·98	Coventry
+3·14	214	3·14	5	21	19·42	20·11	+ ·69	104	23·35	Boston
+ ·81	129	·82	6	18	20·31	19·26	—1·05	95	24·46	Hodsock Priory
—1·41	60	·58	30	18	28·38	25·79	—2·59	91	34·73	Macclesfield
—1·42	62	·41	14	18	26·44	23·20	—3·24	88	32·70	Southport
—4·26	34	·54	7	13	48·62	43·46	—5·16	89	61·49	Arncliffe
— ·33	90	·65	31	13	22·26	18·38	—3·88	82	26·87	Ribston Hall
— ·32	90	·53	3	16	21·76	16·76	—5·00	77	26·42	Hull
—1·39	57	·59	7	18	22·85	24·37	+1·52	107	27·94	Newcastle
—5·25	59	2·00	14	18	100·75	96·51	—4·24	96	129·48	Seathwaite
+ ·37	108	1·04	6	21	33·50	37·18	+3·68	111	42·28	Cardiff
+1·06	119	1·03	19	18	36·47	45·06	+8·59	124	46·81	Haverfordwest
— ·50	91	·84	14	20	36·30	46·40	+10·10	128	45·46	Gogerddan
—1·71	55	·37	7	16	24·33	25·93	+1·60	107	30·36	Llandudno
— ·58	87	·76	13	22	34·28	38·19	+3·91	111	43·47	Cargen
—1·74	55	·52	7	15	27·72	21·67	—6·05	78	33·76	Marchmont
—2·22	59	·92	13	21	39·05	33·44	—5·61	86	49·77	Girvan
—1·72	49	·73	13	20	28·39	26·41	—1·98	93	35·97	Glasgow
—1·18	82	1·50	13	20	52·71	51·20	—1·51	97	68·67	Inveraray
— ·43	93	·96	13	20	43·74	40·70	—3·04	93	56·57	Quinish
—1·28	54	·25	27	18	23·35	20·16	—3·19	86	28·64	Dundee
—1·56	60	·38	19, 29	19	28·04	26·49	—1·55	94	34·93	Braemar
—1·48	54	·54	6	18	26·01	22·07	—3·94	85	32·73	Aberdeen
—1·75	41	·50	24	—	24·20	18·03	—6·17	75	29·33	Cawdor
— ·83	80	·89	13	16	34·40	32·37	—2·03	94	44·53	Fort Augustus
+1·22	115	2·35	13	19	65·17	62·22	—2·95	95	83·93	Bendamph
—2·11	33	·26	27	11	25·56	18·05	—7·51	71	31·90	Dunrobin Castle
—1·20	62	·30	23	19	23·82	17·87	—5·95	75	29·88	Wick
+1·54	128	2·12	4	21	42·35	46·76	+4·41	110	54·81	Killarney
+1·30	132	·74	28	19	31·45	35·14	+3·69	112	39·57	Waterford
— ·08	98	·77	13	16	31·21	34·32	+3·11	110	39·43	Castle Lough
+1·37	131	1·04	29	17	36·87	41·43	+4·56	112	46·52	Ennistymon
— ·32	91	·87	19	18	28·16	28·46	+ ·30	101	34·99	Courtown Ho.
+2·24	163	·98	10	21	29·23	35·27	+6·04	121	35·92	Abbey Leix
+ ·88	130	·96	7	17	22·77	24·74	+1·97	109	27·68	Dublin
+ ·31	110	·87	28	18	29·38	32·05	+2·67	109	36·15	Mullingar
+ ·13	102	·98	13	22	41·01	46·77	+5·76	114	52·87	Enniscoe
— ·52	89	·50	13, 18	20	38·48	40·71	+2·23	106	48·90	Cong
—1·14	73	·39	10, 19	16	34·35	35·20	+ ·85	102	42·71	Markree
— ·16	96	·49	28	17	31·28	32·75	+1·47	105	38·91	Seaforde
—1·40	61	·39	13	17	29·92	23·45	—6·47	78	37·56	Dundarave
— ·57	85	·72	27	16	31·81	32·35	+ ·54	102	39·38	Omagh

SUPPLEMENTARY RAINFALL, OCTOBER, 1913.

Div.	STATION.	Rain inches.	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road .	4·26	XI.	Lligwy	3·19
,,	Ramsgate	3·97	,,	Douglas	3·46
,,	Hailsham	6·62	XII.	Stoneykirk, Ardwell House...	3·06
,,	Totland Bay, Aston House...	4·63	,,	Dalry, The Old Garroch.....	4·35
,,	Stockbridge, Ashley..	5·20	,,	Beattock, Kinnelhead	5·27
,,	Grayshott	5·78	,,	Langholm, Drove Road	5·10
,,	Caversham, Rectory Road ...	4·42	XIII.	Meggat Water, Cramilt Lodge	4·60
III.	Harrow Weald, Hill House...	2·93	,,	North Berwick Reservoir.....	1·44
,,	Pitsford, Sedgebrook.....	3·33	,,	Edinburgh, Royal Observaty.	1·49
,,	Woburn, Milton Bryant.....	3·45	XIV.	Maybole, Knockdon Farm ...	2·10
,,	Chatteris, The Priory.....	2·45	XV.	Ballachulish House	7·93
IV.	Colchester, Hill Ho., Lexden	3·19	,,	Campbeltown, Witchburn ..	4·36
,,	Newport, Belmont House ...	...	,,	Holy Loch, Ardnadam.....	6·25
,,	Ipswich, Rookwood, Copdock	3·33	,,	Islay, Eallabus	3·79
,,	Blakeney	2·57	,,	Tiree, Cornaigmore	4·61
,,	Swaffham	3·78	XVI.	Dollar Academy	2·31
V.	Bishops Cannings	2·45	,,	Balquhidder, Stronvar.....	6·33
,,	Winterbourne Steepleton.....	...	,,	Glenlyon, Meggernie Castle..	6·14
,,	Ashburton, Druid House.....	5 95	,,	Blair Atholl	2·12
,,	Cullompton	5·62	,,	Coupar Angus	1·72
,,	Lynmouth, Rock House	4·33	,,	Montrose, Sunnyside Asylum.	1·61
,,	Okehampton, Oaklands... ...	4·80	XVII.	Alford, Lynturk Manse	1·48
,,	Hartland Abbey.....	3·97	,,	Fyvie Castle	1·02
,,	Probus, Lamellyn.....	4·81	,,	Keith Station	1·40
,,	North Cadbury Rectory.....	3·09	XVIII.	Alvey Manse.....	1·82
VI.	Clifton, Pembroke Road.....	2·84	,,	Loch Quoich, Loan	20·10
,,	Ross, The Graig	3·89	,,	Drumnadrochit	2·23
,,	Shifnal, Hatton Grange.....	3·92	,,	Skye, Dunvegan	9·10
,,	Droitwich.....	3·74	,,	N. Uist, Lochmaddy	...
,,	Blockley, Upton Wold.....	4·72	,,	Glencarron Lodge	10·07
VII.	Market Overton.....	3·19	XIX.	Invershin	1·27
,,	Market Rasen	2·43	,,	Melvich	1·67
,,	Bawtry, Hesley Hall	2·95	,,	Loch Stack, Ardchullin	7·65
,,	Derby, Midland Railway.....	2·76	XX.	Skibbereen Rectory	7·19
,,	Buxton	4·01	,,	Dunmanway, The Rectory ..	7·90
VIII.	Nantwich, Dorfold Hall	3·23	,,	Glanmire, Lota Lodge, No. 1	6·92
,,	Chatburn, Middlewood	2·13	,,	Mitchelstown Castle.....	5·78
,,	Cartmel, Flookburgh	3·61	,,	Darrynane Abbey.....	7·33
IX.	Langsett Moor, Up. Midhope	4·39	,,	Clonmel, Bruce Villa	5·48
,,	Scarborough, Scalby	3·48	,,	Newmarket-on-Fergus, Fenloe	3·12
,,	Ingleby Greenhow	3·06	XXI.	Laragh, Glendalough	5·15
,,	Mickleton	3·10	,,	Ballycumber, Moorock Lodge	2·48
X.	Bellingham, High Green Manor	3·03	,,	Balbriggan, Ardgillan	4·03
,,	Ilderton, Lilburn Cottage ...	1 79	XXII.	Woodlawn	3·88
,,	Keswick, The Bank.....	4·48	,,	Westport, St. Helens	5·35
XI.	Llanfrechfa Grange	6·57	,,	Dugort, Slievemore Hotel ...	6·89
,,	Treherbert, Tyn-y-waun	8·08	,,	Mohill Rectory	4·05
,,	Carmarthen, The Friary	5·17	XXIII.	Enniskillen, Portora.....	2·42
,,	Castle Malgwyn [Llechryd]...	4·84	,,	Dartrey [Cootehill]	2·72
,,	Crickhowell, Tal-y-maes.....	7·80	,,	Warrenpoint, Manor House ..	3·61
,,	New Radnor, Ednol	5·25	,,	Banbridge, Milltown	2·93
,,	Birmingham WW., Tyrmynydd	6·02	,,	Belfast, Cave Hill Road	4·44
,,	Lake Vyrnwy	4·87	,,	Glenarm Castle..... ...	4·83
,,	Llangyhanfal, Plâs Draw.....	3·23	,,	Londonderry, Creggan Res...	1·99
,,	Dolgelly, Bryntirion.....	5·43	,,	Dunfanaghy, Horn Head ...	2·68
,,	Bettws-y-Coed, Tyn-y-bryn...	4·30	,,	Killybegs	...

METEOROLOGICAL NOTES ON OCTOBER, 1913.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow; F for number of days Frost in Screen; f on Grass.

LONDON, CAMDEN SQUARE.—The conditions were fair and mild throughout, with frequent morning fogs and intermittent showers. Mean temp. 53°·4, or 3°·3 above the average. Duration of sunshine 77·9* hours, and of R 52·8 hours. Evaporation ·61 in. Shade max. 70°·3 on 2nd; min. 36°·7 on 25th. F 0, f 0.

TENTERDEN.—Rather wet in first week; very wet on 11th, 20th, 21st and 26th. TS in evening of 28th. Duration of sunshine 127·0† hours. Shade max. 68°·0 on 1st; min. 38°·5 on 23rd. F 0, f 0.

TOTLAND BAY.—Duration of sunshine 103·7* hours. Mean temp. 3°·5 above the average. Shade max. 64°·2 on 3rd; min. 40°·0 on 24th. F 0, f 0.

IPSWICH, COPDOCK.—A mild and very still month with three well marked wet periods. Duration of sunshine 100·7* hours. Mean temp. 52°·4. Shade max. 66°·3 on 2nd; min. 32°·0 on 24th. F 1, f 4.

COLLUMPTON.—Terrific H storm on 27th. Some hailstones measured 1¼ inch in diameter and weighed an ounce. Shade max. 67°·0 on 3rd; min. 30°·8 on 22nd. F 1, f 6.

NORTH CADBURY.—Pleasant, genial, sunny, calm and unusually warm. Only 3 days with maxima below 60°. Shade max. 72°·0 on 3rd; min. 37°·5 on 24th. F 0, f 2.

CHURCH STRETTON, WOLSTASTON.—A cyclone of great fury at 8 p.m. on 27th did much damage. It was accompanied by extraordinary L and T with heavy R and H, and last about 15 minutes.

HODSOCK PRIORY.—Shade max. 65°·7 on 1st; min. 30°·1 on 25th. F 3, f 8.

SOUTHPORT.—Duration of sunshine 82·4* hours, and of R 50·0 hours. Evaporation ·72 in. Mean temp. 51°·4, or 2°·4 above the average. Remarkable prevalence of light easterly winds. Shade max. 65°·0 on 1st; min. 33°·0 on 23rd. F 0, f 4.

HULL.—Fine autumn weather generally. Duration of sunshine 74·2* hours. Shade max. 65°·0 on 2nd and 6th; min. 30°·0 on 10th F 1, f 6.

HAVERFORDWEST.—Duration of sunshine 94·2* hours. Shade max. 69°·9 on 6th; min. 32°·3 on 24th.

LLANDUDNO.—Shade max. 68°·0 on 19th; min. 38°·0 on 24th.

CARGEN.—Mean temp. 2°·5 above the average of previous 53 years. Pastures unusually green and a great improvement in the turnip crop. Shade max. 65°·5 on 19th; min. 25°·0 on 24th. F 3.

EDINBURGH.—Shade max. 65°·1 on 19th; min. 33°·9 on 24th. F 0, f 5.

COUPAR ANGUS.—R 1·03 in. below the average. Mean temp. 48°·5, or 3°·0 above the average. Short TS on 29th with much L. Shade max. 61°·0 on 13th; min. 28°·0 on 10th.

FORT AUGUSTUS.—Shade max. 63°·4 on 19th; min. 29°·5 on 10th. F 3.

LOCH STACK.—Duration of sunshine 97·3* hours.

DUNMANWAY.—A very unsettled but mild month. TS with heavy R on night of 4th.

DUBLIN.—A generally mild month, with heavy R on several days, notably the 5th, 7th and 27th. A cold spell from 21st to 25th inclusive. Mean temp. 51°·9, or 2°·6 above the average. Shade max. 64°·6 on 13th; min. 30°·0 on 24th. F 1, f 2.

MARKREE.—The first 10 days were fine and dry with high temp., afterwards showery with heavy falls at times, and frosts on several nights towards the end. Shade max. 64°·0 on 12th, 13th and 17th; min. 27°·0 on 25th. F 4, f 7.

OMAGH.—As most of the rain fell during the nights, the month was apparently fine and mild.

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* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, May, 1913.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity. 0-100	Absolute. Max. in Sun.	Min. on Grass.	Total Rain Depth.	Days.	Aver. Cloud.
	°		°		°	°	°		°	°	inches		
London, Camden Square	84·4	26	35·3	7	67·8	46·9	47·3	73	131·3	32·5	1·72	11	6·5
Malta	82·4	14	53·0	4	71·1	59·9	...	77	139·0	..	·81	5	4·3
Lagos	90·2	2	72·0	11	87·4	75·9	75·1	78	151·2	70·3	7·91	14	6·3
Cape Town	88·9	1	40·4	24	68·5	53·2	52·0	74	...	...	2·45	14	5·7
Natal, Durban ...	77·0	16	53·0	30	71·8	60·3	57·8	77	...	...	·32	3	3·0
Johannesburg	72·5	9	32·4	24	63·4	45·7	35·9	57	129·1	28·8	·06	1	1·7
Mauritius	...	...	...	...	...	...	...	...	...	...	...	...	...
Bloemfontein	...	...	...	...	...	...	...	...	...	...	...	...	...
Calcutta...	104·1	2	69·4	12	94·3	76·4	74·8	75	...	67·7	8·59	12	3·7
Bombay...	94·5	31	78·8	6	92·0	81·4	76·4	72	139·4	73·4	...	..	3·4
Madras	107·7	12	71·9	14	98·3	80·5	74·2	69	146·5	73·1	2·14	6	2·6
Colombo, Ceylon ...	88·5	20	71·8	22	87·3	76·7	76·1	83	157·5	67·7	7·30	24	6·6
Hongkong	88·5	25	67·0	18	82·5	73·8	71·4	82	...	...	9·30	17	6·9
Sydney	71·0	3	43·0	8	63·2	52·2	50·0	79	115·9	32·6	14·91	28	6·4
Melbourne	69·9	1	31·9	29	58·9	46·7	45·0	77	109·9	28·5	3·11	16	6·8
Adelaide	67·5	23	41·2	10	62·9	48·2	46·8	74	131·9	31·8	1·09	11	6·6
Perth	83·4	6	42·0	23	71·4	51·6	47·5	58	137·9	31·8	1·11	5	3·4
Coolgardie	75·6	21	38·0	28	66·9	46·3	43·6	59	141·0	31·8	·63	6	3·9
Hobart, Tasmania .	62·9	12	32·5	30	55·5	49·2	40·2	75	112·9	28·8	·14	8	6·1
Wellington	61·2	26	34·0	22	54·6	42·6	41·3	77	112·4	27·2	11·80	22	6·3
Auckland	61·5	7	40·0	23	58·1	46·7	46·7	81	125·0	35·0	4·37	22	6·4
Jamaica, Kingston ..	88·3	22	65·8	6	86·1	70·4	69·3	78	...	...	3·05	9	5·6
Grenada	88·0	17	72·0	22	85·0	74·3	...	66	140·0	...	1·18	9	2·8
Toronto	87·0	2	30·0	10	64·0	44·0	39·0	59	...	27·0	1·04	9	4·1
Fredericton	83·0	6	27·0	17	58·0	37·0	...	70	...	...	4·04	13	6·0
St. John, N.B. ...	66·0	3	31·0	2	52·0	40·0	39·0	75	...	...	3·64	13	5·9
Edmonton, Alberta ...	79·8	26	24·0	5	61·0	37·8	...	52	133·4	17·2	·98	8	5·3
Victoria, B.C.	75·0	31	37·0		62·0	45·0	44·0	74	...	...	·80	10	5·7

MALTA.—Mean temp. of air 65°·1. Average daily sunshine 8·6 hours.

Johannesburg.—Bright sunshine 281·0 hours.

COLOMBO.—Mean temp. of air 82°·0, or 0°·6 below, of dew point 0°·4 above, and R 3·30 in. below, averages. Max. velocity of wind 37 miles per hour, for about 8 minutes on 24th. TSS on 9 days.

HONGKONG.—Mean temp. of air 77°·2. Mean hourly velocity of wind 12·5 miles. Bright sunshine 168·1 hours.

Sydney.—Temp. of air 0°·8 below, and R 9·81 in. above, averages.

Melbourne.—Mean temp. of air 1°·3 below, and R ·96 in. above, averages.

Adelaide.—Mean temp. of air 2°·2 below, and R 1·65 in. below, averages.

Coolgardie.—Temp. of air 1°·0 below, and R 0·7 in. below, averages.

Hobart.—Mean temp. of air 1°·0 below, and R 1·77 in. below, averages.

Wellington.—Mean temp. of air 4°·7 below, and R 7·00 in. above, averages. Bright sunshine 147·5 hours.

Auckland.—Cold, stormy and showery month. Rainfall under average of previous 44 years. Mean temp. much below average.