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The Ventilation of Instrument Shelters.

By Rev. W. F. A. ELLISON, M.A., Director, Armagh Observatory.

ONE of the greatest enemies of valuable astronomical and meteorological instruments is moisture, yet, although this is generally recognised, little thought seems to be given by the makers of instruments to their protection from damp. It is an easy matter to design a dome for an equatorial telescope or a hut for the recording portion of an anemograph so as to exclude rain. But to prevent the more insidious form of moisture, that condensed from the air inside the building, from injuring the instruments does not seem to have occurred to the designers of such things. Yet it is not a difficult matter. The solution of the problem is to be found in one word—ventilation.

It is now several years since I set to work to design an observatory with revolving roof to shelter a 5-inch equatorial refractor. In doing so I had before me two main principles—the utmost possible lightness consistent with resisting the weather, and absolutely thorough ventilation. These qualities I obtained in the following way: the upright position of the structure consisted of corrugated galvanised iron roofing, nailed to a light timber frame, and the whole was so supported on dwarf brick piers that the floor was everywhere one foot clear of the ground. A cat could run right through underneath it in any direction, its only contact with the ground being the eight brick supports. Against the possibility of being capsized by wind it was secured by

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driving four long iron spikes deep into the ground and screwing these to the bottom frame. This building proved so dry that dew never formed on the glasses of the telescope, and even in winter, books and papers left there curled up as if before a fire. A box of matches left there in the dampest weather would always strike easily. It was so successful that I afterwards constructed a much larger dome for an 18-inch silvered glass reflector on the same plan. This was transferred to Armagh, when I came here, and re-erected without alteration. Its only difference from the smaller dome is that concrete takes the place of brick in the foundation. Long iron bolts, bedded head down in the concrete, serve for anchorage against wind. The galvanised iron roofing is most useful in such a building, as its corrugations ensure abundant ventilation, and its rigidity adds immensely to the strength of the structure.

When I came to Armagh Observatory I found two valuable instruments suffering seriously from damp. These were the 10-inch Grubb equatorial with its clock, and the recording part of the Robinson-Beckley anemograph. The Grubb dome had eight ventilating apertures below the floor, but these were fitted with cast-iron insets, which so reduced the effective airways that they might as well have been closed altogether. Above, the building had one small window which was not made to open. The effects of damp were only too conspicuous. The fine sidereal clock was falling to pieces; the veneering of its case had nearly all come adrift, the glue having melted, and the steel parts of the movement were badly rusted. The driving clock was in like condition, and the object-glass was partly obscured by rust from its cast-iron cell. My first action was to take a heavy hammer and knock out all the cast-iron gratings from the under floor ventilators. Then I had two more windows inserted in the dome, on opposite sides, and made to open like those of a greenhouse. Neither is ever closed except in the wildest weather, and the improvement in the condition of the instruments is immense.

Next was the anemograph hut. This was even worse than the telescope dome, as it was practically airtight. On the morning after a sharp night the interior was always dripping wet. Every nail and bolt dripped water. In addition to deterioration of the mechanism the accuracy of the records suffered. The paper of the charts when it absorbed moisture increased its dimensions to an extent sometimes of the equivalent of 20 minutes on the time scale and of nearly one unit of the velocity scale. And a still more serious consequence was that the marks of the two pens were often so faint as to be nearly illegible.

All this trouble has now been cured by cutting a row of 2-inch holes with a centre-bit on one side of the hut, where they are protected outside by a sloping board against the entrance of rain. The very first day after this was done the improvement in dryness was most marked. I intend to cut another row of holes on the opposite side, so that a current of air may flow right through. I expect that after that the last trace of dampness will disappear. Even with one row only on one side the charts are now always dry and the trace bold and legible.

In conclusion, might I call the attention of those interested to the material called Rubberoid as a covering for such buildings. It is far cheaper than painted canvas, more waterproof and much more durable, besides being as easily repaired if damaged as a punctured bicycle tyre. It does not require to be painted, and lasts indefinitely.

The Disaster at Louth.

THE attention of the public has recently been focussed on the appallingly sudden and disastrous flood which caused serious loss of life and property in the town of Louth, in North Lincolnshire. Up to the present moment it has not been possible to bring together sufficient information to enable a detailed account of the occurrence to be compiled, but it appears desirable to put upon record such meteorological facts bearing upon the subject as are available.

The last week of May was marked by hot weather in all parts of the country, and numerous thunderstorms developed, more particularly in England. The highest temperatures were reported on May 25th, when 82° F. was reached in the Thames Valley. Thunderstorms, in one case with remarkably heavy rain, took place in Hertfordshire, Essex and Norfolk. At Athlone, in Co. Westmeath, 1·49 in. of rain fell in an hour on the same day. On the 26th, an area of comparatively low barometric pressure lay across England and Ireland, and thunderstorms occurred in parts of the Thames Valley, rainfall being exceptionally heavy in the west of London, particularly at Barnes and Ealing, where over 2 inches fell. At Hammersmith roads were flooded and wood pavements burst up, though at South Kensington, a couple of miles distant, only light showers fell. At Fulham ·86 in. was measured. Isolated thunderstorms again took place on the 27th, on this occasion in the north, ·80 in. of rain falling in 20 minutes at Mosley Hall, near Whaley Bridge, and 1·13 in. at Marchmont, in Berwickshire.

The distribution of atmospheric pressure after this date continued to be irregular; it was lower over the British Isles than in neighbouring countries, and on the evening of the 28th a "low" which appears to have originated over the south of France began to deepen and move northward. The pressure map for 7 h., G.M.T., on the 29th indicates the depression as situated over the Bristol Channel. At 13 h., pressure was below 1012 mb. over the Midlands, and by 18 h. it had fallen to 1009 mb. By the morning of the 30th the centre was over the North Sea, and by the evening of that day, having deepened to 1004 mb., it had moved to the Shetlands.

On the rainfall day of May 29th, ending at 9 h. on 30th, practically no rain fell to the south of a line drawn from Plymouth through Reading to Lowestoft. In the north no rain was observed over the whole of the centre and west of Scotland and in Ulster. A great area in which the rainfall exceeded ·50 in. nearly everywhere occupied England and Wales north of Aberystwyth, Birmingham and Skegness, and extended northward to Edinburgh. Associated with this comparatively wet area, a string of isolated patches lay across the centre of Ireland from the Shannon Estuary to Dublin. More than an inch of rain fell at one or two spots in the Irish strip and North Wales, and also over an extensive area in the north of England occupying the greater part of Lancashire, the West Riding of Yorkshire, Lincolnshire and the east of Nottinghamshire. At Newmarket-on-Fergus, in Co. Clare, 1·02 in. of rain fell in 30 minutes, and at Llandysilio, on the Welsh border, 1·02 in. in 15 minutes, but it was only within the English area that any very exceptional phenomena were reported. The centres of very heavy rainfall appear to have been near Preston and in the centre of Lincolnshire. At Leyland, five miles south of Preston, out of a total rainfall of 3·23 in. in the 24 hours ·60 in. fell in 20 minutes from 16 h. 40 m. to 17 h., G.M.T., and 1·65 in. from 17 h. 55 m. to 18 h. 15 m., the latter a shower of intensity very rarely attained in the British Isles. About ten miles further to the north 1·53 in. was measured at Broughton, whilst there was evidence of much heavier rain in the adjacent hills to the north-west causing an extraordinary rise in the Barton Brook and the River Brock, where flood waters carried away bridges and caused considerable damage to roads.

The Lincolnshire rainfall was even more severe; more than 2 inches fell as far west as Lincoln, but the extremely intense fall appears to have been confined to part of the low hills known as the Lincolnshire Wolds. In Louth itself the

fall amounted to only 1·42 in., but at Elkington Hall, 3 miles to the west, 4·69 in. was measured, of which 4·59 in. fell in 3 hours. About 2 miles south of this 4·10 in. fell in 2 hours at Hallington, but the gauge overflowed at this point so that the precise amount of the fall was lost. There is reason to think that it was at least as great as at Elkington. Ten miles further south, at Horncastle, 3·95 in. fell in 3 hours. All the evidence goes to suggest that the fall of rain somewhat further west than the points of observation near Louth was even more remarkable, but in the absence of any direct confirmation this cannot be stated positively. The amount certainly fell off somewhat abruptly towards the north-west, only 1·82 in. falling in the 24 hours at Kirmond, some 11 miles W.N.W. of Louth and only ·61 in. at Market Rasen. It is extremely unfortunate that no records are available in the district between Louth and Horncastle, as it is a matter of interest to enquire whether the enormous rainfall occurred along the whole ridge or only at intervals. The statement of a witness at the inquest that a large part of the rain ran into the River Bain indicates some extension westward, and it appears probable that the area of intense rain was widest at its northern extremity, which one may assume to have been near Welton-le-Wold.

Little definite information is available bearing on the time relations of the storms. It is clear that more than one storm occurred during the day, and that the Louth flood was associated with rainfall which commenced about 13 h., G.M.T., and became heavy at about 14 h. 30 m. At Horncastle rain commenced seriously at 15 h., G.M.T. A reputable witness from Benniworth, in the Bain Valley, 12 miles W.S.W. of Louth, stated that rain suddenly poured so fast at 14 h. 30 m. that house pipes could not carry it, and "in a moment the "fields were at least 8 inches deep in water." He added, "I saw a huge cloud, in the shape of an egg, which kept "twisting round. There were three flashes of lightning, very "vivid and very shocking. One seemed to pierce through "the cloud, and immediately afterwards the cloud seemed to "come earthward." The evidence of the borough surveyor showed that the Lud stream, normally 3 feet wide and 1 foot deep, was swollen to a width of 52 yards and a depth of 50 feet. The mere volume of water flowing down the two streams which converge on the outskirts of Louth would probably have been sufficient to account for the extremely serious nature of the damage inflicted, but it appears from such information as we have been able to obtain that it is probable that the stream was temporarily blocked with débris brought down by the earlier rains, and that the devastating

flood which poured through the town was the result of the sudden breaking down of this obstacle, which had been able to hold up a considerable volume of water owing to the comparatively gentle gradient of the valley at that point. The abrupt nature of the flood was possibly augmented by the fact that the centre of heavy rain was moving eastward at the time, as is suggested by such scanty time evidence as is available.

In the present incomplete state of the data in our hands it appears inadvisable to attempt any volumetric estimate of the precipitation. The amount of water entering the town of Louth was variously estimated at 20,000,000 and 9,000,000 tons. It is abundantly clear that whilst the amount of rainfall in three hours was nearly, if not quite, unprecedented, the disaster to the town of Louth must be attributed in an almost equal degree to the accident of its geographical position. A similar rainfall in many districts would have undoubtedly drained away without causing exceptional damage, but the valley of the Lud and its tributary form a veritable bottle-neck, and if, as is surmised, the bottle was inadvertently corked by a blockage in the stream the awful suddenness of the disaster may be to some extent explained.

Official Publications.

British Meteorological and Magnetic Yearbook, 1918, Part III., Section 2, Geophysical Journal, 1918.—The 1918 volume of the Geophysical Journal has been issued. The introduction contains a memorandum by Dr. C. Chree, F.R.S. on "Probable errors in absolute observations of magnetic elements." Each of the various magnetic elements, horizontal force, declination, and inclination, is found by somewhat elaborate routine of observation. It is of importance to know how far the figures which are published are to be regarded as significant. For instance, in the case of horizontal force, where the tabular unit is 1γ, the probable error in a single observation by a skilled observer during a "quiet" time is only about 3γ, or one part in 6,000, so far as the mere accuracy of observation is concerned, but the systematic error may be of the order of 5γ. Dr. Chree also gives reasons for the choice of certain hours for the various magnetic observations.

The Annual Supplement for 1918 is longer than any of its predecessors. In addition to the usual geophysical data the monthly sums of wind components at Deerness, Holyhead,

Great Yarmouth, and Scilly for the years 1911–18 are set out in convenient tables.

Records of upper air temperatures obtained by aeroplane ascents at Martlesham Heath were incorporated in the Annual Supplement for 1917. Corresponding data for South Farnborough became available for the first time in 1918, and results for both stations appear in the supplement under review. An attempt has also been made to derive the most probable monthly averages for England SE by combining temperature data at given heights for the two stations.

A new feature of the water level diagram for Kew Observatory is the addition of a graph representing the integrated general rainfall of the Thames Valley. The close agreement throughout the year between the rainfall at the Observatory and the general rainfall over the Thames Valley brought out by the diagram is surprising.

Correspondence.

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

Mock Suns.

WITH reference to the letter of Mr. W. H. Pick, the phenomena of parhelia would seem to have been unusually in evidence during the past few weeks. At Glasgow at 7.45 p.m. (summer time) on May 4th I observed a pair of coloured parhelia at similar altitude to the sun. Not having any more elaborate means available, I measured their angular distances from the sun with a walking-stick, and estimated the chord subtended as $6\frac{1}{4}$ inches at 17 inches distance from the eye. This gives an angle of about 21°, a fair approximation to the theoretical angle of 22°. The southern parhelion fortunately happened, when first seen at 7.45 p.m., to be exactly in line with the street (Kent Road) along which I was walking, and I find from an Ordnance survey map that it trends W. 7° S. Calculation shows that the sun was at azimuth W. 15° N. The total angle was thus 22°. Slight correction is due for the sun's altitude of 9°, but rigorous computation by spherical trigonometry gives a result differing only about $\frac{1}{4}$°. The weather was fine at the time, but heavy rain followed within a few hours. These same parhelia were also reported as seen from near Bridge of Allan (Stirlingshire). A few days later—the exact date is not stated—similar phenomena were, according to letters in the *Scotsman* of May 25th and 28th, observed from Dunure (Ayrshire) and from Edinburgh.

JOHN J. ROSS, B.A., F.R.A.S.

7, Queen's Terrace, Glasgow, June 5th, 1920.

The Flood of April 9th, 1920, at Calne.

AT 7 h. 45 m. thunder was heard in a south-westerly direction, and a dark cloud was seen to be gathering; by 8 h. rain was coming down in tropical quantities, and continued with unabated intensity until 11 h. 15 m. During these $3\frac{1}{4}$ hours 1·78 in. fell, a quantity which exceeds all records here for such a time for at least 50 years. For a thunderstorm to last so long was doubtless due to the fact that the wind changed during the storm from south-west to north-east, remaining so for considerably over an hour, and then veered back to south-west.

The storm was felt over a wide area, extending from the Pewsey Vale in the south to the neighbourhood of Swindon, a distance of considerably over twenty miles, but in very few places was it more than eight miles in breadth. The centre was in the Calne region, extending from Oliver's Camp at the back of Heddington, over Calstone, Cherhill, Compton, Calne, Cliffansty and Cliff Pypard, and it evidently spent itself in the neighbourhood of Swindon. On the east of the Downs the water drains towards the Kennet and into the Thames, and on the west into the Marden and Avon. Very little of the abnormal rainfall was felt on the east side.

A feature of the storm was the excessive amount of rain falling here and there, whilst intervening districts were less deluged. Heddington evidenced a huge downpour; the water swept down the hill and flooded cottages far from any stream. At Calstone a gorge running down from the hills had the appearance, it is said, of the rapids of a strong river, with considerable depth of water and marked velocity. Other possible channels between here and Cherhill were quite normal in appearance. A large table-land above Cherhill Hill felt the full force of the downpour, so that ordinary ploughed land became in an hour or two a lake overflowing in immense quantities into the London road. This current carried the shallow soil clean away, leaving the bare chalk exposed, so that ultimately the ground presented the appearance of a dried-up river bed. At Compton Bassett water poured down from the hillside in a roaring torrent, sounding like the sea. On the ridge between Woodhill Park and Cliff Pypard the effects of the storm beggar description. Here there are two roads, about a quarter of a mile apart, descending from the hill; one was torn up by the flowing water, which cut away the sides of the track and gouged the chalk out in places to the depth of three feet, though these incisions were only six or eight inches wide. The other road bore no traces of the heavy rain. E. W. BROWN.

Calne, 12th May, 1920.

Snow at Jerusalem.

THE report on page 36 of the February issue of the *Meteorological Magazine*, relating to a fall of 39 inches of snow at Jerusalem on February 13th, is interesting. The most copious snowstorm I ever experienced was that of January 18–19, 1881, when near Basingstoke the undrifted fall was about 18 inches. The storm lasted over, virtually, two days. I handled some of the snow three months after the fall.

The Jerusalem snow was more than twice the above quantity and deposited in about half the time. Can any of your readers tell us: Was the day dark throughout, and for how long did the snow lie? I take it the rain value would be even in excess of four inches.

WILLIAM GODDEN.

20, *Richmond Avenue, Willesden, N.W.* 10, 30*th March*, 1920.

Remarkable Audibility.

ON the evening of Sunday, May 16th, at 17h. 30m., G.M.T., I distinctly heard the puffs of the engine of a train starting from Havant Station, which is 7·1 miles distant, bearing S.S.W. A few minutes later the train became visible coming up the line at a point about half a mile to a mile nearer; there can be no doubt but that this was the train I heard, and that it was starting from Havant when I first heard it. The wind was north-east, about Force 4, and gusty, but there was a reversal above, for alto-cumulus was coming from the south, and it was probably the reversal that caused the remarkable audibility. Both on the evening of the 16th and on the previous evening, when wind conditions were similar, there was a continuous low rumble for which I am unable to account; it sounded like thunder at the extreme limit of audibility, but it was too continuous. I have heard the sea, distant 12 miles, under certain conditions, but it would hardly have been the sea on this occasion, for with a north-east wind there would not have been much surf on the East Winnow sand or on Hayling Beach. I have heard similar sounds on other occasions, and it is possible that they are caused by trams which run from Portsmouth to Horndean, where the terminus is only four miles distant, but the volume of sound seems too great for two or three trams, and the sounds may come from trams and other traffic in the streets of Portsmouth, the nearest point of which is under 11·2 miles and the furthest 13·5 miles in a direct line. I am by no means certain that this is the true explanation.

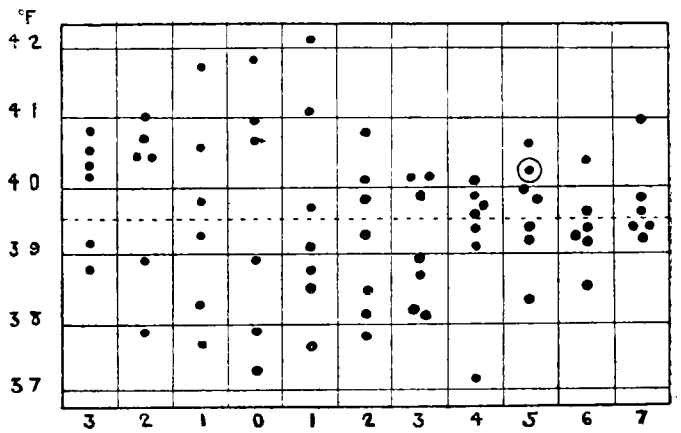
C. J. P. CAVE.

Ditcham Park, Petersfield, 17th May, 1920.

Forecasting Winter Temperatures.

SOME interesting results, I think, are obtained when we treat the Greenwich winters since 1841 in this way.

Smooth the series of mean temperatures of winter in groups of five (42–46, 43–47, &c.), putting down the mean to the middle vear. Then represent those means by dots in a series of graduated columns according to the scheme 3.2.1. min. 1.2.3.4.5.6.7, the minimum being that of sunspots.



It then appears that two groups may be distinguished; in one (2.1. min. 1.2) there is wide variation; in the other (3.4.5.6.7.) the range is generally small. In the former, extreme values above or below average (say over 40·4° or under 38·4°) are relatively numerous; in the latter rare. The dots are scattered over a wide space in the former division, while in the latter they seem to draw in towards the average line, clustering near it.

Should these relations persist in future, they might, I believe, be helpful is estimating the character of an approaching winter. ALEX. B. MACDOWALL.

Bellevue, Bridge of Allan, 1st May, 1920.

Phenology of the Past Winter.

THE following table is based on records kept from 1906 of garden flowers and "allowed" wild species in my garden at Asgarth, Riddlesdown Road, Purley, on an open north-east slope from 330 to 400 feet altitude. The numbers give (a) the total of garden varieties actually in bloom at the end of each month, and (b) the number that first flowered during the month. Of bulbs, such as tulips and narcissi, only leading types are included.

Year.	Previous December.		January.		February.		March.		April.	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
1913 -	78	40	83	26	80	25	98	46	113	41
1914 -	83	37	54	6	66	27	81	49	143	88
1915 -	63	19	11	0	23	11	45	22	65	43
1916 -	61	17	26	10	37	13	65	33	98	63
1917 -	49	18	57	22	107	50	144	81	162	90

To illustrate the earliness of the present year, especially at the beginning of April, it may be noted that only three times has the Banksian rose flowered before May, namely, on April 29th in 1913, on April 24th in 1914, and now on the 6th in 1920. Last year's date was May 15th; in 1917, May 17th. Previous to 1920 the year 1913 gave the earliest and 1917 the latest records.

Although the opening three weeks of May were unfavourable, vegetation here showed a tendency to earliness. Fifty-nine fresh flowers had opened by the 21st, including six more roses. Then the burst of summer brought out 112 more (with 55 roses). This made 62 roses in all by the end of May. The year 1914 had previously stood first with 41, out of a total of 278 May flowers, compared with 333 this year. For the whole of December to May 495 flowers have been recorded, with 431 of the fresh season, thus greatly exceeding the 1914 record of 444 with 342 fresh. In 1915 only three roses were in bloom, and eight in 1917.

Purley, 31st May, 1920. J. EDMUND CLARK.

Thunderstorm Days.

IN looking over some old records kept by me before the war, I noticed that thunderstorms seemed to develop between certain dates in the late spring and early summer with a frequency worthy of comment. Perhaps the most pronounced period occurs round about June 1st (May 27th—June 2nd). In the 6 consecutive years, 1908 to 1913, and again in 1917, 1918 and 1919 thunderstorms developed between these two dates, principally over the southern half of England. Another well-marked spell includes March 6th and a day or two on either side, as in 1912 to 1915 and again in 1919. May 19th is a further period of thunder frequency, storms being reported in the years 1910, 1912, 1914 and 1918. Less pronounced dates are June 20th, July 1st, and April 28th to May 2nd. Of course all this may be a matter of coincidence, but anyone interested may have access to other records and so prove or disprove my theory. E. HARRISON.

36, Rosemont Road, Richmond Hill, Surrey.

Royal Meteorological Society.

THE usual meeting of the Society was held on 19th May, Mr. R. H. Hooker, President, in the chair.

A paper entitled "Agricultural Climatology of Australia," by Dr. Griffith Taylor, was summarised by the President. In this paper the author points out the extreme importance of the rainfall as the controlling factor in the settlement of the country; the season at which rain falls and the certainty of its occurrence (its "reliability") are as important as the total amount. The greater proportion of the wheat lands lie in regions receiving less than 20 inches of rain per annum, while the crop can be grown with as little as 7 inches, if it falls at the right time. Sugar cane is confined to the east coast, where the rainfall exceeds 40 inches and the temperature 68° F. The hay crop is also important, and it is of interest to note that in dry seasons when the grain fails the unripe cereals are cut and used as hay. Ninety per cent. of the sheep are in the south-eastern third of the continent; a rainfall of at least 10 inches and a temperature below 77° F. is required for them. Cattle are reared more in the north-east. The great variability of the rainfall results in serious droughts, the failure of the cereal crops, and the reduction of flocks and herds. It is hoped that these recurrent losses will become less serious with the progress of irrigation, but Dr. Taylor is not sanguine that irrigation will open up to settlement the enormous areas anticipated by some writers.

A discussion followed in which the value of the paper to prospective settlers was emphasized.

The Report on the Phenological Observations for the year 1919, prepared by him in co-operation with Mr. H. B. Adames, was presented by Mr. J. E. Clark. The year 1919 will be remembered for the uniform cold of the first four months, leading up to the snowstorm at the end of April and a warm May. As a result the four earliest flowers in the phenological list were nine days late, but the last four were decidedly early. The early migrants were late, especially the nightingale. Owing to the war the number of phenological observers had been reduced to about 100, but many promises of new contributions in 1920 had been received, so that the list of observers would be nearly doubled. An appeal was made for more observations from Wales, Ireland SW, and Scotland NW.

An interesting discussion followed, to which Messrs. F. J. W. Whipple and J. H. Pease and the President contributed.

Lieut. J. G. Goodyear, R.A.F., and Prof. B. Melvill Jones, M.A., were elected fellows of the Society.

NOTES AND QUERIES.

Sunlight and the Life of the Sea.

IN a paper by Dr. Benjamin Moore, F.R.S., E. Whitley and T. A. Webster, read before the Royal Society on March 9th, it was shown how the microscopic life of the sea depended on sunlight rather than on temperature. The authors stated that in many years the outburst of diatoms occurred before the temperature of the water had even begun to move from its winter level. The growing diatoms capture the light, and utilise it for building carbon and nitrogen into their organic substances. The annual crop of moist plankton corresponds roughly to about 10 tons per acre. The nitrogen fixed by the minute organisms of the sea provides food for the fish, and in various ways serves to furnish fertilizers for the farmers' fields.

Ice in the Arctic.

"THE State of the Ice in the Arctic Seas for 1919," by Commander C. I. H. Speerschneider, has recently been published by the Danish Meteorological Institute. The ice conditions described were about normal, except that the ice in the northern and western portions of the Barents Sea was much further north than the average, whilst in the eastern portion there was considerably more than the average, conditions not approaching the normal until September. In April the ice reached as far south as the northern coast of Iceland, and the belt of ice off the west coast of Spitsbergen was twice as broad as usual. Unusual numbers of icebergs were seen off Cape Farewell in June.

The charts are being reproduced on the back of the Meteorological Chart of the North Atlantic for June, 1920.

New Zealand Daily Weather Report.

LIEUT.-COL. BATES, Director of the Meteorological Office of the Dominion of New Zealand, has forwarded the daily reports of weather of January and February 1920, issued from Wellington. They give observations of Wind Direction and Force (in words), Barometer corrected, Air Temperature, Weather and State of the sea and tide. The map has not yet advanced to the stage of charting the elements recorded, and indeed New Zealand necessarily finds itself somewhat isolated when a weather chart is wanted.

Disturbance of the Normal Atmospheric Circulation in the North Pacific.

THE Monthly Weather Review of the U.S. Weather Bureau for January, 1920, contains allusion to the occurrence of remarkably low pressures in Hawaii and high pressures in Alaska and the Aleutian Islands. On January 17th at Honolulu the reading was 1004 mb., on the same day near Unalaska pressure rose above 1057 mb. The average January pressure is 1016 mb. at Honolulu, an 1005 mb. at Unalaska.

The extremes previously recorded are 998 mb. at Honolulu and 1038 mb. at Unalaska. The reading of 1057 mb. is therefore a remarkable record.

It appears that about January 8th the Asiatic anticyclone spread eastwards across Alaska, and at the same time the usual Aleutian low moved south-eastwards.

Rain Gauges with Rims of Different Shapes.

Two 8-inch rain gauges were compared at Benson from August to December, 1919. Gauge A had the taper to the sharp edge on the outside, so that the inside measurement of the cylinder just below the rim was exactly 8 inches. Gauge B had the taper inside, so that the diameter of the cylinder, outside measurement, was 8 inches. Gauge B was placed in a similar exposure to A, 6 feet north-east of it.

The result has been that gauge A has recorded 1·003 times the amount of gauge B. The difference is trifling, but is probably real, as each month shows an excess for gauge A.

The gauges were read and emptied at 7h. and 18h. each day, and often the amounts were less than 2 mm. Under such conditions the observer would naturally enter the same amount to each gauge, because no appreciable difference could be expected. The result, however, is the same if falls below 2·0 mm. be excluded.

The following comparison includes all falls over 10 mm. :—

A	18·0	19·8	10·1	10·3	16·3	11·7
B	17·9	19·6	10·1	10·2	16·5	11·7

W. H. DINES.

8th April 1920, *Benson.*

It was anticipated that gauge A would catch the greater quantity of rain as drips hovering on the edge on the windward side would be blown into the gauge, whilst a like effect, on the lee side, would be responsible for loss of rain from gauge B. Assuming in the absence of evidence that the error found by Mr. Dines is equally shared, it follows that the standard gauge of pattern A records too much by about 1 part in a thousand.

The experiment suggests that the ideal rim would have a slope inside as well as outside, the cross-section being like the gable end of a house.—[ED. M.M.]

Reviews.

Photographing Clouds from an Airplane. By Ford A. Carpenter. (Prepared by the Department of Meteorology and Aeronautics, Los Angelos Chamber of Commerce, and published in *The Ace* of January 1920.)

THIS paper gives some interesting descriptions of clouds observed from aeroplanes in South California. Though written primarily for the general reader, the paper contains information of interest to meteorologists. A cloud which is very common on the Pacific Coast in the early morning and late evening in summer is known as the "velo" cloud, and consists of a thin layer of light fog above the surface, but below 1,000 feet, extending about six miles seaward and twelve miles inland. Similar clouds are occasionally met with in favourable conditions on the West coast of Scotland.

The author on several occasions refers to "cirro-cumulus" clouds at heights of about 6,000 to 8,000 feet, using a modified cloud classification which he has published in an earlier work. Thin patches or layers of clouds at those levels which are exactly similar to cirro-cumulus are frequently met with. The author is a meteorologist of long experience, and his views on the importance of the study of clouds are worth recording. His opinion is given as follows:—

> "To the aviator, clouds are a sure guide to the weather in the different air levels, and too much emphasis cannot be laid upon the importance of a thorough knowledge of cloud structure, cloud movement and the resulting weather conditions. To my mind cloud study should comprise as much as one-half of a course in meteorology."

The reviewer is decidedly in agreement with the views expressed above. A pilot flying at 5,000 feet who possesses a knowledge of clouds and has seen a recent synoptic chart is in possession of information which no one on the ground can possibly have, and can always avoid getting into difficulties as the result of weather conditions.

The paper is illustrated by photographs both of clouds and of the ground, taken with a Kodak and apparently with ordinary films. If it is desired to concentrate especially on cloud photography from aeroplanes, slow plates usually give the best results. C. K. M. DOUGLAS.

Chilian Meteorology.—(1) Santiago Instituto Meteorologico y Geofisco de Chile. Carlos Henriquez, Director. Seccion climatologica. Publicación No. 27 Anuario Meteorologico de Chile, 1917. Santiago de Chile, 1919. 8vo, pp. 81. (2) Publicación No. 28. Observaciones Meteorologicas en Algunas Ciudades de Chile (Resúmenes), 1911–1915. Santiago de Chile, 1919. 8vo, pp. 86.

In few parts of South America has meteorology during the past ten years made such great strides as in the Republic of Chile, where a well-organised service was established in 1910, from which a stream of valuable reports continues to flow. The high-water mark of efficiency seems to have been reached in 1915, when there were 46 first or second order stations at work of which only two furnished incomplete reports. In 1916 the respective figures were 43 and 1, and in 1917, 28 and 5, showing an appreciable shrinkage from the previous year. The shrinkage, which is almost entirely due to the suppression of inland and high level stations, is explained by the economic crises induced by the War.

Publicación No. 28 gives averages of the principal climatic elements for the five years 1911–1915, except in two cases, at 20 stations in Chile. Although the period is short the data are of much interest, as the averages are homogeneous, and thus intercomparable. A description of each station, along with particulars of remarkable phenomena observed, is given, but it would have been of advantage if some reference had been made to the combination of hours employed in getting the averages, as the present report will doubtless be extensively circulated amongst those not familiar with the procedure described in the annual reports from which it is compiled. The highest station is El Teniente, in latitude 34° S., height 2,142 metres, but most of the records refer to coastal lighthouses, where observations are continuous since 1899, the year when the old maritime service, discontinued in 1910, was established.

The special interest of this report lies in the fact that the Dirección of the Central Office in Santiago is evidently fully alive to the necessity of publishing averages covering the same period. In too many cases the lack of homogeneous normals constitutes a serious drawback to students of South American climatology, since the only way to obtain the information is laboriously to extract the values from the annual reports, and combine them for a uniform period. It is

to be hoped that other South American services, following the example of Chile, may be able to see their way to summarise their results every five or ten years, taking the same period, such as 1911–1915, 1916–1920, 1911–1920, and so on. This would greatly facilitate the preparation of a general climatology which would have some pretentions to be considered a scientific document. This specially applies to rainfall, which varies so much in many districts during different terms of years that at present the discussion of abnormals is rendered difficult and unsatisfactory.

It is unnecessary critically to examine here the summaries for the various stations given in this useful report, but attention may be drawn to the obviously erroneous relative (and absolute) humidity at Punta Galera (latitude 40° S.), where the mean relative humidity is given as 94 per cent. of saturation, with extremes of 91 per cent. in October and 97 per cent. in April and July, suggesting an exceedingly unpleasant climate. At the same station during the six years 1900 to 1905 the mean humidity was 85, the dampest month of the 72 giving a mean no higher than 90.

If mention is made of such little flies in the amber, it is not in a spirit of deprecation, but merely to draw attention to the fact that the system of station inspection leaves some room for improvement, which would doubtless be affected by an increase in the appropriations.

R. C. M.

Practical Exercises on the Weather and Climate of the British Isles and North-West Europe. By W. F. Stacey, Cambridge University Press, 1919. Large Crown 8vo., pp. viii + 64. Price 2*s.* 6*d.*

As an exercise book on the *Daily Weather Report* of the Meteorological Office this little book could scarcely be improved upon. There are 162 exercises divided into thirteen groups under headings such as Winter cyclone, Summer cyclone, Passage of a depression, Wedge, a V-depression, and Easterly type. In each example all the usual elements are given for 50 stations, so that if a pupil works through these exercises there is little of the formal interpretation of the *Weather Report* that he will not understand. It is a question whether many schools will care to spend so much time on a rather technical subject, for, whatever the title may imply or the preface suggest, very little of the work proposed is either climate or geography, but for the student who wishes to obtain a grasp of the routine and *rationale* of forecasting the book should be of great value. J. F.

Geostrophic Wind over London; July, 1881–1915.

FREQUENCY OF STRENGTH AND DIRECTION.

Estimates based on the D.W.R. charts (*8h.*, 1881–1908; *7h.*, 1909–1915).

Direction.	5 m/s. 11 mi/hr.	10 m/s. 22 mi/hr.	15 m/s. 33 mi/hr.	20 m/s. 44 mi/hr.	Over 20 m/s. Over 44 mi/hr.	Total Frequency of Direction.
N.	42	27	13	5	2	89
NE.	29	8	3	—	1	41
E.	15	30	5	2	—	52
SE.	15	4	—	1	—	20
S.	24	14	1	—	1	40
SW.	65	66	32	6	2	171
W.	51	120	73	11	3	258
NW.	51	66	32	3	5	157
Total Frequency of Strength	292	335	159	28	14	828*

* Indeterminate—257.

News in Brief.

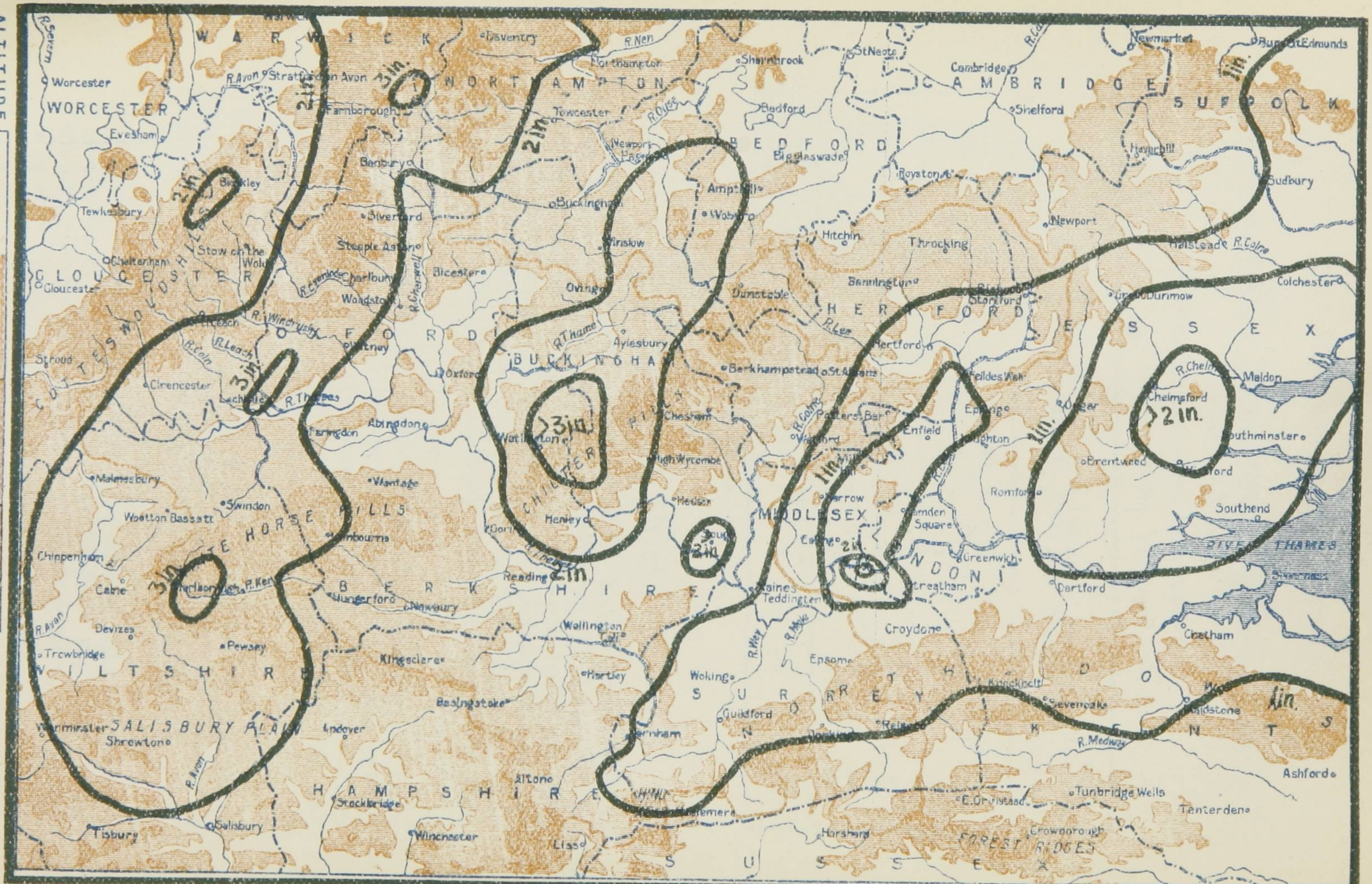
Colonel H. G. Lyons, D.Sc., F.R.S., Ex-President of the Royal Meteorological Society and Acting Director of the Meteorological Office from May 1918 to April 1919, has been appointed Director and Secretary to the Science Museum, in succession to Sir Francis Ogilvie, LL.D., C.B., who has been transferred to the Department of Scientific and Industrial Research.

Captain David Wilson Barker, F.R.S.E., F.R.G.S, a former President of the Royal Meteorological Society, who retired last year from the command of H.M. Training Ship "*Worcester*," received the honour of knighthood on the occasion of the King's birthday.

Professor C. T. R. Wilson, F.R.S., Director of the Solar Physics Observatory, Cambridge, has been awarded the Hopkins Prize of the Cambridge Philosophical Society.

Zone Time.—From April 30th, 1920, official time throughout the Republic of Uruguay will be the 60th meridian time, which has already been adopted in the Argentine, and is the same as the "Atlantic Time" in use in Canada.

THAMES VALLEY RAINFALL MAY, 1920.



ALTITUDE SCALE

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

SCALE OF MILES 0 5 10 15 20

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

Isohyetals

H. M. Stationery Office Press, Kingsway, W.C. 2.
Ps 554/194. 105 P. 35. 1250. 6/20.

Weather in the British Isles: May 1920.

THE exceptionally severe and widespread thunderstorms at the end of the month will long be remembered, but for the most part the weather, though wet, was cool, there being no thundery hot weather until the 20th. The prevalence of south-westerly and westerly winds, which so notably characterised the past winter, persisted during the month.

During the first eleven days the atmospheric conditions were decidedly chilly, and there was frost both in the screen and in the open at many inland stations. On the 1st, at Eskdalemuir, a shade minimum of 21° F. was recorded, with 13° F. on the ground. Sleet also was reported at some of the southern stations during these early days, but milder conditions gradually prevailed, and after the 11th the thermometer seldom fell below the freezing-point. Throughout the month there was no instance of a primary depression passing directly across the British Isles, with the result that gales were rare. The most notable gale was one which during the opening days of the month was associated with a depression of considerable extent, which advanced north-eastwards from the Azores and caused gales from the east in the northern districts and from the south-west in the western districts. This gale was very severe in the Irish Sea and in the Firth of Clyde, and at Southport on the 3rd gusts of 32 metres per second were recorded; much damage was done to pear and horse-chestnut trees in the neighbourhood of Leyland, Lancs.

Soon after the 20th warm weather became general, and conditions for about a week, especially over southern and eastern England, were very fine, sunny, and warm. On four consecutive days (22nd–25th) Yarmouth had more than 14 hours of sunshine per day, and maximum temperatures between 70° F. and 80° F. were common in many localities. On the 25th a reading of 84° F was registered at Cambridge, 83° F. at Westminster, 82° F. at Benson, and 80° F. at Kew Observatory. Subsequently there was a marked increase in the amount of cloud, and under the influence of shallow depressions the character of the weather deteriorated. On the 26th and 27th a long valley of relatively low pressure was stretched across England and the Netherlands, and within this belt violent thunderstorms occurred. On the 25th and 26th there were local storms in the south of England; on the latter day notably in the western suburbs of London, when 65 mm. fell in 70 minutes at Barnes, 32 mm. at Slough in less than an hour, and 16 mm. at Hampstead, the greater part in half an hour. At Shrewton, Wilts, 12 mm. fell in 10 minutes, and at Nettlebed, Oxon, 44 mm. in 45 minutes. On the 29th a depression which had originated over France moved northwards and occasioned very heavy rain in the north of England, more especially in Lancashire and Lincolnshire, in which counties there were floods which caused loss of life and serious damage to property. Further particulars will be found on pp. 83–86. At Benson, during a thunderstorm on the same day, the tower which carries the anemometer was struck by lightning and damage was done to the lightning recorder. The night of the 29th was unusually warm, and at Kew Observatory the minimum was as high as 59° F., followed by further thunderstorms in the south and east of England on the following day.

The total rainfall during the month was above the average except in the south of England generally, and fell below half the average in the neighbourhood of the Thames estuary. The fall was more than twice the average in parts of the south-west of Scotland, and also in the neighbourhoods affected by the great storms of the 29th in the north of England. The total fell to less than one inch (25 mm.) in parts of the home counties and exceeded 3 inches (75 mm.) only very locally in the south and east of Great Britain, the distribution being extremely irregular in the thunderstorm districts. In parts of County Clare, Yorkshire and Lincolnshire as much as 6 inches (150 mm.) fell, but this amount was otherwise confined

(*Continued* on p. 104)

Rainfall Table for May 1920.

STATION.	COUNTY.	Aver. 1875–1909.	1920.		Per cent. of Av.	Max. in 24 hrs.		No. of Rain Days.
		in.	in.	mm.		in.	Date.	
Camden Square	*London*	1·75	·69	18	39	·14	17	13
Tenterden (View Tower)	*Kent*	1·65	·95	24	58	·27	28	13
Arundel (Patching)	*Sussex*	1·80	1·49	38	83	·39	6	13
Fordingbridge (Oaklands)	*Hampshire*	2·09	1·39	35	67	·32	17	12
Oxford (Magdalen College)	*Oxfordshire*	1·81	1·62	41	90	·37	11	14
Wellingborough	*Northampton*	1·98	1·28	32	65	·24	5	14
Hawkedon Rectory	*Suffolk*	1·85	1·03	26	56	·30	26	14
Norwich (Eaton)	*Norfolk*	1·92	1·78	45	93	·62	26	14
Launceston (Polapit Tamar)	*Devon*	2·08	1·78	45	86	·46	1	14
Lyme Regis (Rousdon)	„	2·02	1·73	44	86	·35	1	12
Ross (Birchlea)	*Herefordshire*	2·10	1·70	43	81	·37	28	16
Church Stretton (Wolstaston)	*Shropshire*	2·64	2·83	72	107	·63	27	17
Boston (Black Sluice)	*Lincoln*	1·80	2·00	51	111	·38	5	15
Worksop (Hodsock Priory)	*Nottingham*	2·08	2·10	53	101	·53	29	16
Mickleover Manor	*Derbyshire*	2·10	2·81	71	134	·72	26	16
Southport (Hesketh Park)	*Lancaskire*	2·13	3·54	90	166	·91	29	19
Wetherby (Ribston Hall)	*York, W. R.*	2·09	2·49	63	119	·88	29	..
Hull (Pearson Park)	„ *E. R.*	1·98	2·89	73	146	·73	29	18
Newcastle (Town Moor)	*North'land*	2·04	3·60	91	176	·92	29	13
Borrowdale (Seathwaite)	*Cumberland*	7·50	12·45	316	166	..	..	..
Cardiff (Ely)	*Glamorgan*	2·56	3·85	98	150	·87	6	20
Haverfordwest	*Pembroke*	2·62	3·89	99	148	1·28	5	17
Aberystwyth (Gogerddan)	*Cardigan*	2·63	4·28	109	163	·59	9	13
Llandudno	*Carnarron*	1·86	2·41	61	130	·46	11	17
Dumfries (Cargen)	*Kirkcudbrt.*	2·87	5·62	143	196	1·12	1	23
Marchmont House	*Berwick*	2·53	3·14	80	124	1·13	27	13
Girvan (Pinmore)	*Ayr*	2·98	4·00	102	134	·54	21	21
Glasgow (Queen's Park)	*Renfrew*	2·40	4·60	117	192	·58	26	21
Islay (Eallabus)	*Argyll*	2·58	6·47	164	251	·92	1	26
Mull (Quinish)	„	2·99	6·22	158	208	·72	21	23
Loch Dhu	*Perth*	4·59	10·00	254	218	1·50	1	21
Dundee (Eastern Necropolis)	*Forfar*	2·05	3·17	80	155	1·05	1	16
Braemar	*Aberdeen*	2·33	2·81	71	121	·65	1	13
Aberdeen (Cranford)	„	2·40	3·60	91	150	·63	1	17
Gordon Castle	*Moray*	2·10	2·14	54	102	..	..	..
Drumnadrochit	*Inverness*	2·33	1·98	50	85	·26	11	25
Fort William	„	3·93	6·70	170	170	1·08	21	25
Loch Torridon (Bendamph)	*Ross*	4·54	6·38	162	141	·68	6	20
Stornoway	„	2·55	5·21	132	204	·67	2	25
Dunrobin Castle	*Sutherland*	2·19	2·97	75	136	·43	13	20
Wick	*Caithness*	2·04	2·87	73	141	·37	2	22
Glanmire (Lota Lodge)	*Cork*	2·54	4·13	105	163	1·24	1	22
Killarney (District Asylum)	*Kerry*	3·05	4·04	103	132	·56	5	23
Waterford (Brook Lodge)	*Waterford*	2·33	3·42	87	147	1·00	1, 5	19
Nenagh (Castle Lough)	*Tipperary*	2·51	4·58	116	182	·83	5	24
Ennistymon House	*Clare*	2·70	5·02	128	186	·90	5	24
Gorey (Courtown House)	*Wexford*	2·24	2·97	75	133	1·05	1	16
Abbey Leix (Blandsfort)	*Queen's Co.*	2·43	2·91	74	120	·55	1	21
Dublin (FitzWilliam Square)	*Dublin*	2·07	2·63	67	127	·52	1	19
Mullingar (Belvedere)	*Westmeath*	2·51	3·19	81	127	·60	19	16
Woodlawn	*Galway*	2·86	4·02	102	141	·76	1	25
Crossmolina (Enniscoe)	*Mayo*	3·17	5·40	137	170	·79	18	24
Collooney (Markree Obsy.)	*Sligo*	2·80	3·99	101	143	·62	18	25
Seaforde	*Down*	2·72	3·24	82	119	1·46	1	22
Ballymena (Harryville)	*Antrim*	2·84	3·88	99	137	·62	2	25
Omagh (Edenfel)	*Tyrone*	2·66	4·29	109	161	·70	2	25

Supplementary Rainfall, May 1920.

Div.	STATION.	RAIN. in.	RAIN. mm.	Div.	STATION.	RAIN. in.	RAIN. mm.
II.	Ramsgate	1·10	28	XII.	Langholm, Drove Rd.	5·35	136
,,	Sevenoaks, Speldhurst	·96	24	XIII.	Selkirk, Hangingshaw	3·46	88
,,	Hailsham Vicarage	1·15	29	,,	North Berwick Res.	2·86	73
,,	Totland B. Aston Ho	1·40	36	,,	Edinburgh, Royal Ob.	2·23	57
,,	Ashley, Old Manor Ho.	1·11	28	XIV.	Biggar	4·11	104
,,	Grayshott	1·16	29	,,	Leadhills	6·72	171
,,	Ufton Nervet	1·40	36	,,	Maybole, Knockdon	5·78	147
III.	Harrow Weald, Hill Ho.	·96	24	XV.	Rothesay	6·47	164
,,	Pitsford, Sedgebrook	1·64	42	,,	Oban	5·44	138
,,	Chatteris, The Priory.	1·82	46	,,	Inveraray Castle	13·76	350
IV.	Elsenham, Gaunts End	1·04	26	,,	Holy Loch, Ardnadam	9·17	233
,,	Lexden, Hill House	1·02	26	XVI.	Loch Venachar	6·90	175
,,	Aylsham, Rippon Hall	1·50	38	,,	Glenquey	6·20	158
,,	Swaffham	1·74	44	,,	Loch Rannoch, Dall	4·25	108
V.	Devizes, Highclere	2·41	61	,,	Coupar Angus	2·99	76
,,	Weymouth	1·51	38	,,	Montrose Asylum	2·86	73
,,	Ashburton, Druid Ho.	2·72	69	XVII.	Balmoral Castle	2·57	65
,,	Cullompton	1·86	47	,,	Fyvie Castle	3·31	84
,,	Hartland Abbey	2·38	60	,,	Peterhead, Forehill	3·71	94
,,	St. Austell, Trevarna	2·55	65	,,	Grantown-on-Spey	1·58	40
,,	North Cadbury Rec.	1·55	39	XVIII.	Cluny Castle	2·73	69
,,	Cutcombe, Wheddon Cr.	2·78	71	,,	Loch Quoich, Glenquoich	11·55	293
VI.	Clifton, Stoke Bishop.	1·91	48	,,	Skye, Dunvegan	7·49	190
,,	Ledbury, Underdown.	1·58	40	,,	Fortrose	1·48	38
,,	Shifnal. Hatton Grange	4·06	103	,,	Ardross Castle	2·92	74
,,	Ashbourne, Mayfield	3·48	88	,,	Glencarron Lodge	5·72	145
,,	Barnt Green, Upwood	1·98	50	XIX.	Tongue Manse	2·15	55
,,	Blockley, Upton Wold	2·50	64	,,	Melvich Schoolhouse	2·97	75
VII.	Grantham, Saltersford	1·32	34	,,	Loch More, Achfary	5·56	141
,,	Louth, Westgate	3·34	85	XX.	Dunmanway Rectory	6·75	171
,,	Mansfield, West Bank	1·96	50	,,	Mitchelstown Castle	4·06	103
VIII.	Nantwich, Dorfold Hall	3·13	80	,,	Gearahameen	9·80	249
,,	Bolton, Queen's Park.	7·57	192	,,	Darrynane Abbey	4·99	127
,,	Lancaster, Strathspey.	5·15	131	,,	Clonmel, Bruce Villa	3·22	82
IX.	Wath-upon-Dearne	3·06	78	,,	Cashel, Ballinamona	2·85	72
,,	Bradford, Lister Park.	3·62	92	,,	Roscrea, Timoney Pk.	3·57	91
,,	West Witton	3·46	88	,,	Foynes	4·70	119
,,	Scarborough, Scalby	2·65	67	,,	Broadford, Hurdlesto'n	5·54	141
,,	Ingleby Greenhow	1·95	50	XXI.	Kilkenny Castle	3·68	94
,,	Mickleton	4·40	112	,,	Rathnew, Clonmannon	2·81	71
X.	Bellingham	4·35	111	,,	Hacketstown Rectory	2·81	71
,,	Ilderton, Lilburn	3·31	84	,,	Ballycumber, Moorock	3·18	81
,,	Orton	9·57	243	,,	Balbriggan, Ardgillan	3·04	77
XI.	Llanfrechfa Grange	3·42	87	,,	Drogheda	2·63	67
,,	Treherbert, Tyn-y-waun	6·76	172	,,	Athlone, Twyford	4·67	119
,,	Carmarthen Friary	4·25	108	,,	Castle Forbes Gdns.	3·71	94
,,	Fishguard	3·44	87	XXII.	Ballynahinch Castle	4·98	126
,,	Lampeter, Falcondale	6·11	155	,,	Westport House	6·86	174
,,	Abergwngy	5·20	132	XXIII.	Enniskillen, Portora	3·27	83
,,	Crickhowell, Talymaes	4·00	102	,,	Cootehill, Dartrey	3·36	85
,,	Sennybridge	2·62	66	,,	Armagh Observatory	2·97	75
,,	Lake Vyrnwy	6·73	171	,,	Warrenpoint	3·44	87
,,	Llangynhafal, P. Drâw	1·91	48	,,	Belfast, Cave Hill Rd.	3·83	97
,,	Dolgelly, Bryntirion	8·15	207	,,	Glenarm Castle	4·94	126
,,	Lligwy	4·42	112	,,	Londonderry, Creggan	4·14	105
XII.	Stoneykirk, Ardwell Ho.	4·32	110	,,	Sion Mills	3·88	99
,,	Gatehouse, Cally	..	..	,,	Milford, The Manse	4·37	111
,,	Carsphairn, Shiel	9·14	232	,,	Killybegs, Rockmount	7·35	187

Climatological Table for the

STATIONS Those in italics are South of the Equator	PRESSURE		TEMPERATURE							
			Absolute				Mean Values			
	Mean 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	1010·2	−3·7	54	23	23	9	48·0	37·6	42·8	+2·5
Gibraltar	1023·8	+4·2	66·2	2, 22	38·9	27	60·4	47·6	54·0	−2·3
Malta	1016·0	−0·8	68·5	1	45·0	11	59·7	52·1	55·9	−0·9
Sierra Leone	1011·8	+0·8	91	14	71	23	88·2	75·1	81·7	−0·2
Lagos	1012·2	+1·7	90·2	31	71·0	20	87·3	74·8	81·1	−0·2
Kaduna, N. Nigeria	*944·3	..	91	†11	51	14	87·3	55·7	71·5	..
Cape Town	..	..	95·0	28	51·3	2	78·9	58·3	68·6	+1·0
Johannesburg	..	..	85·9	9	45·5	19	78·9	55·4	67·1	+2·5
Mauritius	1012·7	−1·1	91·6	30	64·9	6	87·6	71·4	79·5	+0·9
Bloemfontein	..	..	96·0	10	46·6	25	86·2	59·6	72·9	+0·1
Calcutta, Alipore Obsy.	1015·3	−2·0	79·6	14	52·1	19	77·2	55·9	66·5	+0·3
Bombay	..	..	89·4	18	61·7	29	84·7	70·5	77·6	+0·4
Madras	..	..	86·3	17	67·4	11	83·4	72·3	77·9	+1·4
Colombo, Ceylon	..	..	90·1	19	70·3	2	85·7	73·2	79·4	+1·4
Hong Kong	1021·3	+1·6	71·9	27	45·5	30	65·8	57·1	61·5	−1·5
Sydney	..	..	..	..	..	..	..	..	..	..
Melbourne	..	..	102·2	21	48·1	18	78·0	57·4	67·7	+3·0
Adelaide	..	..	109·3	10	50·5	29	85·3	60·6	72·9	+1·8
Perth	..	..	99·9	29	51·0	27	77·6	58·5	68·1	−2·6
Coolgardie	..	..	101·2	7, 8	52·5	28	90·5	60·7	75·6	−0·2
Brisbane	..	..	97·5	18	64·4	22	84·5	68·5	76·5	+0·2
Hobart, Tasmania	..	..	92·8	21	44·2	18	72·3	53·2	62·7	+2·4
Wellington	1013·6	+2·4	79·0	30	38·4	4	64·9	51·1	58·0	−2·3
Suva, Fiji	..	..	..	..	..	..	..	..	..	..
Jamaica, Kingston	..	..	88·3	22	66·3	27	85·3	69·9	77·6	−0·1
Grenada	1012·6	+0·6	86	4, 5	70	25	83·7	73·3	78·5	+0·4
Toronto	1019·6	+1·7	48·8	13	7·2	17	30·0	15·1	22·5	−5·4
Fredericton	1018·3	..	41·0	13	−26·0	17	23·1	0·4	11·7	−6·5
St. John, N.B.	1016·9	+1·7	45·5	13	−17·2	18	27·3	10·0	18·7	−5·4
Victoria, B.C.	1019·6	+3·0	52·5	24	15·5	11	41·7	34·2	37·9	−4·9
Jamaica. November	..	..	91·8	26	64·8	12	88·1	70·8	79·5	+0·2

* At Station Level, height of 2,088 feet. † Also on 15th and 21st.

LONDON.—2 thunderstorms, 4 days of fog.

GIBRALTAR.—1 thunderstorm, 1 day of gale.

MALTA.—Mean speed of wind, 8·6 mi/hr, prevailing direction NW.

SIERRA LEONE.—1 day of gale, 1 thunderstorm.

Mauritius.—Prevailing wind E.; mean speed, 5·6 mi/hr.

British Empire, December 1919.

TEMPERATURE				PRECIPITATION						STATIONS Those in italics are South of the Equator.
Mean Values		Absolute		Amount		Diff. from Normal	Days	Mean Cloud Am'nt	Bright Sunshine	
Dew Point ° F.	R'tive Humidity %	Max. in Sun ° F.	Min. on Grass ° F.	in.	mm.	mm.			Hours per day	
39·8	86	82·6	18·1	3·7	95	+ 37	24	7·3	0·81	London, Kew Observatory
46·7	76	119	32	1·82	46	−100	5	3·0	..	Gibraltar.
..	81	117·5	..	2·91	74	− 30	10	5·0	4·7	Malta.
72·6	76	..	..	0·27	7	− 30	4	3·4	..	Sierra Leone.
72·2	69	156·3	55·2	1·28	33	+ 12	2	6·9	..	Lagos.
43·8	40	..	..	0·00	0	− 3	0	1·0	..	Kaduna, N. Nigeria.
55·3	63	..	..	0·19	5	− 17	4	3·4	..	*Cape Town.*
53·1	66	..	45·0	3·04	77	− 21	18	4·8	9·42	*Johannesburg.*
68·6	72	..	59·4	2·38	60	− 60	17	5·7	..	*Mauritius.*
64·7	42	..	..	0·50	13	− 49	3	1·7	..	*Bloemfontein.*
55·0	70	..	42·0	0·00	0	− 5	0	2·1	..	Calcutta, Alipore Obsy
64·8	67	133·1	52·0	0·00	0	− 2	0	1·1	..	Bombay.
69·9	80	157·4	64·1	6·24	158	0	13	6·4	..	Madras.
71·2	80	159·3	65·6	9·28	236	+116	12	7·0	..	Colombo, Ceylon.
50·5	66	..	..	0·73	18	− 10	5	5·1	6·40	Hong Kong.
..	..	..	..	..	..	..	..	..	..	*Sydney.*
53·2	59	153·2	38·0	3·69	94	+ 35	12	4·6	..	*Melbourne.*
53·0	46	168·4	41·0	1·14	29	+ 11	3	2·6	..	*Adelaide.*
54·8	62	163·2	44·0	0·83	21	+ 6	4	2·7	..	*Perth.*
50·1	38	164·0	50·2	2·06	52	+ 36	6	2·8	..	*Coolgardie.*
63·7	67	155·0	58·1	1·58	40	− 88	9	5·3	..	*Brisbane.*
46·5	53	150·6	37·1	1·17	30	− 20	10	5·8	..	*Hobart, Tasmania.*
48·7	71	145·0	25·5	2·41	61	− 22	14	6·2	7·76	*Wellington.*
..	..	..	..	..	..	..	..	..	..	*Suva, Fiji.*
68·6	82	..	..	1·89	48	+ 7	6	3·5	..	Jamaica, Kingston.
69·7	75	135	..	5·28	134	− 58	19	3·3	..	Grenada.
9·6	56	69·0	11·9	1·00	25	− 41	13	6·0	..	Toronto.
1·8	81	..	..	2·75	70	− 18	13	4·2	..	Fredericton.
8·4	68	102·7	−18·5	3·55	90	− 12	18	5·3	..	St. John, N.B.
33·5	89	100·0	9·8	4·79	122	− 37	17	6·3	..	Victoria, B.C.
69·2	78	..	..	0·41	10	− 70	5	3·0	..	Jamaica. November.

COLOMBO, CEYLON.—Prevailing wind NNW ; mean speed, 5·0 mi/hr ; 4 thunderstorms.
HONG KONG.—Prevailing wind ENE ; mean speed, 9·3 mi/hr.
Brisbane.—22nd month of deficient rainfall in last 2 years.
Wellington.—1 sunless day, 3 days of frost, 2 days hail, 1 thunderstorm.

to the usually rainy districts of the west. The general rainfall expressed as a percentage of the average was :—England and Wales, 117 ; Scotland, 164 ; Ireland, 145 ; British Isles, 141.

In London (Camden Square) the month was fair to fine, with occasional very light rain and considerable warmth after the 20th. The mean temperature was 57·5° F., or 3·5° F. above the average. The duration of rainfall was 20·5 hours. Evaporation, 2·71 inches.

Weather Abroad : May 1920.

Anticyclonic conditions developed over Southern Europe early in May and persisted throughout the month. Under their influence high day temperatures were recorded at many stations, 90° F. at Clermont and Biarritz on the 11th and at Perpignan on the 27th and 29th, and 94° F. at Clermont on the 28th. Both Madrid and Lisbon recorded 86° F. on the 8th, and on the 21st Rome reached 91° F., a temperature not exceeded in May since 1834. Cairo recorded 99° on the 27th. From about the 23rd to 28th, however, the fine weather was broken by a shallow depression near the Azores, which caused several heavy falls of rain in the Iberian Peninsula, though Italy continued to suffer from disastrous drought and several very hot nights were experienced there, when the temperature did not fall below 70° F.

As in England, fine warm conditions prevailed as a rule in Northern France, but on several days widespread and severe thunderstorms were experienced. On the evening of the 25th a heavy storm with hail and much wind burst over Paris, unroofing houses, breaking windows and destroying crops. In Germany also there were severe thunderstorms and considerable floods.

Heavy falls of rain were experienced in Denmark and the Scandinavian countries, especially on the 19th (39 mm. at Haparanda). Spitzbergen and Iceland, being on the other side of the low pressure belt, experienced strong north-easterly and northerly winds and very low temperatures, the maximum at Spitzbergen not rising above 25° F.

In America the month opened with a severe storm which destroyed the town of Peggs, in Oklahama, causing many deaths. This storm was connected with a shallow depression which lay over the south-western States, but about the 4th a high pressure area spread southward from Canada and fine dry weather prevailed from Canada to the West Indies. In Ontario, May was the driest month for 27 years, and the grain crops were backward, while the hay crops promised to be a partial failure. Forest fires developed in Ontario, Quebec and New Brunswick, but fortunately the flames were checked by heavy rains at the beginning of June.

The drought which had been experienced since Christmas in the hinterland of Queensland, New South Wales and Victoria was broken by heavy rain at the end of May. These heavy rains extended into South Australia, where a general fall of 2 inches occurred over the whole of the agricultural and much of the pastoral region, the best rainfall for years.

British Rainfall, 1919, is now in an advanced stage of preparation. It would greatly assist in the compilation of the year's statistics of rainfall if any observers who have not yet sent in their returns for the year would do so at an early date. Blank forms when required for this purpose can be obtained by application to the Superintendent, 62, Camden Square, London, N.W.1.