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Discussion at the Meteorological Office. New Methods of Forecasting.

GATHERINGS at the Meteorological Office for the discussion of the recent work of foreign meteorologists were inaugurated by Sir Napier Shaw (then Dr. W. N. Shaw) in 1905. At the request of Dr. Simpson, Sir Napier is continuing the series this winter, and he opened the first discussion, on November 1st, himself.

The works to be discussed were two papers by Professor Bjerknes, his lecture before the Royal Meteorological Society on "The Structure of the Atmosphere when rain is falling"* and an article in *Nature* entitled "The Meteorology of the Temperate Zone and the General Atmospheric Circulation,"† and Sir Napier Shaw explained how the article had originated after the delivery of the lecture. It is not possible to summarize here the whole discussion, which covered a very wide field. Some random notes must suffice.

We have long been familiar with the undercutting of warm currents by cold as exhibited in line-squalls, and also with the rising of streams of warm air over cold ones in their path. These are made to play the leading parts in Bjerknes's analysis of the nature of a cyclone. In the case of a cyclone making progress towards the east a sector to the south is occupied by a warm current; this warm area on the earth's surface is

* Q.J.R. Met. Soc., April 1920. Vol. XLVI, No. 194.

† *Nature*, January 24th, 1920. Sir Napier Shaw's report on the Conference at Bergen (*Met. Mag.*, Sept. 1920) may also be consulted.

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bounded to the north by the "steering line," to the west by the "squall-line," and Bjerknes' recent generalisation is that these squall-lines and steering-lines of all the cyclones of the northern hemisphere are parts of a single line—"the polar front." We are to think of two great streams of air, both flowing from the west, the more northerly stream being colder and carrying less moisture. The boundary between these two streams is unstable and its oscillations manifest themselves as cyclones. The warm stream overrides the cold one, which retaliates, so to speak, by turning round and kicking its partner in the back.

Apparently experience has shown that even if the polar front cannot be traced throughout the complete circuit of the globe the terminology is really helpful in the close study of weather maps. Forecasters who took part in the discussion were able to give instances in which the bearing of the "steering-line" has shown the direction in which a depression would move, or in which the formation of a loop in the polar front has led to the rapid filling up of the depression.

A few years ago meteorologists were inclined to regard cyclones as originating in the upper air. As Gold puts it in "The Ballad of the Stratosphere"—

> "I am the rolling stratosphere,
> I long to perturbate;
> So I tickle the top of the troposphere
> To make him undulate."

The newer theories direct attention to the conditions prevailing nearer the earth's surface, and therefore readily observed; to correlate the two views of the subject should be the next advance.

A paper on the causes of the formation of Mist and Fog by Walter Georgii (*Ann. Hydrogr.*, Berlin, 1920) was announced as the subject for discussion on November 15th. The meeting on November 29th will be devoted to "Investigations on lightning discharges and on the electric field of thunderstorms" by C. T. R. Wilson (*Phil. Trans. A.*, vol. 221).

Hill-fog in Relation to Rainfall.

By L. C. W. Bonacina.

IN *Symons's Meteorological Magazine* for March 1916 I provisionally drew the conclusion (founded upon personal experience in various ranges in the southern part of England between, say, 500 and 1,500 feet above sea level) that hill-mist was incompatible with real rain, and that when heavy rain fell on the hills their summits were for the time being clear or free from fog, even though they might be shrouded immediately before and after the rain. Since then I have taken every

opportunity to study the question, and further experience, together with what I can glean from others, only serves to substantiate the generalization, although certainty on the question can only come with far more abundant data. It will be readily appreciated that in the case of observations of such a purely qualitative nature vicarious reports must be unreliable, and for that reason I have been very careful before accepting the information of others upon the question.

In discussing the theory of this subject there are two facts to be reconciled—(1) Rain gauge records declare that the total annual precipitation increases with height up to the highest elevations in Britain—a little over 4,000 feet above the sea, so that, speaking in general terms, the tops of the hills are wetter than their bases. (2) There are undoubtedly many occasions in all hill districts when a decided, sometimes even heavy, rain in the valleys degenerate into a hill mist, often relatively dry, at a height which may vary from about 600 feet upwards. Clearly fact (2) suggests that true rainfall is less frequent in the uplands than in the lowlands at their feet, and the reconciliation between (1) and (2) consists in explaining *how* the heavier precipitation on the hills, as shown by the rain gauge, is made up.

Part of the upland excess is no doubt due to drizzle, wet fog and drifting showers, which the rain gauge records as rain; but in view of the circumstance referred to under (2) that hill-mist associated with rain below is not infrequently too dry to deposit much moisture, it seems very doubtful if the whole excess can be thus accounted for. Part of the excess would appear to be due to greater intensity of precipitation at higher levels than at lower on those occasions when heavy rain does occur on hills and plateaux. Consequently, I provisionally conclude that in the case of ranges such as the Mendips or the various chalk downs with a general plateau level of about 800 feet, or of uplands like Dartmoor and Exmoor with a plateau level about 1,500 feet, or of mountainous regions like Wales with a higher level still, heavy rain occurs more frequently in the valleys than on the heights, but that when it does occur on the latter the amount is greater. In the case of high mountain systems, like the Alps, the higher slopes, no doubt, get a good many heavy falls of rain and snow which do not fall in the subjacent valleys, but this paper deals with English hills often barely 1,000 feet high.

Considering the frequency with which the summits of the English hills are shrouded in driving moorland mist, especially during unsettled cyclonic types of weather, it is somewhat strange that such mist habitually disappears during heavy rain. This has been explained on the supposition that the rain falling through the mist washes the latter out, and it seems

such a natural process that I cannot think why I never thought of it in my 1916 paper, but went to the rather unnecessary hypothesis of supposing that among the hills, where orographic effects reinforce cyclonic influences, condensation may proceed so actively that the vapour contained in the atmosphere passes straight into rain-drops without going through the mist stage. Of course, there is no theoretical objection to such an explanation, for is not the invisible vapour in the air supposed to pass straight into snow crystals, a stage farther than raindrops? My original explanation may be true, though the washing out process must evidently take effect as well. But, whatever the reason may be, there is no doubt about the general truth of the observation that when heavy rain approaches the hills the cloud level over them rises. Owing to orographical effects the average cloud-level is probably lower in the hills than in the free atmosphere, often descending in unsettled weather to nearly 500 feet above sea-level, whereas the cyclonic cloud level in the free atmosphere is probably seldom much below 1,000 feet. It is clear that if raindrops dissolve out the mist droplets they must cause the amount of water caught by a rain gauge per given time to be increased.

The study of hill-fog in relation to precipitation is, perhaps, even more interesting with snow than with rain. If clouds rest on the hills in cold weather when snow is falling in the valleys below, they must consist either of small snow itself, in which case their appearance is highly characteristic, or of water droplets in a super-cooled condition, in which case shrubs and other objects, or even the ground itself, will often collect snow upon them.

I once asked an observer in the north of England whether a certain Pennine mountain was usually clear during heavy rain, and he replied that the mountain could not be seen at all when there was a rain-sheet between; and this is an aspect of the subject which needs to be borne in mind. It may be taken as a general rule that through short distances of, say, less than 5 miles, even dense rain-sheets are quite transparent, and do not obscure the outline of the hills; but even through greater distances, though rain-sheets become increasingly opaque, the appearance of opacity is quite different from that of mist or cloud, and no keen observer with normal vision could possibly, even at a great distance, confuse the two phenomena, notwithstanding that the rain-sheet gradually merges into cloud.

Matters directly bearing on this subject have been studied by Captain C. K. M. Douglas, whose flying observations upon various forms of condensation are of great value. But

I am studying the subject from the standpoint of *elevated ground*, not from that of the free upper air. After all, we cannot dwell in the free air, and it is in relation to the hills and mountains that the climatological importance of the problems discussed is specially brought out, often in a very practical way.

There must be many local peculiarities, and I have dealt with the subject in highly generalized terms.

In conclusion, I want to ask all who live in hill districts, together with any who may have had previous experience, such as at the Ben Nevis Observatory, the following question :—

Is it usual on the high hills to get steady rain and dense moorland mist at the same time?

Wind, Temperature, and Fog, October 27th, 1920.

SUDDEN changes of temperature occurring when a cold layer of fog is driven away by a rising breeze are not uncommon. That which occurred in London on Wednesday, October 27th, has, however, some unusual features.

The records for South Kensington show that the temperature was almost steady during the morning at 45° F., the minimum having been 40° F. at 5 h. 30 m. G.M.T. The anemometer pen was on the zero line during this period. At 12 h. 50 m. a wind of 4 mi/hr. sprang up, the temperature rose by 4° F. in 10 minutes and reached 54° F. by 13 h. 30 m. The maximum for the day was 55·2° F.

At Kew Observatory, 5½ miles to WSW. from South Kensington there was no appreciable wind until after 15 h., and then it took half an hour to get up to 4 mi/hr. The maximum temperature, which was only 48·6° F. was reached at 17 h. 25 m., by which time the relative humidity had fallen to 83 per cent. It is reported that the fog became less dense about 16 h. and cleared during the evening. The temperatures reached at the other London stations were about as high as at South Kensington—Westminster, 57° F.; Greenwich, 56° F.; Camden Square, Kensington Palace and Croydon, 55° F.; and Hampstead, 54° F.

On the other hand, farther up the Thames Valley the maxima were lower than at Kew Observatory. At Benson only 44° F. was reached, at Reading 47° F., at Wisley 46° F., though 53° F. was reported from Wantage and Farnborough on the higher ground to the south. It looks as if the N.E. wind was able to slide over the cold air in the Thames basin without displacing it.

North of the Thames there were higher temperatures again, 56° F. being reported at Berkhamsted, but the Ouse basin was covered by cold fog, and the maximum at Hitchin and Cambridge did not exceed 45° F. The most remarkable contrast was perhaps that between 63° F. at Woburn and 43° F. at Mursley. At the latter station, which is near Winslow, the fog persisted all day, though the wind, from NE. or NNE., was estimated at Force 3 at all three observations. It should be mentioned that at none of the stations mentioned when a rise of temperature took place could it be ascribed to sunshine, as there was practically none over the whole area.

OFFICIAL NOTICES.

Meteorological Stations.

THE removal of the Meteorological Office (Army Services) from *West Lavington* to the School of Artillery, *Larkhill*, Salisbury Plain, was effected on October 22nd, 1920.

Two new stations appear for the first time in the *Monthly Weather Report* for September 1920. That at *Bungay* (Flixton Hall) has been equipped by Sir R. Shafto Adair, who formerly maintained the station at Minehead. That at *Lenton Fields*, Nottingham, has been started by Mr. R. Francis Granger.

The returns from *Rugeley* and from *Leighton Park, Reading*, have been discontinued.

Cloud and Visibility Signals at Lympne Aerodrome.

A SYSTEM of ground signals has recently been established at Lympne Aerodrome, on the main route from Paris to London, to indicate to pilots the height of clouds at Biggin Hill and Croydon Aerodrome and the visibility at those places. The signals are made by large white letters and figures. Thus "B 1 2; C 2 3" means:—Biggin Hill, clouds below 200 feet, visibility 500 to 1,000 yards; Croydon, clouds 200 to 500 feet, visibility over 1,000 yards.

Wireless Weather Reports from the Eiffel Tower.

THE issue of weather reports by wireless telegraphy from the Eiffel Tower (FL) dates from the year 1911. The morning reports gave an eight-figure group for each of 20 places (Reykjavik, Valentia (Ireland), Ushant, Corruna, Horta (Azores), St. Pierre (America), Paris, Clermont Ferrand,

Biarritz, Marseilles, Nice, Algiers, Stornoway, Shields, Helder, Skudesnaes, Stockholm, Prague, Trieste, Rome), a general plain-language statement of the existing weather in Europe, forecasts for France, and the wind on the top of the Eiffel Tower. The eight-figure group provided barometer, wind, weather and state of the sea. A second, shorter report, giving observations for 2 p.m. was issued at 5 p.m. daily. This service was interrupted by the war. When the strict censorship of meteorological information ceased, the reports were recommenced, but in a modified form. This service has been extended more than once, and from November, 1st 1920, four reports based on observations at French stations are being issued daily at 2 h. 45 m., 8 h. 15 m., 14 h. 15 m., and 19 h. 30 m. G.M.T. in a wave-length of 2,600 m. From the same date the comprehensive report of the Bureau Central Météorologique has also been transmitted on pre-war lines, but with six-figure groups instead of eight-figure groups. This report gives pressure, wind and weather at 14 stations distributed from Stornoway to Algiers, and also the positions of centres of high and low pressure. A general forecast for the following day is also included in the telegram, which is sent out at 11 h. 30 m. on a wave-length of 2,600 m.

Copies of the codes may be seen at the Meteorological Office.

Forecasts by Telegraph and Telephone.

THE following revised regulations have been prepared for insertion in the Post Office Guide :—

The latest information as to the state of the weather in various parts of the United Kingdom or the Continent, and also forecasts to cover a period of 24 hours from the time of issue, can be obtained by telegraph from the Meteorological Office by sending a reply-paid telegram. The number of words to be paid for in the reply is to be arrived at by adding 10 to the number of words required for the applicant's address. Thus, if there were five words in the applicant's address, a reply of 15 words must be paid for. If a further outlook of the probable conditions beyond the period of 24 hours is also desired, an additional 10 words must be paid for.

Forecasts can also be obtained at any time by telephone if a sum has been previously deposited to cover the charges, which are 3*d*. for each forecast telephoned. Telephone inquiries should be made to Regent 8000, Extension 174.

The Meteorological Office is open day and night, including Sundays, and its telegraphic address is "Weather, London."

Forecasts are prepared at 3 h., 9 h., 15 h., and 20 h. G.M.T. daily. When Summer Time is in operation, forecasts are prepared half an hour later by the clock.

Report of the Meteorological Committee.

THE fifteenth Annual Report of the Meteorological Committee for the year ended March 1920 has recently been published. The year under review was notable on the one hand for the absorption of the British Rainfall Organization, and on the other for the decision of the Government to entrust the administration of the Office to the Air Ministry. The formal transfer of responsibilities for the Meteorological Service took place in October 1919

The Research Committee of the War Cabinet had appointed a sub-committee to consider the needs of the Meteorological Services, and the report of this sub-committee, which was presided over by Mr. H. A. L. Fisher, President of the Board of Education, is reprinted here as Appendix I. This report emphasises the desirability of a single Meteorological Service for the country and of close touch with other Government departments.

The constitution and functions of the Meteorological Committee under the new arrangement are set out in Appendix II. of the Report. The present membership of the Committee (Nov. 1920) is as follows:—

Ex-officio Members.

The Controller-General of Civil Aviation, Major-General Sir F. H. Sykes, C.B.E., K.C.B., C.M.G. (*President*).
The Director of the Meteorological Office, Dr. G. C. Simpson, C.B.E., F.R.S.
The Hydrographer to the Navy, Rear-Admiral F. C. Learmonth, C.B., C.B.E.

Nominated Members.

Air Ministry—Mr. H. W. W. McAnally, C.B.
Mr. L. V. Meadowcroft.
War Office—Lieut.-Colonel H. A. Lewis, R.A.
Agriculture and Fisheries—Sir Thomas Middleton, K.B.E., C.B.
Board of Trade—Captain J. M. Harvey.
Colonial Office—Mr. J. E. W. Flood.
Royal Society—Sir Arthur Schuster, D.Sc., F.R.S.
Colonel H. G. Lyons, D.Sc., F.R.S.
Royal Society, Edinburgh—Dr. E. M. Wedderburn, F R.S.E.

Official Publications.

The Book of Normals of Meteorological Elements for the British Isles. Section III. Maps of the Normal Distribution of Temperature, Rainfall, and Sunshine for the British Isles. Price 1s. 6*d*.

THE newly issued third section of the Book of Normals is an atlas illustrating the normal distribution of temperature, rainfall, and sunshine over the British Isles. There is no occasion to emphasise the utility of such an atlas, but attention may be drawn to the modest price.

The Meteorological Office arranged some years ago to collaborate with the Royal Meteorological Society in the production of an atlas which should be representative of British climatology, but circumstances arising out of the war delayed the execution of this scheme. The present publication, though less ambitious in its scope, will, it is hoped, be of considerable use. The maps, which represent the normals for the period 1881–1915, do not show conspicuous differences from those of the earlier series, now out of print, which were for 35 years ending 1910.

Professional Notes No. 14. *Tables of Frequencies of Surface Wind Directions and Cloud Amounts at Metz, Mulhausen, Karlsruhe and Frankfurt.* By D. Brunt, M.A., B.Sc. Price 6*d*. Net.

IN the summer of 1918 Captain Brunt was in charge of the meteorological service for the Independent Air Force, and had occasion to study meteorological conditions in Southern Germany. The forecasting of wind direction comes within the ordinary routine of the weather service, but there is comparatively little information on which estimates of probable cloud amount can be based. Accordingly, tables in which the frequency of various amounts of cloud with each wind direction are given should be of immediate service in the analysis of conditions favourable for military operations. Striking differences in the local conditions are brought out in Captain Brunt's note, which is on the same lines as *Professional Notes No.* 1, in which he discussed cloud amount at stations near London. A similar analysis is shown graphically in *Professional Notes No.* 7, "The Climate of North-West Russia."

Correspondence.

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

Mock Suns and False Cirrus.

I HAD supposed that the phenomenon described by Mr. L. H. G. Dines in the October number of the *Meteorological*

Magazine was of comparatively frequent occurrence. On examination, however, I find that I have recorded it only twice in five years, at South Farnborough, as follows:—

April 25th, 1916, 17 h. 15 m., brilliant parhelia of 22° in "false" cirrus.

March 26th, 1917, 16 h. 50 m., large Cu. Nb. in W., with South parhelion of 22° in "false" cirrus.

The circumstances for the earlier of the two cases, in which both mock suns were simultaneously visible, must be somewhat rare. R. A. WATSON WATT.

South Farnborough, 25th October, 1920.

A Midday Rainbow.

ON Saturday, October 2nd, there was visible here from 12 h. 5 m. to 12 h. 10 m. G.M.T. a brilliant double rainbow. Surely a practically midday rainbow is a very rare phenomenon. I am over 60 and never recollect having seen one before.

I see by Ganot's Physics that if the sun is higher than 42° 2′ there can be no rainbow, but I should have thought that the sun was higher than that at the date and hour mentioned.

H. P. CHOLMELEY, M.D.

Forest Edge, Forest Row, Sussex, 4th October, 1920.

[The altitude of the sun at the time would be about 35·5°, so that the phenomenon was in accordance with the text-book. It is believed that tables of the frequency of occurrence of rainbows at various hours in different months have been published occasionally. Perhaps some reader can give a reference. —ED. M.M.]

Rainbows at Lympne.

ON August 19th two exceptional rainbows were visible in the afternoon. The first occurred at 16 h. 30 m. G.M.T. after a small shower, and showed the primary rainbow and the secondary rainbow (with reversed order of colours). Outside the secondary, three faint supernumerary rainbows were just visible, but the colours could not be marked with certainty other than the red.

The second occurred at 16 h. 50 m. G.M.T. and lasted with undiminished brilliance for 15 minutes, and then faded away in another 15 minutes. With the second the primary and secondary rainbows were very vivid. Inside the primary there were three supernumerary rainbows visible. None were noticed outside the secondary in this case. The intervals between the three supernumerary reds were approximately one-third of the distance of the first of these from the primary red. The effects were enhanced by the background formed by dark Cu. Nb. clouds. R. S. READ.

Lympne Aerodrome, 20th August, 1920.

Remarkable Rain Storm at Bournemouth.

On Friday, October 15th, we were visited by a remarkable rainstorm. The morning had been dull, and light rain fell more or less continuously, but there was nothing in the nature of the weather generally to suggest in any way the tremendous downpour which occurred between 12 h. 30 m. and 13 h. G.M.T. In this half hour no less than 1·15 in. fell out of a total of 1·17 for the 24 hours ending at 9 h. G.M.T. on the 16th.

The following extract from the *Times and Directory* of Saturday, October 23rd, gives some idea of the damage caused by flooding:—

> "A number of low-lying houses and business establishments suffered from flooding, and stocks in some cases could not be removed in time to prevent their being damaged. The roads in various parts of the town were rendered almost impassable for a time; in the Central Pleasure Gardens the rush of water was so considerable that a manhole over the surface water drain blew up and the water poured out in considerable volume. Flower beds were submerged, and even some of the seats. At Boscombe the tram track was slightly damaged and repairs had to be done before traffic could continue. In one way and another the damage done throughout the town was considerable."

It appears from the Daily Weather Report that a depression passed directly along the south coast and that Bournemouth had more rain than any of the places mentioned with the exception of Scilly, where 31 mm. fell.

S. HYLA GREVES.

Rodney House, Bournemouth, 26th October, 1920.

Heavy Rainfall in Southern France.

IN the months of September and October 1920, owing to shallow depressions moving eastwards along the Pyrenees and across the Gulf of Lyons, some places in southern France experienced excessive rains. At Montpellier, rain gauges registered no less than 629 mm. of rain from September 17th to October 17th. The average for this period is only 82 mm., and the annual average based on the 39 years 1873–1911 is 734 mm.

From October 7th–17th sharp thunderstorms caused exceptional downpours, 450 mm. being recorded at Montpellier. On Saturday, October 16th, 204 mm. of rain fell during two local storms of a few hours' duration. Many parts of the town were flooded and serious damage was done.

Last summer was very dry and warm, but the drought was broken with almost tropical violence. The same feature characterised the years 1907 and 1914. M. MOYE.

University of Montpellier, France, October, 1920.

Cirrus at 10,000 Feet.

AT 16 h. 40 m. G.M.T. on October 6th, 1920, a registering balloon was sent up and was distinctly seen in the theodolite telescope to enter the clouds after 17 minutes. The rate of ascent of similar balloons is known from long experience to be close to 1 kilometre in 5 minutes, so the height of the clouds cannot have exceeded 3·5 kilometres. But the clouds were distinctly cirrus; at least, they were clouds that the three observers present would have unhesitatingly entered as cirrus. Neither would they have been taken for false cirrus, as no cumuli were present or had been for some hours.

Benson Observatory, 13th October, 1920. W. H. DINES.

Cloud-pendants over the Comeragh Mountains.

I WAS taking a Sunday afternoon walk with friends on a small hill north of this station about a mile, known as Ballydrehid; it stands north and about half a mile away from the extreme easterly spur of the Galtee Mountains, and is probably a glacial moraine. This little hill commands a magnificent panoramic view of the surrounding country, the Keeper Mountains, Slievenaman, Comeragh, and Knockmealdown Mountains. The afternoon was sultry, with intervals of hot sunshine, but some heavy threatening cumulus were in evidence. At the top of Ballydrehid Hill there is a field of oats which had been cut and the sheaves "stooked," *i.e.*, standing on end in groups of three or four. The air was perfectly calm, when we were standing admiring the view in a field next to the oat field and about 20 feet above it, and we were discussing the advisability of turning homewards, as there was a dark heavy mass of cloud gathering over the Keeper Mountain, NW., and also over the Comeraghs, SE., when the sheaves in the field next to us began to behave in a weird fashion. One sheaf stood up on end and commenced waltzing round and then fell down; then others in various other parts of the field did exactly the same thing; while round us it was perfectly still, although we were not 50 yards away. Then we saw over the Monavullagh Mountain (a spur of the Comeraghs), and about 12–15 miles SE. of us, a long tongue had dropped down from the heavy clouds above mentioned. It appeared like a long arm which was feeling for something, and I

should say was 1,000 yards long. It travelled slowly towards NE. We watched it for about 10 minutes, and then the cloud seemed to draw it up into itself; this was between 14 h. 30 m. and 14 h. 40 m. G.M.T.

I may add that we were caught in a sudden drenching rain on our way home, but without wind. However, I got a report of a similar local wind on the same afternoon from another person about a mile distant SW. Putting all these things together, it seemed to me the whole type of weather was one favouring a series of whirlwinds of varying intensity. I had evidence of three of them. There may have been many more. R. W. SMITH.

Bengurragh, Cahir, October 9th, 1920.

NOTES AND QUERIES.

Relation of Malaria to Temperature.

A PAPER on the relation of temperature to the occurrence of malaria in England appears in the Journal of the Royal Army Medical Corps for August, 1920. The author, Major Angus Macdonald, O.B.E., R.A.M.C., has examined English temperature records from 1763 to 1919 in conjunction with malaria prevalence, and estimated the probabilities of continuous endemicity of the disease in the past in this country and of its occurrence or recurrence in the present. It will be remembered that a disease is endemic when it continues without the importation of germ carriers from other localities.

The mean isotherm of 60° F. in the northern hemisphere has long been considered the northern boundary of recognised endemic malaria, and on the whole the disease increases in intensity towards the equator. The observation of epidemics justifies the assumption that for the development of malarial infection in countries occupied by the anopheline mosquito, this mean temperature, 60° F., is necessary over at least 16 days. These mosquitoes are widespread in England. During the period 1763–1919 there has been no definite change in the temperature conditions in England; the mean of the whole differs little from means taken for casual decennia throughout. The four years 1856–59 presented a seasonal malaria potentiality far beyond normal; in only seven of the fifty years 1841–90 was the required monthly mean reached in each of the months June, July and August, and of these, three were consecutive years, viz., 1857, 1858 and 1859. It was in these years that the last widespread and intense occurrence of malaria occurred of which we have record in

this country. No other comparable period of continued high temperature existed, the nearest being 1825–6, when there was a marked occurrence of malaria, and 1808–9. Furthermore, 1860 was a phenomenally cold year and official recognition of endemic malaria ended suddenly in that year. Greenwich records are used as representing the south of England, and differing but little from those of the Fen district. Evidence of indigenous malaria north of the Humber is very rare.

The period of greatest importation of malaria carriers (*i.e.*, persons already infected) in history was 1916–19; the disease developed considerably in 1917–19 in those months when the requisite thermal conditions obtained and in approximate proportion to the extent of these conditions. The outbreak was more severe in 1856–59, in spite of the smaller number of carriers, because of the more continuous high mean temperature of the summer months.

Elevation of temperature does not occur in England with the regularity and continuity necessary to maintain endemic malaria. When the necessary coincidence of carrier importation and high mean temperature occurs, both epidemic and endemic malaria may break out for a limited time in limited areas. Many other factors affect the disease, and the living conditions in England over 100 years ago may have been more favourable to its incidence, but the temperature factor is essential.

The Highest Aerial Sounding.

THE record of 35,030 metres which is alleged to have been established by a balloon sent up at Pavia on December 7th, 1911, has been accepted by many authorities; it is therefore desirable to examine the available evidence concerning it. The usual details of the ascent are set out in a paper by Professor Pericle Gamba.* The balloon was a Continental one, diameter 190 cm., and it carried a parachute with a Teisserence de Bort meteorograph. Hydrogen was used, and the residual ascensional force was 2,200 gramme weight. The balloon was sent up at 8 h. 14 m. The details in the first columns of the following table have been taken from Professor Gamba's paper. The mean speed of ascent has been computed from the tabulated heights. It will be seen from the table that the rate of ascent for the last eight minutes is no less than 900 metres per minute and nearly four times the

* Reale Istituto Lombardo di Scienze e Lettre, *Rendiconti*. Serie II, Vol. XLVI. Fasc. xi, p. 505.

initial rate. Such a phenomenon is so improbable that some error in the readings of the barograph from which the heights were computed is certain. No evidence as to the calibration of this instrument is given in the paper.

Time from Start.	Pressure.	Temperature.	Nominal Height.	Mean Rate of Ascent.
min.	mm.	a.	metres.	metres/minutes.
0	762	278·6	77	—
10	569	272·0	2,435	235·8
20	408	258·9	5,025	259·0
30	279	241·3	7,810	278·5
40	175	221·4	10,905	309·5
50	85	217·6	15,520	461·5
60	44	216·1	19,730	421·0
70	14	217·2	26,990	726·0
78m. 40s.	4	221·4	35,030	927·7

It may be noticed, however, that if a balloon could retain its hydrogen and rise to such a height that the pressure was only 4 mm., the volume would be nearly 200 times that at starting and the diameter six times, so that the Pavia balloon would have had a diameter of about 36 feet when it burst.

In all probability the barograph was not working properly and the rate of ascent was really approximately constant at the initial rate, say 240 metres per minute. On this assumption the stratsphere was reached at 10·3 km., and the greatest height attained was 18·9 km. If the Pavia ascent is to be deprived of pride of place as the highest on record, the question naturally arises which is the next claimant. Perhaps some reader of the *Magazine* can say. F. J. W. W.

A Defective Sunshine Recorder.

STUDENTS of the *Monthly Weather Report* may have noticed the very low amount of sunshine registered at Hull, as shown by the marked bend in the isohel on the monthly map. The deficiency was accepted in the Office as due to atmospheric conditions, but about a year ago a closer consideration showed that this could not account for the discrepancy, and an examination of the sunshine recorder followed. An instrument was lent to the station by the Meteorological Office, and during February 1920 the Meteorological Office recorder was running with the local recorder. In April the balls were interchanged. Upon comparing the two sets of cards for each month the discrepancy between the standard recorder and the local recorder was found to be the same for

both February and April, which lead to the conclusion that the ball of the local recorder was at fault, as it had only been registering about 74 per cent. of the conventional duration of "bright sunshine." On this evidence the normal, quoted as 2·71 hours in the *Book of Normals*, should be brought up to 3·65 hours per day.

The defective ball has since been examined at the Meteorological Office. The distance between the centre of the sphere and the point where the sunlight is focussed has been found to be about a tenth of an inch less than the specified 2·97 in. Owing to this shortened focal length the ball had to be tilted to bring a sharp image of the sun on the card. Consequently, if the sun is not sufficiently bright, no trace or "burn" will be left on the card. With such a ball there will be a systematic error in the case of morning and evening sunshine, and on the whole there will be a deficiency in the percentage of "bright sunshine."

Geostrophic Wind over London; December, 1881–1915.

FREQUENCY OF STRENGTH AND DIRECTION.

Estimates based on the D.W.R. charts (8 *h.*, 1881–1908; 7 *h.*, 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.	7	20	14	17	9	67
NE.	4	14	10	2	3	33
E.	5	19	15	8	2	49
SE.	23	29	15	7	5	79
S.	21	26	22	20	16	105
SW.	22	53	76	64	27	242
W.	13	43	72	82	33	243
NW.	15	20	35	20	15	105
Total Frequency of strength	110	224	259	220	110	923*

* Indeterminate—162.

News in Brief.

The Folkestone Corporation Bill of 1920 contained a section providing for the keeping of meteorological records, which is probably unique in the annals of Private Bill legislation:—

"The Corporation may provide and maintain barometrical and other instruments for recording the state of the weather and may take all necessary steps for making and publishing weather reports and statistics."

Dr. O. S. Sinnatt, M.C., D.Sc., M.Sc., at present lecturer in Mechanical Engineering, London University, King's College, has been appointed to the Professorship of Aeronautical Science at the R.A.F. Cadet College, Cranwell.

Mr. L. F. Richardson, formerly Superintendent of Eskdalemuir Observatory, who has recently been engaged on experimental investigations at Benson, has accepted an appointment on the staff of the Westminster Training College.

Summer Time in Belgium ended on Saturday night, October 23rd, 1920.

Readers who are familiar with Mr. Lempfert's little book *Weather Science* will welcome a larger work from his pen. The volume (*Meteorology.* By R. G. K. Lempfert, M.A., C.B.E., Assistant Director of the Meteorological Office. London, Methuen & Co. Price 7*s.* 6*d.* net), which has recently been published by Messrs. Methuen & Co., contains a general survey of dynamical meteorology. Special attention has been given to the developments of the past 15 years, during which period the systematic exploration of the upper air has opened up so many new fields of investigation. The treatment is elementary, and does not assume a knowledge of advanced mathematics or physics. It is hoped that a review will be published in the *Magazine* at an early date.

Review.

Australian Meteorology: A textbook including sections on aviation and climatology. By Griffith Taylor, D.Sc. Oxford Clarendon Press, 1920. 12*s.* 6*d.* Net.

Dr. Griffith Taylor, whose writings on Australian climatology are well known, has done good service in preparing this textbook, which is a comprehensive study of meteorology, but written from the Australian point of view.

The books on meteorology by English authors are primarily concerned with the conditions in the temperate zone and on the eastern margin of a continent. Australian meteorology is concerned, on the other hand, with the whole of a continent which lies partly in the tropics, so that Dr. Taylor has scope for much pioner work in his treatment of the subject.

The most speculative chapter in the book is devoted to the origin of the tropical "lows" in Australia. The argument is based on the supposition that "convective domes" of rising air formed over the hottest parts of the continent

have such stability that they act like solid obstacles in producing great eddies in the planetary circulation. It is to be hoped that the author will find an opportunity to set out his theory in greater detail. In the semi-popular exposition it is difficult to follow. A primary objection is that the desert regions are generally regarded as localities where in spite of the heating of the lower layers the air is descending on the whole.

There are 229 illustrations in the book, and the majority are excellent, but a few details call for criticism. For example, the Dines balloon meteorograph is shown in the diagrams and described in the text as having two pens for pressure and temperature respectively, whereas it is an essential feature of this instrument that the synchronous temperature and pressure are indicated by a single point on the record. The illustration of the Dines anemometer is apparently intended to represent the anemobiagraph rather than Mr. Dines' own instrument, but the spring control which is an essential detail in the anemobiagraph is not shown. The instrument illustrated would presumably record wind pressure or the square of the wind speed. A theoretical diagram showing the paths of bodies moving without friction over the globe seems to require reconsideration. The path of a body projected eastward with less than a certain critical velocity is shown rightly as a series of loops, but these loops should not have touched the equator, and in the limiting case of the critical velocity the path should be asymptotic to the equator and not built up of two parts, a short curve and the equator itself.

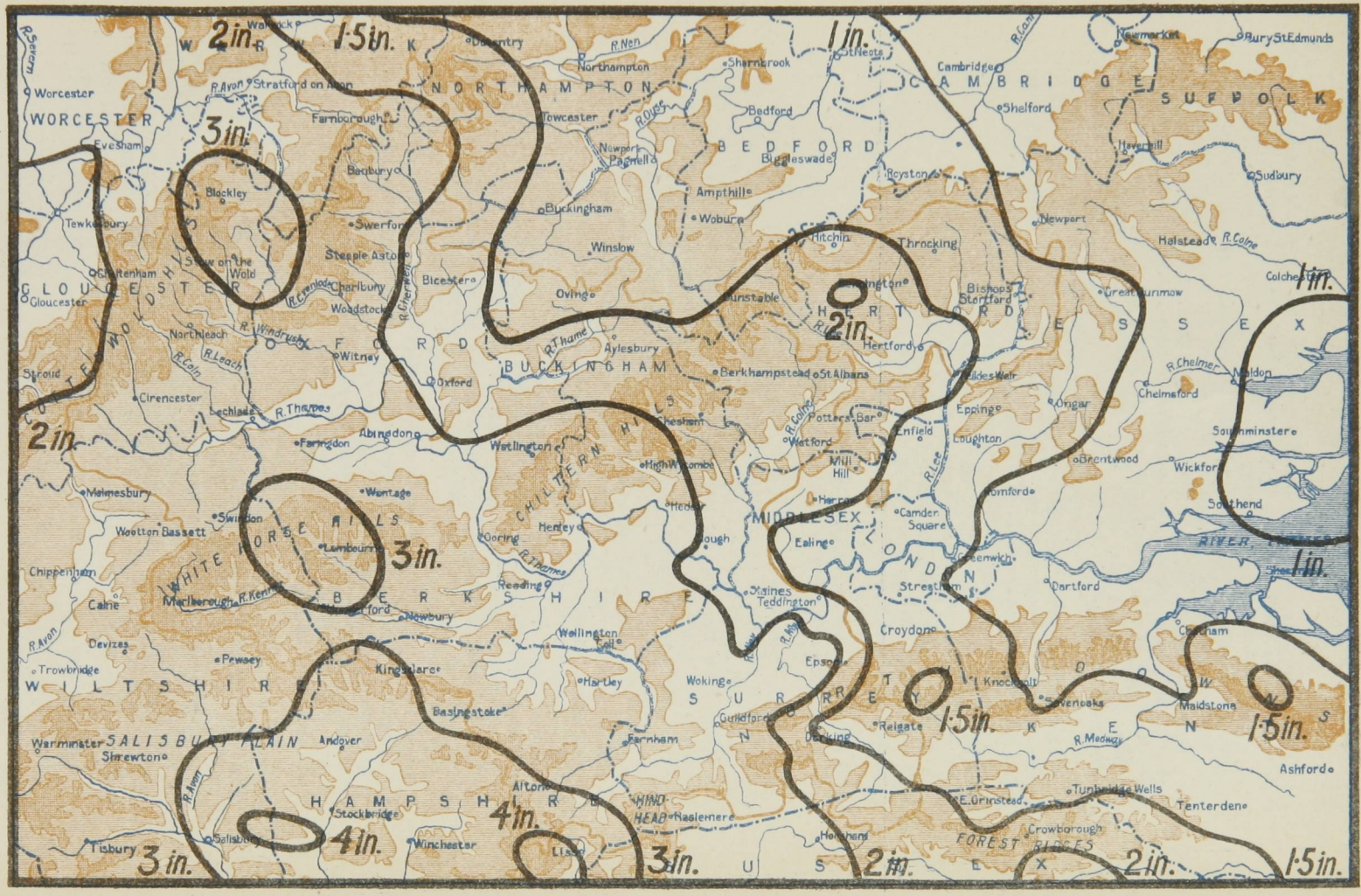
Australian Meteorology can be warmly recommended to the notice of those whose interest is primarily in the science of meteorology as well as to those who are more concerned with Australia.

Weather in the British Isles: October 1920.

THE outstanding characteristic of October was the abundant sunshine in the east and south of England. At Yarmouth only 7 mm. of rain were recorded and there were nineteen days on which the duration of bright sunshine exceeded six hours, whereas at the Valentia Observatory (Co. Kerry) there were 203 mm. of rain and only one day with as much as six hours' sunshine. At Felixstowe the sunny hours during the month amounted to 207, and at Copdock (Ipswich) 200 were recorded, the latter figure being well above any October total recorded at this station during the past 18 years. The observer at Southport reports that it was the driest and yet the most humid October for at least 50 years, and that easterly winds were exceptionally persistent.

A depression which advanced quickly from the westward during the night of the 1st caused gales from the south-east and south in Ireland, in the Hebrides, and in the south-west of England early in the morning of the 3rd, but did not affect the eastern districts. This gale was severe in the south of Ireland and especially in Cork Harbour, where much damage was done to

THAMES VALLEY RAINFALL.——OCTOBER, 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 50

Meteorological Magazine

"Watershed of River Thames above Teddington, and River Lee above Feildon Weir

Isohyetals

H.M. Stationery Office Press, Kingsway W.C.2.

Rs. 5246/99. 105. P.&S. 1250. 11/20.

wharves and shipping. At Valentia Observatory a gust of 67 miles per hour was recorded at 5 h., and there was one of 54 miles per hour at Weaver Point (Cork Harbour) at 11 h. 40 m. Much rain accompanied this gale. As a result of the incessant rainfall in the Dee Valley (27 mm. fell at Crathes on the 1st, 20 mm. on the 2nd, and 38 mm. on the 4th, and 41 mm. on the latter date at Balmoral, whilst Braemar reported 83 mm. on the 3rd and 4th), there were serious floods, said to be even more extensive than those of 1829, previously the worst on record for the neighbourhood. In Shetland there was a continuous gale during the four days, 2nd to 5th. On the 5th secondary depressions passed northward over St. George's Channel, and in many places caused thunderstorms and heavy rain.

After this date pleasanter conditions set in and under the influence of a warm southerly current of air a spell of summer-like weather which synchronised with "St. Luke's Summer" was widely experienced. For many consecutive days the temperature rose to 70° F. and above, and in some instances maxima unequalled in October since 1908 were recorded. At Sheepstor (Devon) on the 9th the maximum was 73° F., the first time that 70° F. has been reached at this station in this month during 14 years. The nights also were very warm and minima between 55° F. and 60° F. were frequently registered, some of the minima being as high as the normal maxima for the time of year.

At some of the western stations, rain fell heavily on the 15th, when there was 29 mm. at Bournemouth in half an hour (12 h. 30 m. to 13 h.) and 57 mm. at Newquay between 17 h. and 19 h. 30 m.

During the last two weeks of the month there was high pressure over Scandinavia, and the dry easterly winds brought clear skies to this country. The days were generally sunny and mild, but there was much local fog and mist; on the other hand the nights were colder and there were occasional frosts. During the week which ended on the 30th, the mean daily amount of sunshine was 8·9 hours at three widely separated stations, Cromer, St. Leonards and St. Heliers, the percentage of the possible duration being 89, 88 and 87 respectively. These figures may be compared with 87 per cent. at Deerness for the week ending 19th June, and 78 per cent. at Castlebay for the previous week. Over a large part of the country there was no cloud from the 24th to the 30th, with the exception of low-lying fog and mist, these and the previous sunny days combined with unusually bright moonlight nights making the month the most brilliant October experienced for very many years. The closing days of the month were boisterous; there was a southerly gale in the north of Scotland, in the Hebrides, and in the northern parts of the North Sea on the 30th, and in most parts of the east and south-east coast on the 31st.

As the result of the long spells of fine weather the conditions for daylight flying were much better than in an average October. There was much fog at night and in the morning, but, except in the immediate neighbourhood of large towns, it never lasted all day. Near the beginning and in the middle of the month there were spells of unsettled weather, but there was no continuously bad day in the south-east area. In the extreme west conditions were less favourable for flying than elsewhere.

The rainfall of the month was in general below the average, but the local departures from the normal were very remarkable. In England a considerable area in East Anglia had less than 13 mm., while in Devon and Cornwall 150 mm. was recorded, this being the only large area with excess. In Scotland and Ireland an inversion of the usual distribution occurred, the wet areas being in general to the east. The north of Scotland was unusually dry, large areas recording less than 50 mm. and only 20 per cent. of the average; but in Aberdeenshire and Perthshire heavy rains occurred at the beginning of the month.

(*Continued on* p. 236.)

Rainfall Table for October 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*	2·72	1·09	28	40	·38	16	13
Tenterden (View Tower)	*Kent*	3·48	1·40	36	40	·56	15	9
Arundel (Patching)	*Sussex*	4·01	2·39	61	60	·61	31	7
Fordingbridge (Oaklands)	*Hampshire*	3·97	3·17	80	80	·62	14*	18
Oxford (Magdalen College)	*Oxfordshire*	2·82	2·08	53	74	1·13	31	11
Wellingborough (Swanspool)	*Northampton*	2·60	1·60	41	62	·54	14	10
Hawkedon Rectory	*Suffolk*	2·65	·55	14	21	·23	31	5
Norwich (Eaton)	*Norfolk*	3·17	·77	20	24	·42	1	6
Launceston (Polapit Tamar)	*Devon*	4·84	6·36	162	131	1·81	3	16
Lyme Regis (Rousdon)	„	3·81	2·50	64	66	·46	21	12
Ross (Birchlea)	*Herefordshire*	3·21	3·50	89	109	·70	3	18
Church Stretton (Wolstaston)	*Shropshire*	3·77	3·32	84	88	1·03	16	13
Boston (Black Sluice)	*Lincoln*	2·75	1·50	38	55	1·26	1	7
Worksop (Hodsock Priory)	*Nottingham*	2·77	1·88	48	68	·58	4	14
Mickleover Manor	*Derbyshire*	2·81	1·95	50	69	·56	15	10
Southport (Hesketh Park)	*Lancashire*	3·74	1·13	29	30	·29	31	9
Wetherby (Ribston Hall)	*York, W. R.*	3·18	2·92	74	92	1·04	15	8
Hull (Pearson Park)	„ *E. R.*	3·19	1·50	38	47	·87	1	9
Newcastle (Town Moor)	*North'land*	3·20	1·62	41	51	·74	4	11
Borrowdale (Seathwaite)	*Cumberland*	12·71	2·20	56	17	..	..	..
Cardiff (Ely)	*Glamorgan*	4·87	3·65	93	75	·76	16	16
Haverfordwest	*Pembroke*	5·51	..	..	..	..	..	..
Aberystwyth (Gogerddan)	*Cardigan*	5·38	3·14	80	58	..	..	..
Llandudno	*Carnarvon*	3·78	1·64	42	43	·31	3	11
Dumfries (Cargen)	*Kirkcudbrt.*	4·45	3·29	84	74	1·22	3	13
Marchmont House	*Berwick*	3·83	2·27	58	59	1·26	4	16
Girvan (Pinmore)	*Ayr*	5·38	5·75	146	107	1·17	5	14
Glasgow (Queen's Park)	*Renfrew*	3·36	1·31	33	39	·59	5	10
Islay (Eallabus)	*Argyll*	4·95	6·26	159	126	1·97	30	12
Mull (Quinish)	„	5·87	4·73	120	81	1·51	30	12
Loch Dhu	*Perth*	7·53	5·35	136	71	1·85	5	12
Dundee (Eastern Necropolis)	*Forfar*	2·81	2·26	57	80	·80	4	16
Braemar	*Aberdeen*	3·88	5·03	128	130	1·95	3	9
Aberdeen (Cranford)	„	3·23	2·89	73	89	·91	2	13
Gordon Castle	*Moray*	3·38	1·42	36	42	·36	4	10
Drumnadrochit	*Inverness*	3·49	..	..	..	..	..	..
Fort William	„	7·32	3·03	77	41	·86	30	13
Loch Torridon (Bendamph)	*Ross*	8·38	1·72	44	21	·42	4	5
Stornoway	„	3·58	2·66	68	74	1·05	6	12
Dunrobin Castle	*Sutherland*	3·15	·90	23	29	·48	5	8
Wick	*Caithness*	3·14	·61	16	19	·19	4	9
Glanmire (Lota Lodge)	*Cork*	4·35	4·60	117	106	1·16	3	19
Killarney (District Asylum)	*Kerry*	5·59	4·48	114	80	1·34	2	17
Waterford (Brook Lodge)	*Waterford*	4·00	7·99	203	200	2·09	6	16
Nenagh (Castle Lough)	*Tipperary*	3·48	4·38	111	126	·83	5	15
Ennistymon House	*Clare*	4·40	3·39	86	77	·85	2	15
Gorey (Courtown House)	*Wexford*	3·75	8·33	212	222	1·87	30	17
Abbey Leix (Blandsfort)	*Queen's Co.*	3·53	5·64	143	160	1·37	5	15
Dublin (FitzWilliam Square)	*Dublin*	2·88	6·39	162	222	·97	19	16
Mullingar (Belvedere)	*Westmeath*	3·19	3·42	87	107	·75	31	13
Woodlawn	*Galway*	3·80	3·11	79	82	·83	3	19
Crossmolina (Enniscoe)	*Mayo*	5·27	3·52	89	67	·79	3	17
Collooney (Markree Obsy.)	*Sligo*	4·21	2·64	67	63	1·01	3	15
Seaforde	*Down*	3·65	7·47	190	205	1·29	3	13
Ballymena (Harryville)	*Antrim*	3·78	5·79	147	153	1·27	30	14
Omagh (Edenfel)	*Tyrone*	3·76	4·69	119	125	1·20	6	15

* and 3.

Supplementary Rainfall, October 1920.

Div.	STATION.	RAIN.		Div.	STATION.	RAIN.	
		in.	mm.			in.	mm.
II.	Ramsgate	·92	23	XII.	Langholm, Drove Rd.	1·92	49
,,	Sevenoaks, Speldhurst	·94	24	XIII.	Selkirk, Hangingshaw	2·37	60
,,	Hailsham Vicarage	1·69	43	,,	North Berwick Res.	·90	23
,,	Totland Bay, Aston	2·55	65	,,	Edinburgh, Royal Ob.	·87	22
,,	Ashley, Old Manor Ho.	3·48	88	XIV.	Biggar	1·57	40
,,	Grayshott	2·91	74	,,	Leadhills	3·00	76
,,	Ufton Nervet	2·51	64	,,	Maybole, Knockdon	2·00	51
III.	Harrow Weald, Hill Ho.	1·93	49	XV.	Rothesay	4·29	109
,,	Pitsford, Sedgebrook	1·02	26	,,	Ardgour House	3·31	84
,,	Chatteris, The Priory.	..	..	,,	Inveraray Castle	4·24	108
IV.	Elsenham, Gaunts End	·91	23	,,	Holy Loch, Ardnadam	2·93	74
,,	Lexden, Hill House	·82	21	XVI.	Loch Venachar	3·30	86
,,	Aylsham, Rippon Hall	1·27	32	,,	Glenquey Reservoir	1·90	48
,,	Swaffham	·77	20	,,	Loch Rannoch, Dall	4·63	118
V.	Devizes, Highclere	2·32	59	,,	Coupar Angus	3·13	80
,,	Weymouth	2·94	74	,,	Montrose Asylum	2·47	63
,,	Ashburton, Druid Ho.	4·95	126	XVII.	Balmoral Castle	4·64	118
,,	Cullompton	3·68	94	,,	Fyvie Castle	4·02	102
,,	Hartland Abbey	6·20	158	,,	Peterhead, Forehill	..	..
,,	St. Austell, Trevarna	7·14	181	,,	Grantown-on-Spey	1·30	33
,,	North Cadbury Rec.	2·86	73	XVIII.	Cluny Castle	1·96	50
,,	Cutcombe, Wheddon Cr.	4·80	122	,,	Loch Quoich, Loan	6·80	173
VI.	Clifton, Stoke Bishop.	3·00	76	,,	Skye, Dunvegan	5·29	134
,,	Ledbury, Underdown.	2·51	64	,,	Fortrose	·72	18
,,	Shifnal, Hatton Grange	4·21	107	,,	Ardross Castle	1·86	47
,,	Ashbourne, Mayfield	2·06	52	,,	Glencarron Lodge	1·32	34
,,	Barnt Green, Upwood	3·44	87	XIX.	Tongue Manse	·78	20
,,	Blockley, Upton Wold	3·74	95	,,	Melvich Schoolhouse	·55	14
VII.	Grantham, Saltersford	1·29	33	,,	Loch More, Achfary	1·40	36
,,	Louth, Westgate	1·18	30	XX.	Dunmanway Rectory	6·04	153
,,	Mansfield, West Bank	2·18	55	,,	Mitchelstown Castle	5·58	142
VIII.	Nantwich, Dorfold Hall	1·71	43	,,	Gearahameen	10·00	254
,,	Bolton, Queen's Park.	1·65	42	,,	Darrynane Abbey	5·83	148
,,	Lancaster, Strathspey.	1·23	31	,,	Clonmel, Bruce Villa	7·38	188
IX.	Wath-upon-Dearne	1·65	42	,,	Cashel, Ballinamona	3·84	98
,,	Bradford, Lister Park.	3·19	81	,,	Roscrea, Timoney Pk.	4·83	123
,,	West Witton	3·61	92	,,	Foynes	2·93	74
,,	Scarborough, Scalby	2·49	63	,,	Broadford, Hurdlesto'n	..	..
,,	Ingleby Greenhow	2·36	60	XXI.	Kilkenny Castle	6·17	157
,,	Mickleton	2·80	71	,,	Rathnew, Clonmannon	7·32	186
X.	Bellingham	2·13	54	,,	Hacketstown Rectory	6·69	170
,,	Ilderton, Lilburn	2·19	56	,,	Ballycumber, Moorock	3·22	82
,,	Orton	1·45	37	,,	Balbriggan, Ardgillan	6·05	154
XI.	Llanfrechfa Grange	4·13	105	,,	Drogheda	4·48	114
,,	Treherbert, Tyn-y-waun	7·36	187	,,	Athlone, Twyford	3·25	82
,,	Carmarthen Friary	6·20	158	,,	Castle Forbes Gdns.	2·85	72
,,	Fishguard	6·05	154	XXII.	Ballynahinch Castle	5·25	133
,,	Lampeter, Falcondale	5·20	132	,,	Westport House	3·35	85
,,	Abergwngy	5·00	127	XXIII.	Enniskillen, Portora	2·90	74
,,	Cray Station	7·00	178	,,	Armagh Observatory	5·36	136
,,	Crickhowell, Talymaes	3·50	89	,,	Warrenpoint	5·40	137
,,	Lake Vyrnwy	4·38	111	,,	Banbridge, Milltown	5·94	151
,,	Llangynhafal, P. Drâw	2·33	59	,,	Belfast, Cave Hill Rd.	6·56	167
,,	Dolgelly, Bryntirion	5·05	128	,,	Glenarm Castle	7·14	181
,,	Lligwy	3·25	82	,,	Londonderry, Creggan	4·10	104
XII.	Stoneykirk, Ardwell Hq.	5·12	130	,,	Sion Mills	3·71	94
,,	Whithorn, Cutroach	3·51	89	,,	Milford, The Manse	2·90	74
,,	Carsphairn, Shiel	5·27	134	,,	Killybegs, Rockmount.	1·66	42

Climatological Table for the

STATIONS	PRESSURE		TEMPERATURE							
			Absolute				Mean Values			
	Mean of Day M.S.L.	Diff. from Normal	Max.	Date	Min.	Date	Max.	Min.	½ max. and min.	Diff. from Normal
	mb.	mb.	°F.		°F.		°F.	°F.	°F.	°F.
London, Kew Observatory	1018·1	+2·2	79	25	36	5	63·9	47·3	55·6	+2·2
Gibraltar	1015·7	+0·8	79	29	52	20	72·6	59·0	65·8	+0·5
Malta	1017·1	+3·4	82	23	57	6	75·2	62·0	68·6	+3·5
Sierra Leone	1011·5	−0·2	92	21, 30	65	22	88·8	73·5	81·1	−0·8
Lagos, Nigeria	1012·2	+1·2	89	11	71	6	86·6	75·2	80·9	−0·3
Kaduna, Nigeria	1013·0	+3·4	92	9,11,14	66	5,29,31	86·6	68·9	77·7	−1·4
Zomba, Nyasaland	1015·7	+1·4	82	4,26,27	53	7	74·6	58·3	66·5	+0·8
Salisbury, Rhodesia	1017·4	−1·7	81	27	45	6,14,24	76·0	49·5	62·7	+2·3
Cape Town	..	..	83	14	41	25	67·2	52·0	59·6	+1·0
Johannesburg	1016·2	−0·3	77	6	31	27	65·8	46·4	56·1	+1·7
Mauritius	1016·9	+0·5	80	16, 21	61	9	78·3	66·0	72·1	−0·5
Bloemfontein	..	..	77	6	23	27	65·7	40·5	53·1	+0·4
Calcutta, Alipore Obsy.	1003·7	+0·2	104	7	70	14	96·8	77·7	87·3	+1·3
Bombay	1007·9	+0·2	93	29	79	3, 4	91·5	81·0	86·3	+0·6
Madras	1005·3	−0·1	109	6	74	26	99·5	81·4	90·5	+0·6
Colombo, Ceylon	1009·3	+1·1	89	21	73	29	87·7	78·2	82·9	+0·1
Hong Kong	1007·1	−2·3	88	23	68	1	80·1	73·1	76·6	−0·8
Sydney	1019·3	+0·7	77	14	43	19	68·8	49·6	59·2	+0·7
Melbourne	1019·6	+0·4	67	29, 31	36	28	58·5	45·6	52·1	−1·9
Adelaide	1020·0	−0·1	74	30	37	23	65·1	48·8	56·9	−0·8
Perth, West Australia	1016·9	−1·8	81	5	45	1	68·8	52·9	60·9	+0·5
Coolgardie	1016·8	−3·0	82	24	37	12, 31	69·0	45·9	57·5	−0·1
Brisbane	1018·3	−0·6	83	16	47	13	73·4	55·8	64·6	+0·2
Hobart, Tasmania	1014·8	−0·5	64	25	34	23	57·5	43·8	50·7	+0·3
Wellington, N.Z.	1009·2	−6·0	63	5	31	21	56·3	44·7	50·5	−2·3
Suva, Fiji	..	..	..	..	..	..	..	..	..	..
Kingston, Jamaica	1012·4	−0·9	90	30	69	24	87·4	72·2	79·8	+0·1
Grenada, W.I.	1013·1	+0·5	86	4, 10	71	15, 16	84·2	74·2	79·2	−0·3
Toronto	1018·6	+3·8	83	31	31	2	65·2	43·7	54·5	+1·8
Fredericton, N.B.	..	..	83	27	25	5	65·7	37·3	51·5	−0·1
St. John, N.B.	1017·3	+3·3	74	26	30	4	56·4	40·0	48·2	+0·5
Victoria, B.C.	1018·5	+2·1	67	6	40	13, 24	57·1	42·9	50·0	−3·1

LONDON, KEW OBSERVATORY.—Mean speed of wind 8·9 mi/hr; 2 fogs; 1 day with thunder heard.

GIBRALTAR.—3 gales; 3 days with thunder heard.

MALTA.—Prevailing wind direction NW.; mean speed 4·8 mi/hr.

SIERRA LEONE.—7 gales; 3 days with thunder heard.

MAURITIUS.—Mean speed of wind 7·2 mi/hr.; 2 days with thunder heard.

British Empire, May 1920.

TEMPERATURE		Relative Humidity	Mean Cloud Am'nt	PRECIPITATION				BRIGHT SUNSHINE		STATIONS
Absolute				Amount		Diff. from Normal	Days	Hours per day	Percentage of possible	
Max. in Sun ° F.	Min. on Grass ° F.	%	0–10	in.	mm.	mm.				
132	26	67	6·4	0·85	22	− 22	12	6·8	44	London, Kew Observatory
146	51	74	4·0	1·41	36	− 9	6	..	..	Gibraltar.
144	..	78	2·5	0·00	0	− 10	0	9·7	69	Malta.
..	..	72	6·3	5·67	144	−142	16	..	..	Sierra Leone.
160	68	75	6·6	8·91	226	− 37	18	..	..	Lagos, Nigeria.
..	..	83	..	3·56	90	− 96	17	..	..	Kaduna, Nigeria.
..	..	90	6·3	2·42	61	+ 36	12	..	..	Zomba, Nyasaland.
140	37	54	3·5	0·39	10	+ 5	3	..	..	Salisbury, Rhodesia.
..	..	77	5·1	3·43	87	− 14	11	..	..	Cape Town.
..	30	56	2·0	1·67	42	+ 24	8	8·7	81	Johannesburg.
..	57	81	5·2	4·55	116	+ 39	15	7·5	67	Mauritius.
..	..	64	3·9	0·39	10	− 20	2	..	..	Bloemfontein.
..	67	51	3·8	2·61	66	− 80	6	..	..	Calcutta, Alipore Obsy.
..	..	73	4·4	0·00	0	− 18	0	..	..	Bombay.
..	..	65	3·2	1·25	32	+ 5	4	..	..	Madras.
154	71	76	6·5	8·68	220	− 91	15	..	..	Colombo, Ceylon.
..	..	86	7·9	18·15	461	+164	19	4·4	33	Hong Kong.
122	36	65	2·3	0·29	7	−119	4	..	..	Sydney.
115	30	75	6·2	1·98	50	− 5	21	..	..	Melbourne.
132	27	63	4·4	2·36	60	− 9	11	..	..	Adelaide.
139	36	66	6·2	6·70	170	+ 50	20	..	..	Perth, West Australia.
137	33	48	5·1	0·26	7	− 28	6	..	..	Coolgardie.
133	40	67	5·1	2·02	51	− 23	12	..	..	Brisbane.
..	27	72	5·7	2·17	55	+ 8	13	5·5	57	Hobart, Tasmania.
121	22	77	6·2	2·27	58	− 62	13	4·1	42	Wellington, N.Z.
..	..	..	..	..	..	..	..	..	..	Suva, Fiji.
..	..	75	5·0	3·46	88	− 22	8	..	..	Kingston, Jamaica.
138	..	72	5·0	1·35	34	− 84	13	..	..	Grenada, W.I.
142	26	64	3·8	0·39	10	− 66	6	..	..	Toronto.
..	..	..	..	1·44	37	− 45	5	..	..	Fredericton, N.B.
129	24	79	5·2	1·56	40	− 54	6	..	..	St. John, N.B.
133	31	90	4·2	1·37	35	+ 2	9	..	..	Victoria, B.C.

COLOMBO, CEYLON.—Prevailing wind direction SW.; mean speed 5·7 mi/hr.; 3 days with thunder heard.

HONG KONG.—Prevailing wind direction E; mean speed 14·0 mi/hr.; 3 fogs; 6 days with thunder heard.

GRENADA.—Prevailing wind direction E.

WELLINGTON, N.Z.—1 day with thunder heard.

BLOEMFONTEIN.—Absolute min. one of the lowest yet recorded.

In Ireland the total fall was below 75 mm. only in the west, and nearly the whole of the east coast received more than 150 mm. Twice the average was reached in small areas locally, and at Brook Lodge, Waterford, only two wetter Octobers have been recorded since 1850. The general rainfall expressed as a percentage of the average was:—England and Wales, 58; Scotland, 67; Ireland, 127; British Isles, 79.

In London (Camden Square) the mean temperature was 51·9° F., or 1·7° F. above the average. The duration of rainfall was 22·6 hours, and the evaporation, ·66 inch.

Weather Abroad: October 1920.

THE most noteworthy feature of the month was the remarkable persistence of high pressure over the Scandinavian area. The anticyclone which was established over that region throughout the last week of September persisted until October 13th, when it withdrew in a south-easterly direction. By the 18th, however, another anticyclone had reached Scandinavia from the westward; this increased in intensity, and persisted till the end of the month. The Atlantic depressions were unable to proceed either eastward or north-eastward, most of them remaining stationary off the west of Ireland and slowly filling up, though on the 17th and 18th a depression penetratcd to Central France. During most of the month there were shallow irregular depressions over the Mediterranean and South France. In accordance with the pressure distribution, the general wind current over north-west Europe was between east and south.

There were some heavy rainstorms in France, especially in the south. Among the most notable falls were 61 mm. at Nice, and 45 mm. at Marseilles on the 1st; 80 mm. at Sanguinaire (Corsica) on the 2nd; 57 mm. at Marseilles and 48 mm. at Perpignan on the 8th; 60 mm. at Sanguinaire on the 11th; and 64 mm. at Paris on the 17th. A fall of 51 mm. was also recorded at Aix-la-Chapelle on the 1st.

The month was unusually dry over most of the Scandinavian area, and there was no rain except on the 2nd and 15th. The dry conditions extended over the Netherlands and the eastern part of the British Isles.

For the first half of the month temperature was high over Western Europe, a maximum of 79° F. being recorded at Paris on the 5th. Towards the end of the month the persistent east winds brought lower temperatures, night frosts being experienced over a wide area, and severe frost over Central Europe. On the 30th the minimum at Warsaw was 14° F. and the maximum 30° F. There were also occasional sharp frosts locally over Scandinavia in anticyclonic conditions, a minimum of 14° F. being recorded at Saerna (Sweden) on 19th.

The autumn was warm and late in Ontario, and many vagaries of plant and tree life have occurred. Wild fruits and flowers were plentiful even near the end of the month.

The monsoon rainfall in India has, on the whole, been deficient. Between the 1st and 21st of October Kashmir received an excess and the Bombay Deccan a normal amount of rain. The Bay Islands and Lower Burma had a fair amount, but other regions suffered from scanty rainfall.

A message received on the 23rd states that light to heavy general rains have fallen through South Australia and an exceptional wheat harvest is now practically assured. Good rainfall has also been experienced in New South Wales and Victoria.

Abundant rain fell in the Argentine during the first few days of the month, and the crop prospects were much improved. Some damage was, however, caused at the end of the month by sharp frost in the littoral provinces.