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## Kelvin

JUNE 26TH, 1824—DECEMBER 23RD, 1907

By Sir NAPIER SHAW, F.R.S.

IN my undergraduate days, Kelvin was known to all students of mathematics in Cambridge as one of the authors of Thomson and Tait's "Natural Philosophy," vol. 1, the first (and last) instalment of a great work in four volumes (*absit omen*), which was to range from definitions and fundamental ideas to electrodynamics. Our volume got as far as elasticity. It differed from our text-books because it seemed to be guided by the wish to know things, not so much by the desire to arrange things that were known. You would not expect to find the explanation of a jamming drawer in our books on friction, but T. & T'. gave it. It used geometrical or analytical methods just as it liked. We used to see Kelvin frequently in Cambridge, but very seldom Tait. Kelvin was a Fellow of Peterhouse, and took an interest in the Musical Society, and he and Maxwell were busy about ohms and ampères and volts. In 1884 he provided Peterhouse with an installation of electric light, to be the first in Cambridge. But while it was in the making, my own College was celebrating a tercentenary, and had been redecorated; the Master, horrified at the idea of spoiling the new clean surfaces with gas, begged me, as Lecturer in Natural Science, to see about electricity. I got Edward Hopkinson of Mather & Platt's, then a junior Fellow, to set up an installation in the Chapel and Hall in time for the commemoration service and banquet. It was done with an

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agricultural engine and a dynamo (with a fault in it that had to be excised by cutting out one coil), a coal-porter as engineer, and the whole only finished on the day itself, no rehearsal. Then, to our dismay, Kelvin appeared in Cambridge, and had to be invited to see the experiment put through. We had arranged with the engineman that if the dynamo got overheated and he had to shut down, he should blow his whistle. In the middle of a speech by the American Ambassador, J. R. Lowell, off went the whistle. Hopkinson went to see about the shutting down, while, much humiliated, I arranged about lighting the gas. But, after all, it was only a *feu de joie* on the part of the lonely engineman : he was so much elated at having run for three hours without a stop that he could not help it, and I still cherish Kelvin's congratulations on the success of that evening's effort.

But it was at Section A of the British Association that young men got to know Kelvin personally. He was always there—Lady Kelvin always with him. We used then to go on with the reading of papers from 11 o'clock till 3 without intermission—sherry and biscuit by way of lunch taken in turn. We got through a good many papers, and Kelvin had a good word to say about each. You never knew what he would say or what he would talk about, but you always knew how he would say it—always with the most perfect good nature, always full of energy and lively interest. He once managed to get in an eloquent appeal for the use of the globes as an educational subject, though it was not the subject of the paper. He always carried a note-book, and was always making use of it. He was always self-possessed ; he had a slight limp as the result of a carriage accident, and I well recollect his limping across from his place to the press-reporter at the table to say: "Put this down," when he had something to say that he wanted the public to hear about. My recollections of his own papers are chiefly of the contents of his note-books on turbulent motion, but I shall never forget a demonstration of the phonograph when that was first produced at a meeting of the British Association. Kelvin was invited to speak into it, and with a good deal of preliminary arrangement of his vocal organs, for he was not an easy speaker, he did so. Then the cylinder was put on to speak, and Kelvin, addressing himself out of the phonograph, with all his imperfections in his throat, was almost drowned in irrepressible laughter.

Kelvin's association with meteorology, apart from thermodynamics, the absolute zero of temperature and its relation to the gas thermometer, and his brother James Thomson's Bakerian lecture, centres mainly in the electrical recorders at Kew Observatory and Greenwich Observatory and the Harmonic Analyser at the Office. Neither of them has contributed to our knowledge of the atmosphere all that was expected of it. The first, because

of the amazing apathy of the Universities of this country on the subject of atmospheric electricity, partly no doubt because the recorder goes out of control at the mere suggestion of a thunderstorm; and the harmonic analyser because, as a means of investigating the sequence of events in the atmosphere, it was misconceived. When I joined the Meteorological Council in 1897, harmonic analysis was the only surviving item of a large programme of research that had been mooted in 1878. Balloons had gone, cloud-photographs had gone, shell-bursts had gone, the daily map was routine, only harmonic analysis and a sort of "founder's share" in the observations at Fort William and Ben Nevis remained. Harmonic analysis, which was one of Kelvin's hobbies, had been tried on the daily curves and on the monthly means with not much result beyond the second order term which is now well known. But a strange result had happened. It was agreed that a single day could not be expected to show any real periodicities, so the tabulated observations were compiled into five-day means in order that they might become amenable to harmonic analysis. Sir Richard Strachey spent a great amount of personal labour over the inquiry, and regarded the third component of the diurnal range as epoch-making. I have no recollection of any work with the seasonal range beyond what I gave myself, with Sir Robert Waley Cohen, in a paper to the Royal Society in which daily values were used. I cannot but think that it was not any sort of real knowledge of what five-day hourly means contained that supplied the motive, so much as the existence of harmonic analysis as an implement and the desire to use it. It is one of many examples of meteorological activity being guided by the desire to use an implement rather than the exploration of the general problem. To get five days inextricably mixed up in order to understand what they are really doing is a kind of witchcraft that is hard to follow. It does not exhibit the real Kelvin in the same way as "Thomson and Tait," or the Thomson-compass, the deep sea-sounder or the syphon-recorder.

## OFFICIAL NOTICE

To meet the needs of observers who communicate their rain-gauge readings monthly to local organisations, specially ruled postcards are now available. These postcards have been published by H.M. Stationery Office at the request of the Meteorological Office; they are designated Form 1098, and are to be purchased from H.M. Stationery Office, Kingsway, London, W.C. 2, the price being 12 copies 6d.; 144, 5s. net.

# Royal Meteorological Society

THE monthly meeting of the Society was held on Wednesday, June 18th, at 49, Cromwell Road, South Kensington, Capt. C. J. P. Cave, President, in the Chair.

*C. K. M. Douglas, B.A.—Further researches into the European upper air data, with special reference to the life history of cyclones.*

The need for international co-operation in the study of the upper air was appreciated at a very early stage, and before the war the observations made in all European countries on selected days were published together. The material placed at the disposal of investigators in this way, though very limited, has proved of great value in several lines of research. It is to be hoped that the plans for the resumption of publication of such information will mature in the near future. Captain Douglas has selected from the international reports the few which illustrate the initial stages of the development of a cyclone. His work goes some way towards resuscitating the old idea that the air at the centre of a cyclone rises because it is warmer than its surroundings. Mr. W. H. Dines's researches showed that the air at the centre of the cyclone at moderate heights is colder than the average. According to Douglas it is just when there is a great stream of cool air passing across the country that an intruding tongue of warm air is likely to be a centre of convective movement. There is no meteorologist who visualises more clearly than Douglas the changing structure of atmospheric currents. Such intimate knowledge of individual cases provides the best check on theoretical researches.

*L. F. Lewis, B.Sc.—The effect of the source of air on its temperature at* 4,000 *feet and* 10,000 *feet.*

The study of the characteristics of the atmosphere by tracing the history of each parcel of air was introduced eighteen years ago in a famous memoir by Shaw and Lempfert—"The Life History of Surface Air Currents." The investigator notes that one weather map for a certain hour shows that the air at a particular place has been travelling for some time from the east with such and such a velocity, and, therefore, must have been near such and such a place 6 hours before; the previous weather map shows that the air at that place must have come from a certain direction, and so on. The method has been used frequently in recent years, and always yields valuable and convincing results.

Miss Lewis has discussed various cases in which the previous history of air which had reached the British Isles could be traced. Dealing in the first instance with air within 2,000 feet

of the surface, she found that in winter the dominant factor which determined whether the air was warm or cool, was whether it had recently been over the Atlantic or over the Continent. Going on to the case of higher strata (and we may note that the computation of the air-paths is more difficult in this case), she found that the land and sea effect diminished in importance and the latitude from which the air had come played the leading part. Very useful generalisations to keep in mind!

*L. H. G. Dines, M.A.—A simple electrical time-marking system for use with self-recording meteorological instruments.*

Accurate timing of meteorological occurrences is seldom attempted in this country. The time at which a seismic wave reaches an Observatory is determined to a second, but the time of passage of a line-squall can hardly be stated within two or three minutes. Of course, there is a reason. The seismologist is mainly interested in questions for which precise information as to time is essential: there are comparatively few cases in which it matters so much to know the exact time of a meteorological event, and, therefore, the open scale charts, which would be needed to show time within a few seconds, are not utilised. There is room for improvement, however, even with the small time-scale of the present charts, and Mr. Dines has done well to show how time marks can be made on the various instruments in a modern observatory. Much ingenuity was required to provide for the great range in the forces which had to be applied to the pen carriers of different instruments. The delicate float-barograph had to be merely stroked, whilst the robust pressure tube anemometer required a vigorous kick. The paper is quite properly confined to a description of the system introduced at Valencia Observatory. A comparison of other systems, such as those in use at Potsdam and Hong Kong, would be of interest.

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# Correspondence

To the Editor, *The Meteorological Magazine*

## The Great Storm of May 31st, 1924,* Measurements in the Wirral Peninsula

THE following brief summary of the great rainfall and thunderstorm of May 31st to June 1st may be of interest. The total fall for 13 hours, 7 p.m. May 31st to 8 a.m. June 1st, was 3·31 inches, of which 1·23 inches fell between 7.5 p.m. and 8.15 p.m.

This heavy fall from 7.5 p.m. to 8.15 p.m. was accompanied

* For the general account of the storm see the *Meteorological Magazine*, June 1924, page 119.

by occasional thunder and lightning. There was a temporary lull in the rainfall until 8.30 p.m., when a severe thunderstorm broke over the district, accompanied by a continuous rainfall which lasted without interruption until 2 p.m. on Sunday afternoon, June 1st. The rain moderated in force considerably after 8 a.m., June 1st, and between that hour and 2 p.m. only 0·26 inch was measured. The total for the 24 hours ending 7 p.m. was 3·57 inches. This fall is of considerable interest owing to the fact that over a period of more than 60 years the previous highest record for this area was 2·03 inches. There was great flooding as the result.

It is also of interest to note that this fall brought our May total up to 6·00 inches against an average fall of 1·87 inches, which is far in excess of any other May reading recorded over a long period.

(Rev.) ERIC F. ROBSON.

*St. Andrew's Vicarage, West Kirby, Cheshire, June 3rd, 1924.*

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## A New Halo Phenomenon? An Oblique Arc 90° from the Sun

ON Tuesday, June 10th, at 10h. G.M.T., I observed here a small segment of a very large arc. I thought at first that it might be a belt of cirro-stratus cloud, but it was too clearly defined as a geometrical curve for such a supposition to be entertained. The arc consisted of a narrow white band, and was to the east of the sun, the difference in azimuth being nearly 90°.

The arc was oblique and slightly curved: if it had been prolonged it would have passed below the sun and about 45° from it, *i.e.*, 6° above the horizon, the elevation of which is 4°. Owing to the presence of much low nimbus and strato cumulus the phenomenon was visible only for about 30 seconds: the time was too short for angular measurements

T. H. APPLEGATE.

*R.A.F. Station, Catlewater, Plymouth, June 27th, 1924.*

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## Upper Air Research

IN accordance with the programme of the International Commission for the Upper Air, twelve registering balloons were sent up between March 3rd and March 22nd by the Upper Air Section of the Meteorological Office. Of the twelve, nine instruments were found and returned. Eight of the ascents were made from

the Aerodrome at Shotwick, near Chester, and the remainder from Kew Observatory. The percentage of finds was the same in each case.

Heights ranging up to 19·3 kms. were reached, the drift of the balloons being in all cases towards points between north-northeast and southeast. As has commonly been found heretofore, there was no appreciable connection between the height reached and the distance travelled. An ascent made from Kew on March 7th presented some interest from the fact that the balloon started in an easterly current, passed back at a higher level towards the south-east, and, after reaching 18 kms., fell some 40 miles to the east-southeast through the easterly current again.

As both stations are comparatively near the coast, the choice of the locality of the ascent on any given day is determined from the consideration of the pressure gradient prevailing a few hours beforehand. The system has worked well, and, in five months' working, 80 per cent. of the balloons sent up have been found and returned.

L. H. G. DINES.

*Kew Observatory, Richmond, Surrey, June 12th, 1924.*

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## Music and Meteorology

ALTHOUGH music is not first and foremost a descriptive art, yet certain passages echo the moods of Nature as they appeal to the composer, and appear to describe the meteorological aspect of things.

Among the classical composers, Handel included the "Hailstone" Chorus in "Israel in Egypt." More famous is the thunderstorm in Beethoven's "Pastoral" Symphony, where "at least four different incidents faithfully portray not only the first drops of rain and the distant thunder, but all the feelings of depression and apprehension they inspire" (D. F. Tovey). Beethoven employs the piccolo in order to depict the whistling of the wind. This instrument is used for the same purpose by Wagner in "The Flying Dutchman." One of the finest storms in music is that depicted in the prelude to Wagner's "Valkyrie." The staccato scale played in the bass by the strings gives the dull monotony of the pouring rain, the other instruments join in as the storm rises to its climax with a long roll of thunder on the kettle-drums.

Both Chopin and Debussy have recorded their impressions of a rainy day in pianoforte music: the former in the "Raindrop" Prelude, the latter in "Un Jardin sous la Pluie." Debussy has likewise given us his ideas of anticyclonic weather in summer in that dreamy work "L'Apres-midi d'un Faune." Even the fiery

Wagner deserted his storms and tempests on occasion. In the "Valkyrie" prelude he depicted the storm tearing through the forest, but in the second act of "Siegfried" he represented, with the aid of the piccolo and violins in tremolo, the gentle breeze soughing in the trees on a fine afternoon.

CICELY M. BOTLEY.

10, *Wellington Road, Hastings, January 23rd*, 1924.

# NOTES AND QUERIES

## The Weather of October, 1923

A DETAILED examination of the weather in the British Isles during the four days, October 9th to 12th, 1923, has been undertaken at the Meteorological Office. Readers who have in their possession any autographic records of temperature, rainfall, humidity or wind (even if the records have already been submitted to the Office for any other purpose) are requested to lend them for a short time. Any details of the weather, such as the times at which rain began and ended, would also be welcome. Communications should be addressed to the Director, Meteorological Office, Air Ministry, W.C. 2, quoting the reference number 463722/23 (M.O.2.).

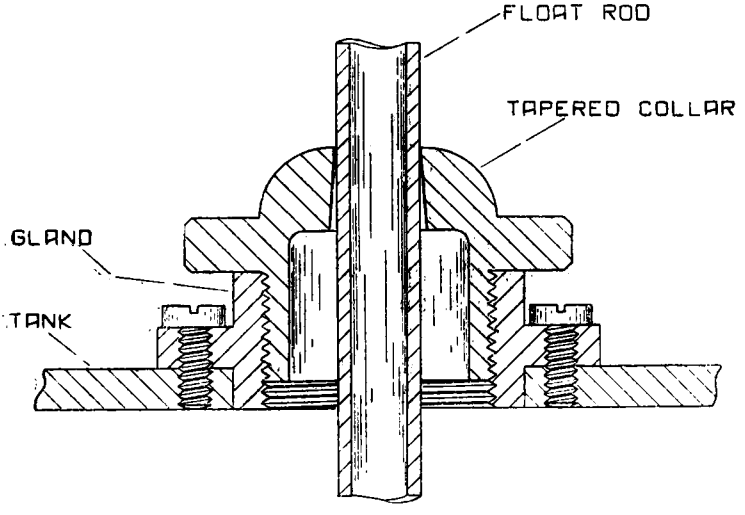
## Defects of Pressure Tube Anemometer at Low Wind Speeds

THE up-and-down movement of the float in the Dines Tube Anemometer is controlled by means of a metal collar, screwed into the tank, through which the float spindle passes. The bore of the collar is cylindrical, and it follows that the bearing surface between the collar and the float spindle is considerable. Observers have frequently reported that the float rod "sticks," especially when the wind falls light during the night.

In order to investigate the cause of the "sticking," experiments have been carried out in the Instruments Division of the Meteorological Office during the past year. It was thought that the deposition of water drops on the float spindle and collar, which might conceivably occur at any time, but particularly at night, owing to condensation, would produce damping forces sufficient to resist the displacement of the float when the wind was light. The experiments confirmed this view, showing that the damping forces which developed when the collar and spindle were partially wetted were approximately five times the normal

frictional forces in the dry state. It was also found that the damping force depended on the size of the drops, being greater when the drops were smaller. Further, after the spindle and collar were completely wetted, the water was found to act as a lubricant, the float working more freely.

With a view to overcoming the defect, certain instruments have been provided with tapered collars, as illustrated below.




DINES ANEMOGRAPH: TAPERED COLLAR FOR FLOAT ROD GLAND.

The advantage of this type of collar is that the water runs off from the spindle into the float chamber. At the same time the area of communication between the inside and outside of the float chamber remains the same, and it is improbable that there is any increase in the leakage of air from the instrument. Reports from stations where these collars are in use indicate that the anemometer works properly in light winds.

A report received from one station suggested that the "sticking" of the float rod had been overcome by lubricating the collar and float rod by means of a small quantity of oil. On general principles such a procedure is not to be recommended, as, unless the parts were kept scrupulously clean and oiled frequently, there would be a tendency for dirt to accumulate on the rod, and the last state would be worse than the first.

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The Gordon Bennett Race for free balloons which started for Brussels on Sunday, June 15th, 1924, was won by the Belgian, Lieut. Demuyter, who took advantage of an unexpected south wind and landed near Berwick, 438 miles from the starting point.

## The India Weather Review

A CHANGE has been made in the system of publication of information with regard to the weather of India. The last issue of the *Monthly Weather Review* referred to December, 1920. The monthly summaries fos 1921 are all embodied in the *India Weather Review*, 1921, which has recently been published. It is to be noted that such information for the year 1921 as was immediately available was issued in the Annual Supplement to the *Indian Daily Weather Report* on January 11th, 1922. Opinions must differ as to the merits of monthly and annual publication of statistics. The advantage of finding all the figures for a particular station for the twelve months in a single volume is considerable, so that the change of practice will be welcomed by most climatologists.

An interesting feature of the new volume is the inclusion of a table showing for each of six stations the monthly means of direction and velocity of upper winds. The " tail-method " is used, and at one station or another heights such as 15 kilometres above sea level were reached in nearly every month of 1921.

Some criticisms of detail may be allowed. One is that there appears to be no reference in the Introduction or elsewhere to the standard of time to which the observations refer. According to the published instructions it is the rule to use local Mean Time at all the stations, even for the telegraphic service, but there may well have been a change of practice in the last twenty years. In a network covering such a wide range of longitude, this detail is important. Secondly, there is no information as to the latitude and longitude of the stations. The heights of stations provided with barometers are to be found (with some difficulty), but for other places (such as Cooch Behar, with 257 inches of rain in the year) this detail is missing. The other criticism is that there are two tables, Table B and Table C, both " Abstracts of 8 hrs. observations." Table B includes stations with barometers, Table C those without. Seven of the stations in Assam are in the former table, and eleven in the latter. It would be more convenient to the reader unfamiliar with local circumstances if these tables could be combined.

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## A Smoke Abatement Bill

A BILL " to amend the laws relating to Smoke Nuisances and for other purposes connected therewith " has been introduced in the House of Lords by the Earl de la Warr on behalf of the Government.

The effect of the measure will be to increase the penalties for the production of smoke in such quantities as to constitute a nuisance.

## Weather Reports from Northeast Greenland

WE have had occasion previously to call attention to the enterprise shown by the Scandinavians in obtaining meteorological information from the neighbourhood of Greenland. At the end of June a Danish ship, the "Godthaab," started from Thorshavn to visit the settlements in northeast Greenland. The "Godthaab" is to keep in communication with Jan Mayen by wireless telegraphy, and meteorological reports are being transmitted via Tromsoe, the Norwegian meteorological service co-operating thereby with the Danish.

A number of reports from the "Godthaab" have already been received in the Forecast Division of the Meteorological Office from the area off northeast Greenland in about latitude 75° N. They form a valuable addition to the daily weather charts, extending them into the region of the Arctic north of the island of Jan Mayen (70° 59′ N, 8° 19′ W) and southwest of Spitzbergen, from which places weather reports are regularly received. The reports from the "Godthaab" on July 8th showed continuous thick fog, with a temperature little above the freezing point.

## Thirteen Months in the Year

THE following resolution was adopted by the American Meteorological Society at the meeting held at the Weather Bureau, Washington, on April 30th, 1924:—

> . . . . "The American Meteorological Society recognizes the advantages and universal benefits to mankind throughout the world of a simplification of the calendar, and considers that the interest of the public and many branches of science dealing with statistical data, like meteorology and particularly climatology, will be promoted by the adoption of a thirteen-month calendar, permitting the summarizing of data in equal aliquot intervals of weeks, fortnights, months and seasons. It is opposed to any modification of the calendar, such for example, as has been proposed by the French, that retains the present incommensurate relations of the week and the months." . . . .

The Secretary was directed to transmit a copy of the resolution to the Committee of the League of Nations that is considering the reform of the calendar.

Most meteorologists on this side of the Atlantic will agree with Professor Marvin's sentiment: "I think we ought to oppose any change in our present calendar that would make our present data discontinuous with our future data and offer no real advantages." How Professor Marvin reconciled this dictum with his support for the resolution is not explained in the official report of the meeting.

## Excessive Rainfall in Sicily in November, 1920

AN account of the rainfall in eastern Sicily in November, 1920, has been published recently by Senor Filippo Eredia*. It is remarkable in that at many stations the rainfall was not merely unprecedented but more than twice as much as had been recorded previously in November. In two cases more than the normal rainfall of the whole year. The rainfall was associated with the slow passage of depressions along the Mediterranean to the south of Sicily. Some of the more striking figures are quoted in the following table :—

| STATION | Height Metres | NORMAL | | Previous Max. in November mm. | NOVEMBER, 1920 | |
|---|---|---|---|---|---|---|
| | | Year mm. | November mm. | | Rainfall mm. | Multiple of Normal |
| Viagrande‡ .. | 405 | 1151·8 | 168·6 | 541·4 | 1090·4 | 6·5 |
| Sant' Alfio‡ .. | 550 | 1369·1 | 223·7 | 773·3 | 1051·0 | 4·7 |
| Acireale .. .. | 200 | 916·4 | 163·5 | 350·9 | 1042·3 | 6·4 |
| Lentini .. .. | § | 620·1 | 89·3 | 231·7 | 589·9 | 6·6 |
| Linguaglossa .. | 560 | 1226·9 | 116·6 | 439·0 | 894·0 | 7·7 |
| Ramacca.. .. | 500 | 548·7 | 66·4 | 346·0 | 530·5 | 8·0 |

In the British Isles the ratio of a month's rainfall to the normal has not been known† to exceed 4·7.

## Siccawei Observatory

A VERY interesting account of the history and work of the Siccawei (Zi-ka-wei) Observatory for the past 50 years is contained in an illustrated supplement to the " North China Daily News," dated December 15th, 1923. The story of the growth of the Observatory begins in 1842 when Fr. Gotteland, a professor of Physics in Switzerland, landed at Shanghai and commenced regular astronomical observations ; his successors include such scientists as Henri le Lee, Decheverens, Chevalier, de Moidrey and Fr. Froc, the present director. An important event in the history of the meteorological department, instituted

* Le pioggie eccezionali sul versante orientale della Sicilia by Filippo Eredia. *Reale Accademia Nazionale Lei Lincei*, Vol. XXXII. Feb. 4th, 1923.

‡ Mr. Etria.

§ The height of Lentini is between 0 and 100 metres.

† Fluctuations of Monthly Rainfall, by J. Glasspoole, *British Rainfall* 1922, p. 238.

half a century ago, was the publication by Decheverens of an account of the Typhoon of July 31st, 1879. So great was the impression created by this article amongst the merchants of Shanghai that a typhoon signal service for all parts of the China coast was quickly established. Since 1896 daily weather maps and forecasts have been prepared and information distributed by telegram to all concerned, and it is interesting to note that, by a special form of code, the latitude, longitude and degree of violence of a typhoon is completely signalled by semaphore to local shipping. The Supplement also contains an excellent reproduction of the Galitzin seismograph record of the Japanese earthquake of September last as registered at Siccawei.

## The Standard of Time in the Far East

FROM a paper by Dr. J. Boerema, on "A new determination of the eastern longitude of Batavia," we learn that Central Java time has been fixed as Mean Time for the meridian 110° East of Greenwich. In Dr. Boerema's investigation the longitude of his observatory was found by the use of the wireless time signals from Bordeaux. The correction to the previously accepted longitude is only 0·617 second of time: Dr. Boerema thinks that a systematic error of this order of magnitude will be found in the accepted longitudes of all stations east of Singapore.

## Red Lightning

WITH reference to a thunderstorm which occurred at Ross-on-Wye on June 17th, 1924, Miss Mary L. Southall writes:—

> "The rainfall during the storm was only ·33 inch. The storm, after rumbling in the distance some time previously, came on at about 7h. 45m. and lasted till about 8h. 30m. (Greenwich Time). I have known more alarming flashes and peals, but the flashes seemed to last longer and as if they were playing about in the gardens of the opposite houses and lighting up the walls of the houses. They were accompanied by rain and wind. I think I have seen quite as brilliant lightning with white light at night, but I do not remember a storm characterised by such redness of the lightning. It was almost as though coloured lights (as used in fireworks) had been let off. A farmer, who lives a few miles away, was out in the storm and he too thought he had not seen lightning quite like it. One flash, he said, was 'like a purple cord' coming down from the sky. I should be very much interested to know if red lightning is considered less dangerous than white?"

## An Observation which may Refer to Parry's Upper Arc

THE following note is based on a report from Flying Officer R. C. Bryant, senior Meteorological Officer in Iraq :—

> On Thursday, March 20th, 1924, at 5h. G.M.T., a solar halo was observed at Hinaidi (Lat. 33° 17′ N., Long. 44° 29′ E.). At the time the sky was wholly covered with cirro-stratus and alto-stratus moving from south-west. At 5h. 4m. an arc convex to the halo was observed to be forming. The length of this arc was approximately equal to the radius of the circular halo, and the distance away from the halo was roughly one-third of that radius. The sequence of colours was as that of the halo around the sun. It remained visible for a period of seven to ten minutes, then abruptly disappeared. The true halo remained visible for some considerable time afterwards.

On the assumption that the circular halo was the halo of 22°, the arc cannot have been the circumzenithal arc, which is more than 45° from the sun. The only known arc near the right position would seem to be Parry's Upper Arc. This is the arc attributed by Hastings to refraction of light through hexagonal prisms settling down with not only their axes horizontal, but also the upper and lower faces.

Perhaps some reader will work out the theoretical position and shape of Parry's Upper Arc at the time specified by Flying Officer Bryant ?

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## The McLeod Sunshine Recorder

IN the obituary notice of Herbert McLeod, recently published in the "Proceedings of the Royal Society" it is stated that "His Sunshine Recorder, in which the sun's light and heat from its unclouded disc are concentrated by means of a glass ball on prepared paper, whereby the duration of the sunshine is indicated by the trail of charred paper, is also well known, and is in very general use."

The description quoted applies to the Campbell-Stokes sunshine recorder, the use of the glass ball being due to Mr. J. F. Campbell, of Islay, the specification* of the card holder to Sir George Stokes. McLeod's instrument was devised in 1884. A record obtained with it is reproduced in *Nature*, February 5th, 1885. The image of the sun formed by reflection in a bright hemisphere (the silvered inner surface of a flask) was photographed on ferro-prussiate paper. We do not know whether more than the one instrument was ever set up. Certainly it is not "in very general use."

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* Q. J. R. Met. Soc. Vol. vi., April 1880, p. 83.

## A Photograph of an Elliptic Halo

ON June 18th, 1924, Mr. G. A. Clarke succeeded at Aberdeen in photographing an elliptic halo. The following notes are taken from his description. Unfortunately, the photograph is not suitable for reproduction in a half-tone block.

> " This is a very poor photograph of what might in other circumstances have been a magnificent study. Just about 12h. 30m. on June 18th, a sheet of cirro-nebula covered the southern portion of the sky, and the ice-crystal layer was perfectly structureless. In it there was seen a very fine halo of 22° with the upper and lower ' arcs of contact ' bent down, and meeting, thus forming a complete ' ellipse ' round the circular halo. All the branches on the left were strongly coloured from the orange to the yellow green, with a bluish white beyond the green. The phenomenon was rapidly fading while the cloud layer was increasing in density and becoming floccular in places, as shown by the photograph. By the time my camera was ready, the halo was becoming faint, very faint indeed near the ' elliptical ' part. Still, if this photograph be held at arm's length the two easterly arcs, circular and elliptical, will be seen. The photograph, which was taken in order to enable measurement of the ' semi-major axis ' of the ellipse to be made, gives 26°—the radius of the circular halo being assumed to be 22°. I wish I had seen the halo early enough to have obtained a good photograph of it."

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## Aeroplanes and Thunderstorms

A PARAGRAPH which recently appeared in the press would seem to indicate that the problem of locating thunderstorms, and tracing their direction and rate of movement, has been completely solved by wireless direction-finding, and that pilots of aeroplanes are now warned by radio-telephony of the exact position and line of movement of thunderstorms.

Unfortunately this ideal has not yet been attained. It is a well known fact that some relation exists between the type and intensity of atmospheric disturbances, heard by means of an ordinary wireless receiving set, and the intensity or distance of thunderstorms. Experiments are still being carried out with a view to determining exactly what that relation is. In particular simultaneous observations are being made at the meteorological station at Croydon, and by Captain Cave at Petersfield, in an endeavour to ascertain whether the actual type of apparatus in use, designed by Mr. Watson Watt, can be effectively used in locating thunderstorms.

At present reports of thunderstorms to pilots take their place in the ordinary list of dangerous phenomena which are reported specially to pilots in the air, when such phenomena are observed near and are likely to affect the London Continental Aerial Routes. In addition to thunderstorms such phenomena as squalls, fog and very low cloud receive special attention.

## The Loss of the French Airship "Dixmude"

THE following extract from "Aviation" of June 16th, 1924, is of interest in connection with the article on the above which appeared in the *Meteorological Magazine* of last February :—

> "A bottle found May 18th on the beach at Propriano, south-western Corsica, contained a farewell note of the ill-fated 'Dixmude' airship crew. The message, written in pencil, read : 'All out of gasoline. We are drifting in a wind storm. Good-bye and long live France.—Dixmude crew.'"

## The Smoke-Screen over Paris

IN his report for the year 1923, M. Besson publishes the results of his researches on the loss of light due to smoke in the neighbourhood of Paris. The observations utilised were made with the Bellani lucimeter, an instrument which may be regarded as a combination of the black bulb thermometer and the Wilson radiointegrator. A bulb of blue glass is enclosed in a larger bulb from which the air is exhausted, and the amount of spirit distilled from the smaller bulb gives a measure of the amount of radiation. The calibration of the instruments is somewhat difficult, and no attempt seems to have been made to compare them with any absolute standard. Nevertheless, comparative results of considerable value have been obtained. It is shown how the radiation in the suburbs is affected by the direction of the wind. For example, at Ville-Evrard, 6 miles from the fortifications, there is a loss of 21 per cent. in the radiation when the wind blows from the city. The loss at the Tour Saint-Jacques, in the centre of Paris, averages 19 per cent. ; it is greatest on days with no direct sunshine, when it amounts to no less than 68 per cent.

## The Determination of the Height of Clouds

THE same report also contains an article on the height and velocity of alto-cumulus and strato-cumulus clouds. Perhaps the most important point in this article is that it shows the practicability of the method used at Montsouris for the deter-

mination of the height of clouds. The method is due in the first instance to Bravais; it depends on the exact measurement of the angle between rays reaching the observer from the cloud and from its image in a sheet of water. At Montsouris the sheet of water is merely a large artificial puddle which can easily be kept clean. The fact that during the four years 1919-1922 the height of alto-cumulus was measured 946 times, and that of strato-cumulus 299 times, should recommend the system to all interested in clouds.

## The Influence of Climatic Conditions on the shape of the Nose

DR. ARTHUR THOMSON and L. H. D. BUXTON have recently published an interesting paper on "Man's Nasal Index in relation to certain climatic conditions." The nasal index is one hundred times the breadth of the nose divided by its height, thus a broad flat nose has a higher nasal index than a high and narrow one. The variation in this respect is very marked; among some groups of negroes the nasal index averages as high as 105, while among the races inhabiting the high plateaux of Asia, with a cold dry climate, it falls below 60. In general a short broad nose is associated with a damp moist climate, and a high narrow nose with a cold dry climate. The authors seek to give precision to this generalisation, and for this purpose compare the results of many thousand measurements of the nasal index, both on the living subject (101 local groups) and on skulls (98 local groups), with the corresponding mean annual temperature and humidity. Between the limits of 50° and 90° F. the agreement is good; the nasal index of living subjects is given by the formula:

$$\text{Nasal index (living)} = \text{temperature (°F.)} \times 0{\cdot}483 + \text{humidity (per cent.)} \times 0{\cdot}253 + 24{\cdot}91,$$

and the coefficient of correlation between the observed and calculated values is $+ 0{\cdot}72 \pm {\cdot}03$. The result given by measurements of skulls is not quite so good: $r = + 0{\cdot}55 \pm {\cdot}05$.

The physiological meaning of this relationship is that one of the purposes of the nose is to raise the temperature and humidity of inhaled air before it enters the lungs. The colder and drier the air, the greater the need for this function, so that in a race which has lived long in a cold dry environment the nasal passages become long, and the nose high and narrow. After migration from one type of environment to the other the adjustment is not immediate but takes many generations, thus the high narrow noses of the dominant castes in India agree with the historical fact that the latter are comparatively recent immigrants from the north. The fossil skulls found in Europe

indicate very high narrow noses during the Ice Age, gradually becoming shorter and broader as the climate improved. The question whether this adjustment is due to natural selection or to the inheritance of acquired characters is not discussed.

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## Amendments to Reference Table—Climatological Table for the British Empire

A REFERENCE TABLE, giving the height, hours of observations, &c., for all the stations used in the Climatological Table for the British Empire, was published in the *Meteorological Magazine* for July, 1922, p. 174. The following is a list of changes that have taken place since that date :—

| | |
|---|---|
| LONDON—KEW OBSERVATORY | Hours changed to 7h., 13h., 21h. in January, 1923.<br>New normals (1881-1915) adopted for pressure in January, 1923. |
| GIBRALTAR ... ... ... | From March, 1923, mean max. and min. temp. refer to 24-hr. means.<br>New normals (66 years, 1852-1920) adopted for all elements in January, 1924. |
| MALTA ... ... ... ... | From March, 1923, mean max. and min. temp. refer to 24-hr. means. |
| SIERRA LEONE ... ... | Authority—Sanitary Department, Freetown. |
| LAGOS, NIGERIA ... ... | From April, 1922, Latitude 6° 27′ N, Longitude 3° 24′ E, and hours of observation 9h. and 15h. |
| KADUNA, NIGERIA ... ... | Authority — The Surveyor-General, Lagos. |
| SALISBURY, RHODESIA ... | Height previous to 1st January, 1924, 4,834 ft., subsequently 4,860 ft. |
| BLOEMFONTEIN ... ... | Authority :—G. H. Schepers, Esq., Grey College. |
| CALCUTTA ... ... ... | Hours of observation, 8h. from September, 1922. |
| BOMBAY ... ... ... | Hours of observation, 8h. from October, 1922. |
| MADRAS ... ... ... | Hours of observation 8h. from September, 1922. |
| COLOMBO ... ... ... | Hours of observation, 9½h. and 15½h. from January, 1923, for cloud amount. |
| SANDAKAN ... ... ... | Hours of observation, 9h., 15h., 21h. from April, 1923. |
| SYDNEY ... ... ... | Height 138 ft. from 1st July, 1922. |
| COOLGARDIE ... ... ... | Latitude, 30° 57′ S. |
| KINGSTON, JAMAICA ... ... | Latitude, 17° 58′ N, Longitude 76° 48′ W, height 111 ft., and<br>New normals (1881-98 ; 1908-22) adopted for pressure in January, 1924. |
| ST. JOHN, N.B. ... ... | Height, 119 ft. |

At the following stations " mean wet bulb " is obtained from the extremes for the 24 hours instead of from observations at fixed hours. This value, together with ½ (max. + min.) dry bulb, is used for the computation of relative humidity :—Sydney, Perth, Wellington.

## The British Empire Exhibition at Wembley: Atmospheric Pollution

THE work of the Advisory Committee on Atmospheric Pollution is illustrated at Wembley by a collection of exhibits in the Ministry of Health Section. The amount of soot which falls in London and other places is shown in various ways. There is a model entitled "The Londoner's Burden," representing a man carrying a large sack of soot, the soot-fall of one second. Another model represents Westminster Abbey, and on the same scale the deposit of soot for one year. Perhaps the most pleasing exhibit is a diagram showing the improvement in the purity of the London atmosphere between 1916 and 1924. The need for further improvement is brought out by the collection of building stones, all of which have deteriorated more or less under the influence of the London smoke.

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## News in Brief

Sir Napier Shaw, F.R.S., Professor of Meteorology in the Imperial College of Science and Technology, formerly Director of the Meterological Office, has been elected a foreign member of the Royal Swedish Academy of Science in respect of his "masterly researches in the domain of Meteorology."

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Prof. S. Chapman, F.R.S., whose name is familiar to meteorologists for his work on atmospheric tides and similar phenomena has been appointed to the chief professorship of mathematics at the Imperial College of Science and Technology in succession to Prof. A. N. Whitehead, F.R.S., who has been appointed to the chair of philosophy at Harvard University, U.S.A.

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We note with regret the sad termination of the Mount Everest Expedition, the loss of G. Leigh-Mallory and A. C. Irvine. Col. Norton and Dr. Somervell had succeeded in reaching a height of 28,000 feet, and it is surmised that Mr. Mallory and Mr. Irvine went higher still before they were overcome.

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## The Weather of June, 1924

DURING the first part of the month unsettled rainy conditions prevailed generally, but about the 14th there was a change to warmer, drier weather with, however, a good deal of cloud in some parts.

The heavy rainfall referred to in last month's report continued

on the 1st, and measurements in some parts of the country were exceptionally large. The resulting floods continued for some days. Under the influence of the anticyclone near Iceland, fairer conditions prevailed in Scotland until the 6th, but rather cool unsettled weather was general in the south with occasional thunder. A depression which passed across south England on the 4th, brought heavy rain locally [54 mm. (2·12 ins.) at Patching Farm, Sussex], but in the rear of this depression a temporary improvement was experienced in the southern and eastern counties and temperature rose slightly above 70°F. at many places on the 7th. After this, cyclonic conditions prevailed again over the whole of the British Isles, until nearly the middle of the month. On the 13th the high pressure area to the south of Iceland moved south-eastwards towards England, and fairer conditions set in. A cold northerly wind, however, prevailed on that day so that temperature failed to rise above 56°F. in many of the southern districts. Subsequently temperature rose gradually : 75°F. was exceeded in places and 79°F. occurred in London (Camden Square) on the 17th, when a depression moving northwards from the Bay of Biscay caused thunderstorms in many parts and rather heavy rain in places. From the 19th onwards, the weather in the south-east continued fair and warm with very little rain—80°F. was exceeded on the 26th at many places. In the west and north, however, unsettled, rainy conditions were maintained, so that in parts of these districts the total rainfall for the month was twice and in some places three times the normal. At The Stye, Borrowdale, the total was 376 mm. (14·8 ins.), at Llyn Llydaw 295 mm. (11·6 ins.), and at Inveraray 237 mm. (9·34 ins.). At the latter place heavy falls 62 mm. (2·44 ins.) and 63 mm. (2·49 ins.) occurred on the 20th and 24th, and the observer writes that " on the 20th there was an exceptionally heavy hailstorm within an area of two miles which lasted for about an hour and a half, the streets and fields being flooded with water in a short time. At Auchnangoul, about 3 miles distance, no hail fell and the farmers were at work in bright sunshine. The same applies to the 24th when the heavy rain was again very local." The total sunshine for the month (91 hours) at Valencia was the lowest June report since sunshine observations began there in 1881.

Ground frosts occurred many times throughout the month, and a reading as low as 22° F. was registered at Rounton on the 3rd. A remarkable disturbance of a tornado-like character was experienced in the centre of Belfast on the evening of the 24th.

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Although the weather on the Continent was mainly unsettled, many high temperatures were recorded, the highest being 104°F. at Turin on the 25th. Dusseldorf was visited on the 8th by a

severe storm, which did a large amount of damage to property, but fortunately the casualties were few. At 2 p.m. the sky was suddenly darkened and torrents of rain and hail fell, flooding the town. In the south-western districts a whirlwind uprooted trees, blew down factory chimneys, and the steeple of St. Martin's Church fell. Early on the 17th a dense fog at Vest Fjord in the north of Norway was responsible for a collision between two passenger steamers in which 17 people were drowned. Heavy rains have been reported from Smyrna and other districts of Asia Minor, and the resulting floods have done much damage to the crops. According to a telegram published in *The Times* the temperature in Calcutta on May 31st, was 115°, the highest ever recorded in the city. (108°F. is the highest temperature recorded during the years 1878—1920 at Alipore Observatory, which is regarded as giving authoritative values for Calcutta). During the middle of the month, excessive rains were reported from the districts surrounding the Gulf of Bengal, while the rainfall in the extreme north of India was scanty. Reports of floods in the United States were again received, but this month from Tennessee. The towns of Carter's Bluff and Hunter and also many villages were inundated and partially destroyed, with a number of fatalities. On the 28th, late in the afternoon, a violent hurricane swept along the southern shores of Lake Erie, and took a heavy toll of life. At Lorain, where the State Theatre collapsed, some 300 persons were reported to have been killed, and many houses in the main street were blown down. It is believed that three pleasure steamers on Lake Erie are lost, but full details of the disaster are not yet known. Useful rains have fallen in Queensland and New South Wales.

The special message from Brazil states that in the north the total rainfall for the month was 73 mm. above the normal, and in the central and southern districts 40 mm. above normal, and 8 mm. below normal respectively. The distribution in these last two districts was, however, irregular. High pressure systems have been more frequent and the depressions more active during this month than in April or May. In general, the pressure distribution during the last few months has been abnormal. At Rio de Janeiro temperature was 5°F. above normal while pressure was only slightly above normal.

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## Rainfall June, 1924: General Distribution

| | | |
|---|---|---|
| England and Wales | 104 | per cent. of the average 1881-1915. |
| Scotland .. .. .. | 108 | |
| Ireland .. .. .. | 129 | |
| British Isles .. .. | 110 | |

# Rainfall: June, 1924: England and Wales.

| CO. | STATION. | In. | mm. | Per-cent. of Av | CO. | STATION. | In. | mm. | Per-cent. of Av. |
|---|---|---|---|---|---|---|---|---|---|
| *Lond.* | Camden Square..... | 2·47 | 63 | 122 | *War.* | Birminghm, Edgbaston | 2·54 | 65 | 109 |
| *Sur .* | Reigate, Hartswood... | 2·72 | 69 | 139 | *Leics* | Leicester Town Hall... | 2·13 | 54 | ... |
| *Kent.* | Tenterden, Ashenden.. | 1·67 | 42 | ... | ,, . | Belvoir Castle..... | 2·29 | 58 | 120 |
| ,, . | Folkestone, Boro. San. | 1·49 | 38 | ... | *Rut .* | Ridlington..... | 2·78 | 71 | ... |
| ,, . | Broadstairs ..... | ... | .. | ... | *Linc.* | Boston, Skirbeck ..... | 2·01 | 51 | 110 |
| ,, . | Sevenoaks, Speldhurst. | 3·05 | 77 | ... | ,, . | Lincoln, Sessions House | 1·19 | 30 | 59 |
| *Sus .* | Patching Farm..... | 4·00 | 102 | 198 | ,, . | Skegness, Estate Office. | ·98 | 25 | 54 |
| ,, . | Eastbourne, Wilm. Sq. | 1·83 | 47 | 99 | ,, . | Louth, Westgate ..... | 1·62 | 41 | 75 |
| ,, . | Tottingworth Park.... | 2·08 | 53 | 99 | ,, . | Brigg ..... | 1·57 | 40 | 75 |
| *Hants* | Totland Bay, Aston... | 1·94 | 49 | 105 | *Notts.* | Worksop, Hodsock.... | ·99 | 25 | 50 |
| ,, . | Fordingbridge, Oaklnds | 1·95 | 49 | 105 | *Derby* | Mickleover, Clyde Ho.. | 2·18 | 55 | 91 |
| ,, . | Portsmouth, Vic. Park. | 3·28 | 83 | 182 | ,, . | Buxton, Devon. Hos... | 2·70 | 69 | 84 |
| ,, . | Ovington Rectory .... | 2·82 | 72 | 122 | *Ches.* | Runcorn, Weston Pt... | 2·48 | 63 | 96 |
| ,, . | Grayshott ..... | 3·57 | 91 | 159 | ,, .. | Nantwich, Dorfold Hall | 1·82 | 46 | ... |
| *Berks* | Wellington College... | 2·73 | 69 | 126 | *Lancs* | Bolton, Queen's Park . | 2·95 | 75 | ... |
| ,, . | Newbury, Greenham.. | 3·03 | 77 | 140 | ,, .. | Stonyhurst College.... | 2·92 | 74 | 95 |
| *Herts.* | Bennington House.... | 1·72 | 44 | 83 | ,, .. | Southport, Hesketh... | 1·91 | 49 | 88 |
| *Bucks* | High Wycombe ..... | 3·03 | 77 | 155 | ,, .. | Lancaster, Strathspey. | 2·84 | 72 | ... |
| *Oxf..* | Oxford, Mag. College.. | 2·27 | 58 | 107 | *Yorks* | Sedbergh, Akay ..... | 5·41 | 137 | 163 |
| *Nor .* | Pitsford, Sedgebrook.. | 1·80 | 46 | 93 | ,, . | Wath-upon-Dearne ... | 1·62 | 41 | 73 |
| ,, . | Eye, Northolm..... | 1·72 | 44 | ... | ,, . | Bradford, Lister Pk... | 1·83 | 47 | 78 |
| *Beds.* | Woburn, Crawley Mill. | 2·34 | 59 | 118 | ,, . | Oughtershaw Hall .... | 3·95 | 100 | ... |
| *Cam.* | Cambridge, Bot. Gdns. | 1·99 | 51 | 94 | ,, . | Wetherby, Ribston H.. | 1·94 | 49 | 92 |
| *Essex* | Chelmsford, CountyLab | 1·37 | 35 | ... | ,, . | Hull, Pearson Park ... | 1·76 | 45 | 85 |
| ,, . | Lexden, Hill House... | 1·82 | 46 | ... | ,, . | Holme-on-Spalding ... | 1·96 | 50 | ... |
| *Suff .* | Hawkedon Rectory ... | 1·48 | 38 | 71 | ,, . | Lowthorpe, The Elms. | 1·29 | 33 | 70 |
| ,, . | Haughley House..... | 1·47 | 37 | ... | ,, . | West Witton, Ivy Ho.. | ·98 | 25 | ... |
| *Norf.* | Beccles, Geldeston.... | 1·87 | 48 | 104 | ,, . | Pickering, Hungate ... | 1·34 | 34 | ... |
| ,, . | Norwich, Eaton ..... | 1·60 | 41 | 83 | ,, . | Middlesbrough ..... | 1·49 | 38 | 79 |
| ,, . | Blakeney ..... | ·96 | 24 | 52 | ,, . | Baldersdale, Hury Res. | 1·44 | 37 | 61 |
| ,, . | Swaffham ..... | 1·46 | 37 | 68 | *Durh.* | Ushaw College ..... | 2·17 | 55 | 100 |
| *Wilts.* | Devizes, Highclere.... | 2·32 | 59 | 103 | *Nor .* | Newcastle, Town Moor. | 2·23 | 57 | 103 |
| *Dor .* | Evershot. Melbury Ho. | 1·80 | 46 | 79 | ,, . | Bellingham Manor.... | ·92 | 23 | ... |
| ,, . | Weymouth. Westham.. | 1·62 | 41 | 91 | ,, . | Lilburn Tower Gdns... | 2·90 | 74 | ... |
| ,, . | Shaftesbury, Abbey Ho. | 1·73 | 44 | 75 | *Cumb* | Penrith, Newton Rigg.. | ... | .. | ... |
| *Devon* | Plymouth, The Hoe... | 1·43 | 36 | 68 | ,, . | Carlisle, Scaleby Hall . | 1·52 | 39 | 60 |
| ,, . | Polapit Tamar ..... | 2·16 | 55 | 100 | ,, . | Seathwaite ..... | 8·20 | 208 | 126 |
| ,, . | Ashburton, Druid Ho.. | 3·02 | 77 | 118 | *Glam.* | Cardiff, Ely P. Stn..... | 3·02 | 77 | 121 |
| ,, . | Cullompton ..... | 3·62 | 92 | 171 | ,, . | Treherbert, Tynywaun | 4·97 | 126 | ... |
| ,, . | Sidmouth, Sidmount .. | 3·59 | 91 | 171 | *Carm* | Carmarthen Friary.... | 3·04 | 77 | 106 |
| ,, . | Filleigh, Castle Hill ... | 3·76 | 95 | ... | ,, . | Llanwrda, Dolaucothy. | 5·04 | 128 | 148 |
| ,, . | Hartland Abbey..... | 1·53 | 39 | ... | *Pemb* | Haverfordwest, Portf'd | 3·39 | 86 | 126 |
| *Corn.* | Redruth, Trewirgie ... | 1·93 | 49 | 77 | *Card.* | Gogerddan..... | 4·16 | 106 | 134 |
| ,, . | Penzance, Morrab Gdn. | 1·56 | 40 | 70 | ,, . | Cardigan, County Sch. . | 2·95 | 75 | ... |
| ,, . | St. Austell, Trevarna.. | 2·20 | 56 | 85 | *Brec .* | Crickhowell, Talymaes | 3·50 | 89 | ... |
| *Soms* | Chewton Mendip ..... | 3·56 | 90 | 120 | *Rad .* | Birm.W.W.Tyrmynydd | 2·87 | 73 | 88 |
| ,, . | Street, Hind Hayes ... | 2·92 | 74 | ... | *Mont.* | Lake Vyrnwy ..... | ... | .. | ... |
| *Glos..* | Clifton College ..... | 3·41 | 87 | 137 | *Denb.* | Llangynhafal ..... | 1·85 | 47 | ... |
| ,, . | Cirencester ..... | 2·79 | 71 | 113 | *Mer .* | Dolgelly, Bryntirion.. | 4·35 | 111 | 125 |
| *Here.* | Ross, County Obsy. ... | ... | .. | ... | *Carn.* | Llandudno ..... | 2·17 | 55 | 107 |
| ,, . | Ledbury, Underdown. | 3·13 | 79 | 138 | ,, . | Snowdon, L. Llydaw 9 | 11·61 | 295 | ... |
| *Salop* | Church Stretton..... | 2·84 | 72 | 117 | *Ang .* | Holyhead, Salt Island. | 2·84 | 72 | 132 |
| ,, . | Shifnal, Hatton Grange | 2·56 | 65 | 115 | ,, . | Lligwy ..... | 2·18 | 55 | ... |
| *Staff.* | Tean, The Heath Ho... | 2·77 | 70 | 107 | *Isle of Man* | | | | |
| *Worc.* | Ombersley, Holt Lock. | ... | ... | ... | | Douglas, Boro' Cem... | 3·43 | 87 | 139 |
| ,, . | Blockley, Upton Wold. | 2·47 | 63 | 93 | *Guernsey* | | | | |
| *War.* | Farnborough..... | 1·49 | 38 | 63 | | St. Peter Port Grange. | 1·13 | 29 | 61 |

## Rainfall: June, 1924: Scotland and Ireland

| CO. | STATION | In. | mm. | Per-cent. of Av. | CO. | STATION. | In. | mm. | Per-cent of Av. |
|---|---|---|---|---|---|---|---|---|---|
| *Wigt.* | Stoneykirk, Ardwell Ho | 2·69 | 68 | 111 | *Caith* | Loch More, Achfary... | 5·41 | 137 | 146 |
| ,, . | Pt. William, Monreith . | 2·84 | 72 | ... | ,, .. | Wick ..... | 1·44 | 37 | 80 |
| *Kirk.* | Carsphairn, Shiel. .... | 3·13 | 79 | ... | *Ork* . | Pomona, Deerness .... | 1·72 | 44 | 93 |
| ,, . | Dumfries, Cargen..... | 1·73 | 44 | 62 | *Shet* . | Lerwick ..... | 2·23 | 57 | 125 |
| *Dum* | Drumlanrig ..... | 2·14 | 54 | 87 | | | | | |
| *Roxb* | Branxholme ..... | 1·58 | 40 | 70 | *Cork.* | Caheragh Rectory .... | 5·70 | 145 | ... |
| *Selk* . | Ettrick Manse..... | 2·09 | 53 | ... | ,, .. | Dunmanway Rectory. | 5·18 | 132 | 148 |
| *Berk.* | Marchmont House .... | 2·38 | 61 | 103 | ,, .. | Ballinacurra ..... | 3·84 | 97 | 148 |
| *Hadd* | North Berwick Res.... | 1·69 | 43 | 102 | ,, .. | Glanmire, Lota Lo. .... | 4·10 | 104 | 152 |
| *Midl* | Edinburgh, Roy. Obs.. | 1·77 | 45 | 91 | *Kerry* | Valencia Obsy. ..... | 4·97 | 126 | 155 |
| *Lan* . | Biggar ..... | 1·24 | 31 | 60 | ,, . | Gearahameen ..... | 7·50 | 191 | ... |
| *Ayr* . | Kilmarnock, Agric. C.. | 2·73 | 69 | 124 | ,, . | Killarney Asylum..... | 5·21 | 132 | 179 |
| ,, . | Girvan, Pinmore..... | 2·80 | 71 | 97 | ,, . | Darrynane Abbey .... | ... | .. | ... |
| *Renf.* | Glasgow, Queen's Pk.. | 1·86 | 47 | 81 | *Wat* . | Waterford, Brook Lo.. | 3·39 | 86 | 126 |
| ,, . | Greenock, Prospect H.. | 3·27 | 83 | 99 | *Tip* . | Nenagh, Cas. Lough... | 3·60 | 91 | 147 |
| *Bute.* | Rothesay, Ardencraig. | 3·06 | 78 | 100 | ,, . | Tipperary ..... | 3·07 | 78 | ... |
| ,, . | Dougarie Lodge ..... | 3·09 | 79 | ... | ,, . | Cashel, Ballinamona .. | 3·66 | 93 | 159 |
| *Arg* . | Glen Etive..... | ... | .. | ... | *Lim* . | Foynes, Coolnanes .... | 4·74 | 120 | 184 |
| ,, . | Oban ..... | 5·35 | 136 | ... | ,, . | Castleconnell Rec. .... | 5·03 | 128 | ... |
| ,, . | Poltalloch ..... | 5·36 | 136 | 179 | *Clare* | Inagh, Mount Callan .. | 5·54 | 141 | ... |
| ,, . | Inveraray Castle..... | 9·34 | 237 | 236 | ,, . | Broadford, Hurdlest'n. | 4·27 | 109 | ... |
| ,, . | Islay, Eallabus..... | 3·33 | 85 | 127 | *Wexf* | Newtownbarry ..... | 3·09 | 79 | ... |
| ,, . | Mull, Benmore ..... | 13·80 | 351 | ... | ,, . | Gorey, Courtown Ho... | 2·71 | 69 | 112 |
| *Kinr.* | Loch Leven Sluice .... | 1·81 | 46 | 83 | *Kilk.* | Kilkenny Castle ..... | 3·80 | 97 | 156 |
| *Perth* | Loch Dhu ..... | 4·20 | 107 | 101 | *Wic* . | Rathnew, Clonmannon | 2·51 | 64 | ... |
| ,, .. | Balquhidder, Stronvar. | 2·56 | 65 | 67 | *Cars.* | Hacketstown Rectory . | 3·62 | 92 | 129 |
| ,, .. | Crieff, Strathearn Hyd. | 1·76 | 45 | 67 | *QCo.* . | Blandsfort House..... | 4·24 | 108 | ... |
| ,, .. | Blair Castle Gardens .. | 1·73 | 44 | ... | ,, | Mountmellick ..... | 3·40 | 86 | ... |
| ,, . | Coupar Angus School.. | 1·84 | 47 | 98 | *KCo.* | Birr Castle..... | 2·88 | 73 | 125 |
| *Forf.* | Dundee, E. Necropolis. | 2·17 | 55 | 121 | *Dubl.* | Dublin, FitzWm. Sq... | 2·78 | 71 | 143 |
| ,, . | Pearsie House..... | 1·83 | 47 | ... | ,, . | Balbriggan, Ardgillan . | 2·20 | 56 | 109 |
| ,, . | Montrose, Sunnyside.. | 1·40 | 36 | 84 | *Me'th* | Drogheda, Mornington | 2·33 | 59 | ... |
| *Aber.* | Braemar Bank ..... | 1·45 | 37 | 76 | *W.M* | Mullingar, Belvedere . | 3·11 | 79 | 120 |
| ,, . | Logie Coldstone Sch. .. | 2·13 | 54 | 109 | *Long* | Castle Forbes Gdns.... | 3·24 | 82 | 125 |
| ,, . | Aberdeen, Cranford Ho | 2·05 | 52 | 114 | *Gal* . | Galway, Waterdale ... | ... | .. | ... |
| ,, . | Fyvie Castle ..... | 1·41 | 36 | ... | ,, . | Ballynahinch Castle .. | 6·60 | 168 | ... |
| *Mor* . | Gordon Castle..... | 2·65 | 67 | 130 | *Mayo* | Mallaranny..... | 7·23 | 184 | ... |
| ,, | Grantown-on-Spey.... | 2·29 | 58 | 102 | ,, . | Westport House..... | 3·26 | 83 | 121 |
| *Na* . | Nairn, Delnies..... | 2·23 | 57 | 127 | ,, . | Delphi Lodge ..... | 8·63 | 219 | ... |
| *Inv.*. | Ben Alder Lodge ..... | 2·13 | 54 | ... | *Sligo* | Markree Obsy. ..... | 4·55 | 116 | 155 |
| ,, . | Kingussie, The Birches | 1·83 | 47 | ... | *Ferm* | Enniskillen, Portora .. | 3·69 | 94 | ... |
| ,, . | Fort Augustus ..... | 2·43 | 62 | 120 | *Arm.* | Armagh Obsy. ..... | 2·37 | 60 | 94 |
| ,, . | Loch Quoich, Loan.... | 11·40 | 290 | ... | *Down* | Warrenpoint ..... | 3·22 | 82 | ... |
| ,, . | Glenquoich ..... | 7·74 | 197 | 158 | ,, . | Seaforde ..... | 3·80 | 97 | 138 |
| ,, . | Inverness, Culduthel R. | 2·29 | 58 | ... | ,, . | Donaghadee ..... | 2·30 | 59 | 99 |
| ,, . | Arisaig, Faire-na-Squir | 4·86 | 123 | ... | ,, . | Banbridge, Milltown . | 2·55 | 65 | 99 |
| ,, . | Fort William..... | 4·94 | 125 | 141 | *Antr.* | Belfast, Cavehill Rd. .. | 4·61 | 117 | ... |
| ,, . | Skye, Dunvegan..... | 3·93 | 100 | ... | ,, . | Glenarm Castle..... | 3·04 | 77 | ... |
| ,, . | Barra, Castlebay ..... | 1·83 | 47 | ... | ,, . | Ballymena, Harryville | 4·08 | 104 | 140 |
| *R&C* | Alness, Ardross Cas. .. | 2·16 | 55 | 96 | *Lon* . | Londonderry, Creggan | 2·70 | 69 | 96 |
| ,, . | Ullapool..... | 2·72 | 69 | ... | *Tyr* . | Donaghmore ..... | 3·30 | 84 | ... |
| ,, . | Torridon, Bendamph.. | 6·33 | 161 | 155 | ,, . | Omagh, Edenfel ..... | 2·76 | 70 | 98 |
| ,, . | L. Carron, Plockton... | 4·53 | 115 | ... | *Don* . | Malin Head ..... | 2·36 | 60 | 110 |
| ,, . | Stornoway ..... | 3·33 | 85 | 143 | ,, . | Rathmullen..... | 2 52 | 64 | ... |
| *Suth.* | Lairg ..... | 2·43 | 62 | ... | ,, . | Dunfanaghy ..... | 3·00 | 76 | 105 |
| ,, . | Tongue Manse..... | 2·58 | 65 | 126 | ,, . | Narin, Kiltoorish ..... | 3·78 | 96 | ... |
| ,, . | Melvich School..... | 2·08 | 53 | 107 | ,, . | Killybegs, Rockmount. | 5·02 | 127 | 132 |

## Climatological Table for the British Empire, January, 1924

| STATIONS | PRESSURE | | TEMPERATURE | | | | | | | Relative Humidity | Mean Cloud Am'nt | PRECIPITATION | | | BRIGHT SUNSHINE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Absolute | | Mean Values | | | | Mean | | | | | | | |
| | Mean of Day M.S.L. | Diff. from Normal | Max. | Min. | Max. | Min. | ½ max. and min. | Diff. from Normal | Wet Bulb. | | | Am'nt | Diff. from Normal | Days | Hours per day | Percentage of possible. |
| | mb. | mb. | °F. | °F. | °F. | °F. | °F. | °F. | °F. | % | 0—10 | mm. | mm. | | | |
| London, Kew Obsy. | 1014·9 | — 2·7 | 52 | 26 | 45·4 | 37·3 | 41·3 | + 2·4 | 41·2 | 87 | 7·2 | 64 | + 19 | 16 | 1·7 | 21 |
| Gibraltar | 1019·2 | — 2·0 | 69 | 43 | 60·6 | 48·5 | 54·5 | — 0·3 | 51·2 | 78 | 5·7 | 126 | — 3 | 12 | ... | ... |
| Malta | 1014·6 | — 1·6 | 63 | 40 | 56·5 | 48·9 | 52·7 | — 1·6 | 48·9 | 79 | 5·7 | 73 | — 2 | 15 | 5·3 | 53 |
| Sierra Leone | 1010·9 | — 0·3 | 94 | 62 | 88·5 | 73·8 | 81·1 | — 0·4 | 74·5 | 70 | 3·3 | 2 | — 9 | 2 | ... | ... |
| Lagos, Nigeria | 1008·7 | — 1·2 | 91 | 65 | 89·5 | 74·8 | 82·1 | + 1·1 | 76·5 | 71 | 6·3 | 49 | + 21 | 4 | ... | ... |
| Kaduna, Nigeria | 1014·1 | + 2·5 | 93 | ... | 88·2 | ... | ... | ... | 60·4 | 46 | 0·9 | 0 | 0 | 0 | ... | ... |
| Zomba, Nyasaland | 1009·5 | + 1·6 | 87 | 60 | 81·2 | 64·5 | 72·9 | + 0·5 | ... | 89 | 7·3 | 194 | — 91 | 22 | ... | ... |
| Salisbury, Rhodesia | 1008·6 | — 0·7 | 87 | 55 | 81·5 | 59·3 | 70·4 | + 0·9 | 62·6 | 58 | 4·1 | 64 | —137 | 6 | ... | ... |
| Cape Town | 1013·7 | + 0·3 | 99 | 51 | 81·6 | 61·8 | 71·7 | + 1·9 | 64·9 | 57 | 2·6 | 7 | — 10 | 2 | ... | ... |
| Johannesburg | 1011·1 | + 1·0 | 89 | 49 | 81·0 | 57·5 | 69·3 | + 3·1 | 57·5 | 57 | 4·3 | 99 | — 60 | 13 | 8·7 | 64 |
| Mauritius | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Bloemfontein | ... | ... | 101 | 48 | 88·9 | 62·2 | 75·5 | + 2·3 | 61·6 | 48 | 3·6 | 97 | — 5 | 9 | ... | ... |
| Calcutta, Alipore Obsy. | 1016·7 | + 1·5 | 84 | 52 | 78·0 | 58·3 | 68·1 | + 1·7 | 57·7 | 81 | 4·0 | 6 | — 4 | 1* | ... | ... |
| Bombay | 1013·5 | + 0·3 | 86 | 61 | 82·7 | 68·0 | 75·3 | + 0·1 | 65·4 | 73 | 2·3 | 0 | — 2 | 0* | ... | ... |
| Madras | 1015·0 | + 0·9 | 86 | 64 | 84·0 | 68·4 | 76·2 | + 0·1 | 70·9 | 84 | 3·7 | 60 | + 37 | 4* | ... | ... |
| Colombo, Ceylon | 1011·5 | + 0·7 | 91 | 70 | 87·4 | 72·8 | 80·1 | + 0·3 | 75·6 | 68 | 4·4 | 65 | — 26 | 7 | 8·5 | 72 |
| Hong Kong | 1019·9 | + 0·5 | 75 | 47 | 65·9 | 59·8 | 62·9 | + 2·6 | 58·9 | 81 | 7·5 | 27 | — 10 | 9 | 3·3 | 30 |
| Sandakan | ... | ... | 88 | 73 | 85·4 | 75·1 | 80·3 | + 0·4 | 76·2 | 81 | ... | 275 | —194 | 13 | ... | ... |
| Sydney | 1009·1 | — 3·4 | 98 | 55 | 80·3 | 64·4 | 72·3 | + 0·7 | 64·4 | 62 | 4·0 | 122 | + 31 | 11 | 9·2 | 65 |
| Melbourne | 1010·4 | — 2·5 | 104 | 46 | 74·4 | 55·5 | 64·9 | — 2·6 | 58·1 | 60 | 5·6 | 73 | + 26 | 12 | 6·8 | 47 |
| Adelaide | 1013·2 | + 0·2 | 105 | 48 | 79·8 | 57·3 | 68·5 | — 5·6 | 57·9 | 48 | 4·2 | 18 | 0 | 8 | 9·4 | 67 |
| Perth, W. Australia | 1014·4 | + 1·9 | 106 | 53 | 81·8 | 60·4 | 71·1 | — 2·7 | 60·8 | 52 | 3·2 | 8 | — 1 | 4 | 10·1 | 78 |
| Coolgardie | 1012·1 | + 0·7 | 106 | 51 | 91·6 | 59·9 | 75·7 | — 1·7 | 62·1 | 32 | 2·1 | 0 | — 12 | 0 | ... | ... |
| Brisbane | 1008·9 | — 2·4 | 100 | 63 | 88·3 | 70·2 | 79·3 | + 2·1 | 71·6 | 63 | 5·2 | 58 | —105 | 9 | 8·2 | 60 |
| Hobart, Tasmania | 1006·1 | — 4·2 | 89 | 41 | 66·2 | 50·6 | 58·4 | — 3·9 | 52·0 | 64 | 6·9 | 138 | + 93 | 20 | 7·2 | 48 |
| Wellington, N.Z. | 1012·3 | — 0·5 | 84 | 46 | 71·5 | 57·4 | 64·5 | + 1·8 | ... | 70 | 5·8 | 57 | — 29 | 12 | 7·9 | 53 |
| Suva, Fiji | 1007·5 | — 0·5 | 89 | 69 | 86·1 | 73·3 | 79·7 | — 0·2 | 75·5 | 77 | 4·7 | 231 | — 41 | 18 | ... | ... |
| Kingston, Jamaica | 1015·8 | + 0·5 | 91 | 65 | 86·9 | 68·2 | 77·5 | + 0·7 | 69·5 | 65 | 4·0 | 13 | — 11 | 3 | ... | ... |
| Grenada, W.I. | 1015·3 | + 2·5 | 85 | 70 | 81·6 | 71·7 | 76·7 | — 0·3 | 72·0 | 75 | 4·5 | 121 | + 8 | 23 | ... | ... |
| Toronto | 1019·6 | + 2·2 | 43 | — 6 | 30·8 | 16·0 | 23·4 | + 1·3 | 20·8 | 52 | 6·8 | 124 | + 51 | 20 | 2·0 | 22 |
| Winnipeg | 1020·6 | + 0·8 | 38 | —31 | 4·8 | —11·9 | — 3·5 | + 0·9 | ... | ... | 4·5 | 11 | — 8 | 10 | 2·5 | 29 |
| St. John, N.B. | 1016·7 | + 1·0 | 49 | —19 | 30·7 | 9·8 | 20·3 | + 1·1 | 18·3 | 63 | 5·5 | 134 | + 12 | 17 | 4·0 | 44 |
| Victoria, B.C. | 1020·4 | + 5·1 | 55 | 17 | 43·9 | 36·7 | 40·3 | + 0·2 | 38·1 | 88 | 8·1 | 67 | — 48 | 16 | 1·7 | 20 |

* For Indian stations a rain day is a day on which 0·1 in. (2·5 mm.) or more rain has fallen.