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British Association for the Advancement of Science

OXFORD MEETING, AUGUST 4TH TO 11TH, 1926

IT is generally agreed that the Oxford Meeting of the British Association was one of the most successful in its long history. To that very satisfactory result many people both within and without the Association contributed. The fact that the Presidential Chair was occupied by H.R.H. The Prince of Wales, and that the University and City of Oxford were the hosts for the meeting undoubtedly helped considerably to augment the numbers attending. It was, however, not so much the presence of some three thousand five hundred people which made the occasion memorable, as the enthusiasm and scholarship of the contributors of papers, and the co-operation of many active workers in planning and carrying out the various social functions; both the scientific side and the social side of the meeting were unqualified successes. A not unimportant contributor to this desirable result was the weather.

Throughout the period the weather was remarkably good. On only two mornings did it rain with any intensity, and on each of these occasions the sky cleared in time for the afternoon outdoor programmes to be completed in brilliant sunshine. In this respect therefore meteorology was a prominent favourite, but as a science amongst its sisters it took but a very poor place.

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At Southampton in 1925 meteorology was well to the fore, partly owing to the fact that the Director of the Meteorological Office was President of Section A (Mathematics and Physics), but this year there was not a single paper on meteorology read in Section A, neither did the subject find a place in the programmes of any other Section as it has done in past years.

In spite, however, of this regrettable absence of papers on the subject, meteorology was not allowed to be forgotten, for the Meteorological Office, at the request of the Council of the Association, staged a large exhibit and demonstration in a commodious room in the University Museum. The exhibition comprised a comprehensive selection of meteorological instruments, including those used in the investigation of atmospheric pollution and upper air conditions, together with the usual climatological ones, such as wind, temperature and rainfall instruments. With these were shown numerous photographs, of which some splendid cloud studies were prime favourites with visitors; and many diagrams and maps, some illustrating the various sides of the activities of the Office, and others showing the special lines on which private investigators are working, prominent in their topical appeal being some seismograms from Kew recording the recent earthquake in the Channel Islands.

The demonstration of forecasting was equally popular. With the collaboration of the Signals Branch of the Air Ministry, who erected a wireless receiving station, synoptic charts for north-western Europe were drawn twice daily, those for 0700 and 1300, entirely from broadcast data, thus demonstrating the possibilities made general by the use of wireless in meteorology. On the 0700 chart a forecast was prepared for the Oxford district, which was made available to all members by its issue on a "Local Daily Weather Report" prepared and duplicated complete with weather map and other data in the exhibition. This Report was circulated daily by means of scouts to the Reception Room of the Association, to all meeting places of the various Sections, and to all the Colleges which were housing members of the Association. By 11 a.m. each morning the whole of Oxford was posted with its own weather report.

From the great interest evinced by the many visitors both in the display of equipment and in the demonstration it was evident that the policy of the Meteorological Office in this matter was amply justified.

The great day of Meteorology was the Tuesday before the Association broke up its meeting. On that day the annual Meteorological Luncheon was held, and both in venue and the numbers who attended it proved to be the most memorable of the series. It was found possible to hold the function

in the Hall of a College, the Warden of Keble College being kind enough to place his resources at our disposal. The suitable atmosphere thus immediately created ensured the success of the Luncheon, and when it is mentioned that the large number of 69 sat down in the beautiful Hall under the Chairmanship of Dr. G. C. Simpson it can be realized that the scene was a notable one. The following were present :—

Dr. G. C. Simpson, C.B., F.R.S. (in the Chair) ; Colonel Sir Henry Lyons, F.R.S., Lady Lyons and Miss Lyons ; Professor A. S. Eddington ; Dr. Annie J. Cannon ; Sir Richard Gregory ; Professor A. Fowler, F.R.S., and Mrs. Fowler ; Lady Lockyer ; Sir Frank Dyson, K.B.E., F.R.S., Astronomer Royal ; Sir Gilbert Walker, F.R.S., President of the Royal Meteorological Society ; Professor H. H. Turner, F.R.S., and Mrs. Turner ; Professor Louis Vessot King, F.R.S. ; Dr. Vaughan Cornish ; Dr. Harold Jeffreys, F.R.S. ; Major G. M. B. Dobson ; Mr. R. S. Whipple ; Mr. H. Knox Shaw ; Professor E. A. Milne, F.R.S. ; Professor Herbert Dingle ; Professor H. C. Plummer, F.R.S., and Mrs. Plummer ; Dr. W. J. S. Lockyer and Mrs. Lockyer ; Professor R. S. Troup, F.R.S. ; Dr. J. S. Owens and Mrs. Owens ; Professor Carroll M. Sparrow ; Professor A. M. Tyndall, Recorder of Section A ; Mr. M. A. Giblett and Mr. W. M. H. Greaves, Secretaries of Section A, and Mrs. Greaves ; Professor H. Stansfield ; Dr. J. K. Fotheringham and Mrs. Fotheringham ; Mr. A. Stevens ; Professor Albert Gilligan ; Dr. H. Borns ; Mrs. A. M. E. Neville ; Dr. A. D. Gardner and Mrs. Gardner ; Mr. F. Debenham and Mrs. Debenham ; Dr. Sturrock and Mrs. Sturrock ; The Reverend Father Lynch, S.J. ; Mr. M. J. B. Davy and Mrs. Davy ; Miss Gertrude Bacon ; Mr. J. J. Shaw and Mrs. Shaw ; Mr. L. H. G. Dines ; Miss E. E. Austin ; Mr. J. D. Fry ; Mr. N. K. Johnson ; Mr. J. Wadsworth ; Mr. J. Hughes ; Mr. W. W. Jervis ; Mr. Joseph Lunt ; Dr. R. Madwar ; Mr. W. M. Witchell ; Mr. E. W. Bliss ; Mr. E. W. Shurlock ; Mr. A. P. Hollis ; Mr. M. F. Budden ; Mr. A. Pearse Jenkins ; and Mr. R. H. Mathews.

During the course of the Luncheon the Chairman first called for the customary loyal toast, and then the company proceeded with the subjoined toast list :—

1. The Success of the Sister Sciences : Meteorology, Astronomy and Seismology.
   Proposer : Sir R. Gregory.
   Seconder : Dr. Vaughan Cornish.
   Reply : Astronomy—Professor A. S. Eddington.
   Meteorology—Sir G. Walker.
   Seismology—Professor H. H. Turner.
2. The Continued Success of the British Association, especially in Section A.
   Proposer : Sir F. Dyson.
   Seconder : Sir H. Lyons.
   Reply : Professor A. Fowler.

During the speeches reference was made to the recent honours conferred by the King on Sir Frank Dyson, Sir Henry Lyons and Dr. G. C. Simpson. Professor Turner added to our merriment by singing, to the tune of "The British Grenadiers," the following

song, which was introduced by Australians at the beginning of the Great War. It was an event to hear the whole company made to join in a repetition of the last line of each stanza as a chorus.

Meteorology *

Some talk of Astrophysics, and some of Educa-
Tion, while shells and bullets whizz, sixteen thousand miles away.
No disrespect is meant to them, nor yet to Botany,
If we sing just now, with a tow-row-row, of Meteorology.

Some use the millimetre, and some the millibar,
And for the thermometer, there's Réaumur, Cent., and Fahr.
But we'll sink all these distinctions, and all united be
When we sing right now, with a tow-row-row, of Meteorology.

Some praise the dirigible, and some the aeroplane,
We need not stop to quibble, the points of both are plain.
But let me make confession, the dream of bliss for me,
Is to go to the Moon, with a " sounding-balloon," for Meteorology.

Some folk are fond of roses, in gardens or in rooms,
And some of country posies, and some of hothouse blooms.
Let each one have his fancy, the " rose of the winds " for me !
This lovely flower I draw by the hour, for Meteorology.

We toast " our wives and sweethearts," and also " absent friends,"
Both these will cause to beat hearts, till human nature ends,
But I hope you'll drink in bumpers the toast that appeals to me
'Tis Hip, Hip, Hooray ! for Australia, and Meteorology.

After the Luncheon a registering balloon was released by Mr. L. H. G. Dines from the Quadrangle of the College in the presence of the assembled company, who then dispersed, some to visit the exhibit in the Museum opposite.

That evening meteorology was again prominent, for during the course of a Conversazione held in the Museum, Dr. G. C. Simpson gave a short lecture on " Weather Forecasting," accompanied by the projection of some excellent slides, and the Meteorological Office Exhibition was kept open and the 1800 chart drawn. On this occasion there was a continual stream of visitors through the exhibition room, and the lecture room was filled to overflowing. Undoubtedly interest in meteorology is growing apace.

R. H. MATHEWS.

Erratum

With reference to the statement on page 159 of the *Meteorological Magazine* that a minimum temperature of $-24°$ F. was recorded at a height of 21,000 feet on Mount Everest, Mr. F. J. W. Whipple points out that this reading was obtained from a thermometer with its bulb freely exposed, about one foot above the surface of the snow, and is not a shade minimum.

*From *The Observatory*, Vol. XXXVII. (1914), p. 430.

OFFICIAL NOTICES

A Course of Training for Observers

The Fourth course of training for Meteorological observers provisionally arranged for the week April 19th to April 24th, as intimated in the February issue of this Magazine, but unavoidably postponed will now be held during the week September 27th to October 2nd at Kew Observatory, Richmond.

The subjects to be dealt with include the following :—

Meteorological instruments and methods of observation.

Recording of observations and their transmission to the Meteorological Office.

The Weather Map : charting of observations distributed by wireless telegraph.

Climatology.

The course is addressed primarily to observers at stations which report regularly to the Meteorological Office. Others will, however, be admitted, at the discretion of the Director, as far as the accommodation permits. Applications for tickets of admission should be made to the Director, Meteorological Office, Air Ministry, Kingsway, London, W.C. 2. There will be no fee for the course, but travelling and other incidental expenses incurred by observers attending the course will in no case be paid by the Meteorological Office.

Meteorological Ground Signals at Lympne Aerodrome

In the *Meteorological Magazine* for November, 1920, reference was made to a system of cloud and visibility signals which had been installed at Lympne Aerodrome to indicate to pilots flying on the air routes between Croydon and the Continent, the height of cloud and the visibility at neighbouring aerodromes.

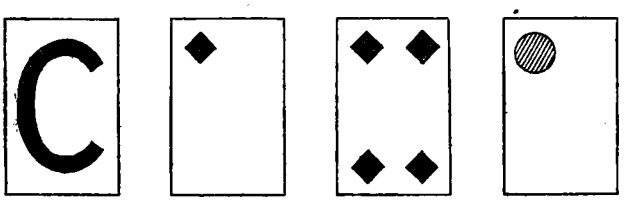
A revised system of ground signals has been recommended recently by the International Commission for Air Navigation and is being introduced on the London—Paris—Brussels routes. The new system was brought into operation at Lympne on 15th August. For each station for which information is displayed, there are four large white rectangular panels arranged in a line. On the first panel, reading from left to right is a single capital letter, permanently fixed, which indicates the station to which the information refers. The second and third panels bear red diamond-shaped marks, arranged as on a playing card. The diamonds are hinged along one diagonal and when closed are indistinguishable from their white background. In this way, any number of diamonds from 1 to 9 can be exposed,

the number indicating, according to fixed scales, the height of the lowest cloud and the visibility respectively.

A variation from the normal arrangement of diamonds in a playing card is made in the case of the lowest cloud height in the cloud height scale and the lowest distance of visibility in the visibility scale, each of which is indicated by one diamond in the top left-hand corner of the appropriate panel. Also the second lowest cloud height or distance of visibility is indicated by one diamond exposed in the centre of the panel. For values higher in the scale of cloud height or visibility the diamonds are arranged from 2 to 9 in the usual way.

The fourth panel is only utilised when one of four adverse weather phenomena is reported, namely, rain or drizzle ; snow, hail or sleet ; thunderstorm or line-squall ; gale. Each of the four groups is represented by an appropriate symbol which can be exposed or shielded at will.

A typical ground signal would be :—



indicating

Croydon.	Lowest cloud below 150 feet.	Visibility between 1,000 and 2,000 yards.	Rain or drizzle.

By the simple arrangement described above, a pilot flying over Lympne can see at a glance from the air the weather conditions prevailing at Biggin Hill and Croydon, if he is flying towards London, or at St. Inglevert, near the French coast, if he is proceeding across the Channel. The information is kept up to date, reports being received at Lympne from each of the three stations every hour during the period that flying is in progress and even more frequently if important changes in the weather conditions occur between two regular hours of observation.

Official Publications

Annual Report of the Meteorological Committee to the Air Council for the year ended 31st March, 1926 (M.O. 288).

PROFESSIONAL NOTES—

No. 45. *The Comparison of Sunshine Recorders of the Campbell-Stokes Type.* A report prepared in the Meteorological Office, London, at the request of the International Meteorological Committee. (M.O. 273*e*).

This paper gives the results of a comparison carried out at Kew Observatory between three sunshine recorders of Campbell-Stokes pattern, exposed side by side under identical conditions. Causes likely to produce slight variations in the records are discussed, and the general conclusion is reached that the maximum duration is likely to be recorded by an instrument in close agreement with the Meteorological Office specification.

Correspondence

To the Editor, *The Meteorological Magazine*

A Proposal for a Meteorological Cruise in the Atlantic in 1927

The lamented death of Colonel Chaves on 23rd July, which was the subject of a sympathetic notice in the *Meteorological Magazine* for August, brought to a close a career of devotion to the science of meteorology which deserves exceptional recognition.

Towards the close of the nineteenth century when the islands of the Azores were connected by cables with both the eastern and the western shores of the Atlantic, Colonel Chaves extended the meteorological organisation of the archipelago from Ponta Delgada to include stations at Horta, Angra do Heroismo and Flores. The ideas with which the new stations were established are set out in a brochure, published at Monaco in the year 1900, under the auspices of the late Prince Albert, who was himself much interested in the islands from the point of view of meteorology and oceanography. The prospective stations mentioned in the volume include one on the island of Pico, a volcanic cone which reaches to a height of 7,500 feet and is a commanding figure in the group, but that part of the scheme is attended by special difficulties. The observations at the other stations were sent to Europe and to America free of any charge.

It is customary for observations to be transmitted between the meteorological services of different countries by way of exchange; those of the Azores were offered without any reciprocal contribution on the part of the continental services. Indeed the provision for transmission of the observations was incorporated by the Portuguese Government in the concessions for the cables. In this respect Colonel Chaves's contribution to the study of the meteorology of the globe may be described as unique.

The islands from which the observations are derived form parts of a volcanic archipelago on about the same latitude as Lisbon, 38° to 40° north, and are in themselves well worth visiting; they are however seldom visited because the steamship lines crossing the Atlantic, with few exceptions, do not touch there; apart from the boats which bring the season's pineapples to Europe, the ordinary facilities for getting from one of the islands to the others are limited to the boats of the Empresa Insulana of Portugal, which make the voyage from Lisbon to Madeira and thence to the Azores and back, but only one of the two extends the voyage to Flores the most western of the Islands.

The geology of these mid-Atlantic islands is of much interest as well as their meteorology, and the services which Colonel Chaves has rendered are so exceptional that meteorologists may be disposed to avail themselves of an opportunity for a special visit to the Islands, and to use the occasion to pay a tribute to the memory of the founder of the Meteorological Service of the Azores.

The best time of the year for the visit would be mid-summer when the days are long, the weather fine, the often vexed Atlantic smooth enough for a pleasure cruise, and the temperature at sea in those latitudes neither too warm nor too cold for comfort. There is an eclipse of the sun on the 29th June next year, of which the line of totality crosses the Irish Sea, and this might be taken as a starting point.

If a sufficient number of readers of the Magazine and their friends would join in a cruise of about 25 days, beginning with 28th June, to see the eclipse at sea and thereafter visit the Azores, we would endeavour to make the necessary arrangements, either with a British Company or with the Empresa Insulana.

It will be remembered that a conference of meteorologists, at which there would be time to discuss papers as well as read them, has often been projected, and was in prospect for the autumn of 1914. The present occasion invites a revival of that idea under the exceptionally favourable conditions of life at sea. The co-operation of meteorologists from other countries would, of course, be welcomed, and is not difficult to arrange, because some of the lines of steamers between the United States and the Mediterranean call at Ponta Delgada in the Island of San Miguel and at Madeira, and could bring friends from the South or West.

We write this note to ask those who would be disposed to join in such a cruise to communicate with one of us as speedily as possible.

(Sgd.) C. J. P. CAVE.
NAPIER SHAW.

2nd September, 1926.

Fishing Weather

The following paragraph occurs as a footnote to a paper "On Barometer Indicators," published in the *Report of the Council of the British Meteorological Society for the 11th Annual General Meeting*, 1861, June 12, pp. 35-48 (p. 47):—

> "Attention has of late been directed to the influence of temperature with the adventures of the fisherman. Sir Francis Chantry, the well-known eminent sculptor, who was fond of fishing, always carried a thermometer, and based his anticipations of success on the relative temperature of the air and water. Important and practical deductions have been formed in the herring fishery from the varying temperature of the sea, by attention to which a sort of geometrical scale has been formed as to the greater or less probabilities of the take of fish."

In recent years meteorologists have been paying much attention to the difference of temperature between sea and air, but I do not think they have taken its influence on the behaviour of fish into consideration. Is there any record of Chantry's experience?

F. J. W. WHIPPLE.

Kew Observatory, Surrey. August 3rd, 1926.

[We cannot trace any record of Chantry's experience, but the general opinion of anglers, as quoted by F. G. Aflalo (*Fishermen's Weather*, London, 1906), is that the most favourable conditions are experienced when the water is warmer than the air. It seems probable, however, that this refers mainly to fish which feed on fly: warm water and cold air would mean that the fish would be active, but their natural food supply would be scanty, so that the attractiveness of the bait would be enhanced. The relation of the herring fishery to temperature is a different problem, depending on the strength and direction of the warm currents which bring their food supply.

In looking up references, a curiosity was found in *Nature*, Vol. 25, 1882, p. 229, to the effect that the temperature can be estimated very closely from the rate of the cricket's chirp:—"Take 72 as the number of strokes per minute at 60° F., and for every four strokes more add 1°; for every four strokes less deduct the same." Ed. *M.M.*]

Anti-Crepuscular Rays

A very good reflection of the sunset from an eastern part of the horizon was visible here on Sunday last, August 22nd, between 7.35 and 7.50 p.m. The sun was shining brightly at the time,

and near the western horizon, whilst in the opposite direction several "rays" were seen, in fan-shaped formation and of a bright pink hue, as if emanating from one source. I noticed that when a bank of alto-stratus cloud passed in the vicinity that the rays were visible under the cloud and not above it. I may add that the air was remarkably clear, the Houses of Parliament, St. Paul's and the Tower being clearly observed, as well as the Crystal Palace.

The place of observation was Richmond Park, near Penn Ponds.

A. HARRISON.

36, *Rosemont Road, Richmond. August 24th*, 1926.

NOTES AND QUERIES

Variations in the Atmospheric Pressure at the 20-kilometre Level

It has been established by more than one investigator* that at a height of 20 km. above sea level the variations in the atmospheric pressure are insignificant as between cyclonic and anticyclonic areas, but there is sometimes a tendency to go further than this and to imply that in this region the pressure is not subject to any appreciable variation.†

An endeavour has been made to discover what variations actually exist, and to that end the British observations by means of registering balloons between the years 1909 and 1925 inclusive have been examined, and about 60 of them found to have reached a height of 19 km. or more. The data are fairly well distributed over the four seasons of the year, but have a tendency to be grouped around certain epochs in a manner which somewhat spoils their independence. When, as happened once or twice, several soundings were available on the same day, selection was made to avoid the inclusion of two or more in close proximity of place and time.

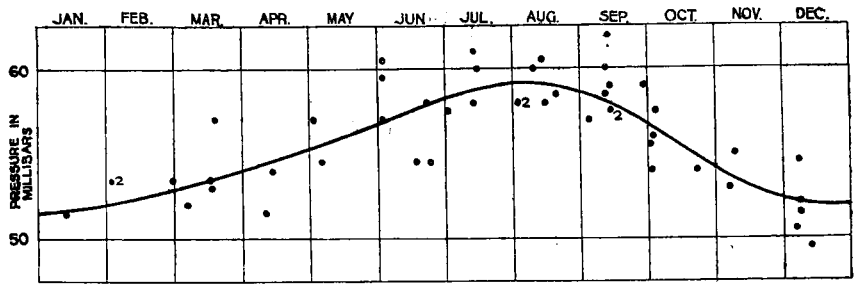
Finally 48 were selected, which occurred in the two distinct periods 1909-1913 and 1924-1925; the winter season is less well represented than the other three. When a height of not more than 19 km. was attained the pressure at 20 km. was computed from that at 19 by assuming that the temperature of the layer 19-20 was the same as that recorded at 19; since the vertical temperature gradient at this height is always very small, such a

* See, The vertical temperature distribution in the atmosphere over England. By W. H. Dines. *London. Phil. Trans. A.* Vol. 211; and "Winds and temperature gradients in the stratosphere." By G. M. B. Dobson. *London. Q. J. R. Met. Soc.* Vol. XLVI. No. 193.

† See, Meteorology. By A. E. M. Geddes, pp. 232 and 276.

procedure is justifiable and not likely to introduce an error exceeding 0·1 mb.

It was found that the pressure at 20 km. was subject to a well marked seasonal variation about an annual mean of 55·2 mb. The individual data are shown plotted in the figure, with a smoothed curve drawn through them. Owing to the fewness of the observations the latter must be regarded as to some extent a provisional estimate of the true curve of annual variation, but it is probable that it represents the main features, and denotes



the magnitude to within a millibar or two. This conclusion is supported by the fact that when further selection of the data was made by including only such soundings as were made under nocturnal or twilight conditions (29 in all), a curve of the same shape was obtained with an annual range of about 1 millibar less.

The departures of the individual observations shown in the figure from the mean curve were tabulated, and their standard value found to be 1·7 mb. How far this is due to real variations of pressure it is not at present possible to say; so many small sources of error in measurement exist that until more observations are available, or the accuracy of observation is increased, it will not be possible to settle the point with certainty.

L. H. G. DINES.

Memoirs of The Royal Meteorological Society

The volumes of the Quarterly Journal of the Royal Meteorological Society for the past few years have contained a number of papers devoted to the theoretical aspects of meteorology, contributed by specialists in the different branches of the subject. Papers of this nature are of very great scientific value, but their treatment frequently necessitates the use of advanced mathematical methods, such as are beyond the equipment of many of the Fellows. Moreover, their publication was a heavy drain on the Society's limited resources, and the Council found itself unable to provide space in the Journal for many matters which, though of wider interest, were of less scientific importance.

In 1925, as announced in the Report of the Council, the Royal Society acceded to an application from the Council for the allocation of a sum of £150 from the Government Publication Grant, and the Council decided to utilise this sum in the publication of a series of " Memoirs."

The object of this series, which is to be independent of the Quarterly Journal, is to provide " for the publication of papers involving highly technical methods of presentation." Three " Memoirs " have now been published, and their titles give an indication of the scope which the series is likely to attain. They are :—

" Diffusion over Distances ranging from 3 km. to 86 km.," by Lewis F. Richardson, B.A., F.Inst.P., and Denis Proctor.

" The Single-Layer Problem in the Atmosphere and the Height-Integral of Pressure," by Lewis F. Richardson, D.Sc., and Russell E. Munday (Exhibitioner of Jesus College, Oxford).

" The Six-hourly Variations of Atmospheric Pressure and Temperature," by S. K. Pramanik, M.Sc., D.I.C. (U.P. Government Scholar, Imperial College of Science and Technology, London). Communicated by Prof. S. Chapman, F.R.S.

Abstracts of the Memoirs are being published in the Quarterly Journal for reference, but the Memoirs will not necessarily be read before meetings of the Society.

The first Memoir is intended to link up the work of Taylor and others on diffusion over distances of a few hundred metres, with that by Defant on diffusion over distances of the order of 1,000 km. For this purpose two sets of records are available—the scattering of pilot balloons loosed from the same place within a short interval of time, and the scattering of volcanic ash erupted from Asama, Japan, in December, 1920. The balloon records employed were mainly those resulting from the toy balloon " races " organised by Major J. M. MacLulich at Brighton. The results show a scattering from the mean track of 10 km. to 86 km. for the volcanic ash, and of 3 km. to 49 km. for the balloons, and confirms the suggestion obtained from previous work that the diffusivity increases with the scale of the phenomena studied.

In the second Memoir a number of theorems on the " single layer " are propounded and established theoretically, and from the published records of registering balloons certain conclusions are drawn. Nothing was found in the observations to justify the hope that the atmosphere could be treated as a single dynamical layer, while it is concluded that " Laplace's equations for

free tidal oscillations in an ocean of uniform depth are a very bad description of ordinary disturbances of the European atmosphere."

In the third Memoir on the six-hourly variations of pressure and temperature, observational data for a large number of stations were utilized. Tables are given with stations arranged in order of increasing latitude in 10° zones from 0°—60° latitude, no distinction being made between places in the northern and southern hemispheres. The annual mean amplitude of the pressure variation does not vary much with latitude between 50° north and south latitude: it is slightly greater at coast stations than at inland stations, the mean between these latitudes being 0·018 mm. at the former, and 0·015 mm. at the latter. The seasonal variation of amplitude is large, the values being greater in winter than in summer, particularly at inland stations.

The annual mean amplitude of the six-hourly temperature variation has its maximum value (0·23° C.) at about 25° latitude, decreasing towards the equator, and more rapidly towards higher latitudes; it is greater at inland than at coast situations. The mean amplitude is much greater in winter than in summer.

The Millibar in France

The Director of the Office National Météorologique de France has decided to adopt the millibar as the unit of pressure in all publications of that Office from the 1st January, 1927.

The millibar was first adopted in the French Daily Weather Reports in January, 1917, and continued in use until March, 1921, when it was decided that, for the daily reports, it would be more convenient to go back to the millimetre. The reversion to millibars is especially welcome, since it means that all nations along the eastern seaboard of the Atlantic from Spitsbergen to the west coast of Africa will now use the millibar as their unit of pressure.

Upper Air Turbulence in Western Australia

An interesting extract from an Australian pilot's log relating to disturbed conditions in the upper air following a "willy-willy" has been forwarded by Mr. H. A. Hunt, Commonwealth Meteorologist. The extract runs as follows:—

> "At a height of 4,000 feet the air was bumpy but not exceptionally so; I was strapped in, but my passenger found the trip decidedly uncomfortable. I then noticed that the machine was rising rapidly and I pulled the throttle half-shut but still the machine went up. At a height of

6,000 feet the air was so terribly bumpy that I was obliged to wedge myself under the side cowling for additional support, the passenger having a very rough time and actually bumping his head severely on the cabin roof. In order to regain the lower altitude where the air was not so rough, I closed the throttle but the machine hung at the higher altitude for quite an appreciable time before descending. I then continued at a height of about 4,000 feet but had very little throttle opening, as there was a continual tendency for the machine to gain height."

A "willy-willy" is the local name given to the hurricanes which sometimes visit the northwest coast of Australia during the summer months, the greatest frequency occurring in January. These storms appear to originate in the Cambridge Gulf or in the Arafura Sea and move southwestward at first, subsequently curving and approaching the Australian coast from westnorthwest. They consist of atmospheric whirls with spirally inflowing winds which attain a destructive speed of from 60 to 120 miles per hour. Their destructive section is frequently less than 100 miles wide, while 150 miles may be taken as an extreme diameter.

The particular "willy-willy" which was followed by the conditions referred to in the above extract developed off Broome on Friday, January 22nd, 1926. On the morning of Saturday, the 23rd, the storm centre was still near Broome but was just beginning to move inland. During Saturday it moved inland and filled up rapidly. While the "willy-willy" was raging at Broome, the pilots of the Western Australia Airways, Ltd., were instructed not to enter the danger zone but to house their machines and await instructions. It was not until midnight on Saturday that the "all clear" message was received and flying was not resumed until Sunday. It was on the Sunday and the following day or so that the pilots reported the very rough air conditions to which the above extract referred.

When forwarding the extract from the pilot's log, the Western Australia Airways, Ltd., in their covering letter assume on the above evidence that the effects of the "willy-willy" persist in the upper air for some two or three days after the storm has moved away. It is very improbable, however, that the turbulent effects would survive so long in the upper air after the moving away of the whirl. A more probable explanation is that the disturbed upper air conditions reported were not due to the whirl as such but resulted from the effect of the southerly wind in the rear of the disturbance. Such a wind drawn from the warm desert interior would probably be warm and dry and the temperature lapse rate might thus approach or even exceed the dry

adiabatic and cause great turbulence up to considerable heights. Analogous conditions are encountered in Egypt and Iraq where the turbulence sometimes extends up to 8,000 to 10,000 feet.

W. C. K.

Speed of Depressions near the Falkland Islands

The Governor of the Falkland Islands maintains a station at Stanley, on the east coast, the records from which include a good series of barograms. He has now kindly sent for our information, another good series of barograms, extending from December, 1924, to August, 1925, and obtained by Mr. J. Robertson at Port Stephens, at the western extremity of the islands. A comparison of the two records yields the results given below for the speed at which depressions travel in this area. The two stations are approximately 125 miles apart and very nearly on the same parallel of latitude (52° S approx.). Depressions are assumed to move approximately from west to east. The barograms have no time marks, but in most cases it was possible to estimate the speed of the clocks from an examination of the times at which the weekly records commenced and finished, the new sheets being nearly always put on the instrument at a definite hour and adjusted to read correctly at the start.

The following table of frequencies was obtained in relation to the passage of a minimum of pressure in the neighbourhood of the two stations :—

FREQUENCIES OF SPEEDS OF DEPRESSIONS WITHIN SPECIFIED LIMITS.

	11–20 m.p.h.	21–30 m.p.h.	31–40 m.p.h.	41–50 m.p.h.	51–60 m.p.h.	61–70 m.p.h.	71–80 m.p.h.	Mean Speed.
Dec.-Mar.	1	4	2	1	—	—	—	29 m.p.h.
April-Aug.	1	3	5	5	1	2	1	41 m.p.h.

The mean speed at which depressions travel is thus 29 m.p.h. during the summer (southern hemisphere) and 41 m.p.h. during the winter.

J.W.

Brush for Stevenson Screen

Observers in dusty localities must have felt the need for a convenient brush for the purpose of removing dust and wind blown débris of various kinds from the louvres and interior of the Stevenson screen. To be suitable for the purpose, the brush should be capable of getting well into the corners and have fairly long bristles so that the spaces between the louvres may

be well swept out. For use at official stations, the Meteorological Office has had a number of suitable brushes made and observers who feel the need for such a brush and find difficulty in obtaining anything suitable are invited to communicate with the Director. The cost of the brush is 8½d.

Reviews

Meteorological Conditions along Airways. By W. R. Gregg. Report No. 245 of the United States National Advisory Committee for Aeronautics.

The report was prepared in an endeavour to show the meteorological requirements necessary for determining the operating conditions along airways. The service that meteorology can render aviation may be treated under two headings: (1) furnishing in convenient form statistical information based upon many years' records of the principal meteorological elements in different parts of the country; and (2) making quickly available current data and forecasts for specified airways based upon detailed observations at points on or near those airways. As aviation in the United States of America is in a large measure in the organization stage, only the first of these headings is dealt with, and in order to bring out clearly the nature of the data available, a definite route is chosen, viz., the Chicago-Fort Worth Airway, on which regular flying begins this year.

The principal factors, from a meteorological point of view, on which the ground organization depends—in particular the selection and orientation of aerodromes—are the direction and velocity of the prevailing surface winds, the frequency of occurrence of fog and low cloud, thunderstorms, and excessive precipitation, including snow-fall. The adoption of satisfactory flight schedules is primarily dependent on the direction and velocity of the wind at flying levels, and also on the frequency of occurrence of fog, low cloud, etc., along the airway. Both in the selection of aerodromes, and in the preparation of flight schedules, topographical irregularities play an important part, owing to the influence these irregularities have on the variation in wind gustiness and on the frequency of occurrence of fog or very low cloud.

In the report, stations along the airway for which meteorological data are available have been selected, and useful summaries of the seasonal and annual frequency of low visibilities and of clouds below selected heights are given. Upper wind data for heights up to 4,000 metres are treated separately for three sections of the route, viz., Chicago to Davenport, Davenport to St. Joseph, and St. Joseph to Fort Worth, and valuable tables

supplemented by diagrams showing the average frequency of winds of different directions and velocities, and the resultant wind velocities along these different sections of the airway, should be a very useful aid in the fixing of flight schedules. It is shown that on the average throughout the year, assuming a cruising speed of 100 mi/hr. and flight at an altitude of 1,600 ft., the actual ground speed of an aeroplane northward would be faster than that southward by the following amounts :—

Chicago to Davenport, 14 mi/hr. ; Davenport to St. Joseph, 8 mi/hr. ; St. Joseph to Fort Worth, 13 mi/hr. The value of information of this nature to an operating company is obvious.

The fact that it is not stated to which years the observations refer, nor the number of observations given, detracts to a certain extent from the value of the paper, as most of the tables are percentage frequencies. It would appear that the visibility observations, for example, cannot cover a very long period, as the international visibility scale is used. The fact, however, that the available information is for a definite airway, and that it is discussed in a straightforward manner, will be useful when similar information has to be compiled and discussed for other areas. It is also realized that the data are far from being complete, and future reports of a similar character will undoubtedly improve, as new material becomes available.

The importance of meteorology in relation to the selection of aerodrome sites in the British Isles is discussed very fully by F. Entwistle in a paper (No. 413) read at the Third International Air Congress at Brussels in 1925, while the more general problem of the relationship between meteorology and aviation is dealt with by E. Gold in the *Journal of the Scottish Meteorological Society* (Vol. XVIII.). Both these papers should be read in conjunction with this report.

G. R. H.

Onweders, optische Verschijnselen, enz. in Nederland. Naar Vrijwillige Waarnemingen in 1922. Deel XLIII. K. Ned. Meteor. Inst. No. 81. Amsterdam 1924.

The publication of this series of volumes was inaugurated by the Institute in 1882 but up to 1895 the contents were confined to a discussion of thunderstorms and their accompanying phenomena, noted annually by voluntary observers. Since 1896 the series has also contained details of the optical phenomena observed.

The present volume is based on observations received from 184 stations, which are distributed with fair regularity over Holland. In Section I. frequency data for thunder and hail are given, followed by a discussion of the state of the atmosphere

on thundery days or periods during the year. The illustrations show cyclone tracks and records of autographic instruments. Paragraphs on lightning, hail, ball-lightning, St. Elmo's fire and waterspouts complete this section. It is noted that the word "fireballs" (Vuurbollen) heads the paragraph on ball-lightning, though a literal translation of the latter term (Bolbliksem) is also used in the text. The use of the word "fireball" in this connection seems to be established in Holland and it is not uncommon in our own country. The astronomical application of the term to a certain class of cosmic meteor certainly antedated the comparatively recent time at which ball-lighting was recognised as a definite electrical phenomenon, and it is unfortunate that the confusion of nomenclature should be perpetuated. Tables showing for each month the daily and hourly frequencies of thunder and hail are given at the end of the book.

The chief optical phenomena considered in Section II. are halos, coronæ, rainbows and mirage. Detailed accounts of the more interesting observations are given. A striking halo complex was seen at De Bilt on March 10th, 1922 (Fig. 19). Tables follow in which the monthly frequency of solar halos, lunar halos and lunar coronæ at a number of individual stations are presented. Perhaps the most striking feature of the book is a further table (VIII.) in which daily frequencies of halos and coronæ, without distinction as to sun or moon, are shown. Separate frequencies are given for no less than eight different kinds of halo or coronal phenomena.

The Dutch Meteorological Institute is certainly to be congratulated upon the regular publication of this series. Both descriptively and statistically the phenomena included are dealt with much more thoroughly than is the case with most other countries. E. W. B.

The Weather of August, 1926

August, 1926, was unusually fine and warm. At Kew Observatory, for example, the mean temperature for the month was 2·5° F. above the average for August, the duration of sunshine was 20 hours above and the rainfall was 40 mm. (1·57 in.) below the average. The total fall of 17 mm. (0·67 in.) for the month was the lowest since 1899.

After mainly fine warm weather at the beginning of the month, conditions deteriorated somewhat towards the end of the first week, a trough of low presssure which extended from a depression near Iceland causing rain in a few districts that night and local thunderstorms on the 6th. The persistence of low pressure systems southward of Iceland caused rather unsettled weather

with bright intervals during the next two weeks. There were occasional thunderstorms and local heavy falls of rain, notably on the 9th 49 mm. (1·91 in.) at Rhayader, 48 mm. (1·88 in.) at Llyn Fawr (Glamorgan), 46 mm. (1·81 in.) at Malvern and 42 mm. (1·65 in.) at Llandrindod Wells; on the 16th 43 mm. (1·71 in.) at Tenterden in Kent and 39 mm. (1·54 in.) at Ramsgate; on the 20th, 37 mm. (1·46 in.) at Eskdalemuir. Temperature, however, remained fairly high, many places recording maximum temperatures of 75° F. and above. 79° F. was registered at Greenwich on the 9th and 81° F. at Jersey on the 16th. Warm nights were also experienced, several stations recording minimum temperatures between 60° F. and 64° F. Good sunshine records were obtained on various days especially on the 12th, when many stations in south and south-east England registered between 12 and 14 hours, and on the 17th when Colwyn Bay registered 13 hours and Hoylake and Sheffield more than 12 hours.

The falls of rain on the 16th at Tenterden and Ramsgate occurred during a severe thunderstorm which visited south-eastern England during the night of the 16th-17th. Damage by lightning and heavy rain was reported from most places along the south and south-east coasts from Carisbrooke in the Isle of Wight to Margate. Ramsgate suffered particularly, the damage there being estimated at several thousands of pounds. At Dover, after a calm night, the wind sprang up suddenly and reached a velocity of 46 miles per hour, 11·2 mm. (0·44 in.) of rain was registered in 12 minutes and 18·8 mm. (0·74 in.) in three hours. At Margate, 16·5 mm. (0·65 in.) fell between 12.30 and 1.30 G.M.T., and 13 mm. (0.51 in.) fell in less than 20 minutes. At Hellingly, in Sussex, the storm lasted 50 minutes, during which time 30·8 mm. (1·21 in.) of rain fell, 18·5 mm. (0·73 in.) falling in 12 minutes. At Upper Hardres and Bossingham, in Kent, there was very heavy hail accompanied by a high wind, and a great deal of damage was done to fruit and crops; on the 19th there was still a large quantity of ice remaining outside Upper Hardres church. The chief feature of the storm was the vividness and continuity of the lightning, an observer near Tunbridge Wells frequently counted as many as four flashes per second.

During the last ten days of the month high pressure systems spread over England from the south giving drier weather in many parts (at Kew there was no appreciable rain after the 21st), and an anticyclone which passed across the British Isles on the 27th and 28th caused a few days of very fine warm weather. About 12 hours of sunshine were enjoyed daily in south-east England from the 26th to the 29th and day temperatures were high, on the 30th 83° F. and 84° F. were recorded in

London. Some high night temperatures were again recorded especially on the night of the 24th-25th, when the thermometer remained well above 60° F. in many places and did not fall below 65° F. in several parts of London.

At the end of the month a trough of low pressure which approached from the Atlantic brought a renewal of unsettled weather and cooler winds in its rear.

Pressure was above normal over the whole of Europe, with the exception of Finland and the north of Sweden, and also at Jan Mayen, the excess reaching 4.3 mb. at Scilly. Pressure was slightly below normal over the North Atlantic between Newfoundland, the Azores and Iceland.

Temperature was above normal except in Switzerland and northern Norway. Rainfall was below normal over the whole of western Europe, the deficit amounting to 79 mm. at Zurich.

The special message from Sweden states that temperature was above normal, the excess reaching 4° F. in the north. Rainfall was normal in the north, but only slightly exceeded half the normal fall in the centre and south. Thunderstorms were rather frequent in central Sweden.

At the beginning of the month further rain in Yugoslavia following on the floods of July caused a landslip which derailed an express train from Vienna to Zagreb. Four lives were lost on the Italian Alps above the Fassa valley as the result of a severe storm which raged along the whole chain of higher mountains.

A heavy rainstorm broke in Barcelona on the night of the 13th and continued throughout the morning of the 14th. A large part of the city and its suburbs was flooded and it is believed that several persons were drowned.

Very hot weather was experienced in the south of France in the middle and end of the month. Forest fires broke out in several districts, the most serious being at Mont-de-Marsan in the district of Landes. In the district round Montpellier vines and fruit trees were reported to be dying from the heat and drought; several places recorded temperatures above 95° F., on the 19th the temperature reached 102° F. at Toulouse, on the 21st 100° F. at Montélimar and on the 22nd 98·6° F. at Nimes. Very hot weather also occurred in Spain, particularly on the 22nd and 23rd, when the highest temperatures for the last five years were recorded. The temperature is reported to have reached over 100° F. at many places and 109° F. at Cordova. Rain fell in Madrid on the 28th for the first time for 55 days.

The Indian monsoon was generally active throughout the month. At the beginning of the month heavy floods on the

Tista river breached the railway at Barnes Ghat, cutting off communication with an important tea district. Floods in Lower Burma breached the entire railway system, some bridges being washed away, others damaged. Rangoon was isolated from the rest of Burma. Large areas of rice and other crops were destroyed. In Upper Burma, on the other hand, various crops are reported to have failed for want of sufficient rain. The Yangtse river was in heavy flood, its depth near Hankow was 48 feet, this is more than has been recorded for 25 years. The floods are reported to have covered two thousand square miles of country and to have caused the loss of three thousand lives.

A gale blowing along the North Atlantic coast of America during the week-end of the 7th and 8th took a heavy toll of shipping, two fishing schooners were wrecked off Nova Scotia. On the 12th a thunderstorm of great intensity swept over New York, 4½ in. of rain was recorded in the 24 hours, of which 3¼ in. is reported to have fallen in less than 75 minutes. Considerable damage was done by lightning and water. On the evening of the 16th a small cyclone coming in from the sea during a thunderstorm wrought damage at Glencove, Long Island. Hundreds of trees were blown down and more than a dozen houses demolished. In the centre and west of the Continent hot weather was experienced. High temperatures were recorded in South Dakota and Utah, especially towards the end of the month. In the southern interior of British Columbia there were many forest fires.

Lake Chapala in Mexico overflowed, twenty-five persons were drowned, and railway communication between Guadalajara and Mexico city was cut off.

The special message from Brazil states that the rainfall was scanty in the north, being 30 mm. below normal, in the central region it was 7 mm. above normal, and in the south the distribution was irregular with an average of 5 mm. above normal. The atmospheric circulation was less active, the Atlantic anticyclone probably being in a normal position. At Rio de Janeiro the pressure was 3 mb. above normal and the temperature 0·3° F. above normal.

Rainfall, August, 1926—General Distribution

England and Wales ..	79	per cent. of the average 1881-1915.
Scotland	86	
Ireland	86	
British Isles	82	

Rainfall: August, 1926: England and Wales

CO.	STATION.	In.	mm.	Per-cent. of Av.	CO.	STATION	In.	mm.	Per-cent of Av.
Lond.	Camden Square.....	1·55	39	70	*War.*	Birminghm, Edgbaston	2·07	53	76
Sur .	Reigate, Hartswood...	2·10	53	91	*Leics*	Thornton Reservoir ..	2·63	67	94
Kent.	Tenterden, Ashenden..	2·42	61	106	,, .	Belvoir Castle.....	2·59	66	99
,, .	Folkestone, Boro. San.	1·24	31	...	*Rut .*	Ridlington.....	1·40	36	...
,, .	Margate, Cliftonville..	2·04	52	64	*Linc.*	Boston, Skirbeck	1·40	36	59
,, .	Sevenoaks, Speldhurst.	1·77	45	...	,, .	Lincoln, Sessions House	2·09	53	85
Sus .	Patching Farm.....	2·31	59	92	,, .	Skegness, Marine Gdns.	1·46	37	60
,, .	Brighton, Old Steyne .	3·31	84	152	,, .	Louth, Westgate	1·64	42	59
,, .	Tottingworth Park....	2·52	64	93	,, .	Brigg	2·87	73	103
Hants	Ventnor,Roy.Nat.Hos.	1·36	35	68	*Notts.*	Worksop, Hodsock....	3·14	80	128
,, .	Fordingbridge, Oaklnds	1·09	28	42	*Derby*	Mickleover, Clyde Ho..	2·27	58	83
,, .	Ovington Rectory	1·85	47	68	,, .	Buxton, Devon. Hos...	3·95	100	90
,, .	Sherborne St.JohnRec.	...	..	...	*Ches.*	Runcorn, Weston Pt...	2·97	75	83
Berks	Wellington College...	...	..	...	,, ..	Nantwich, Dorfold Hall	3·14	80	...
,, .	Newbury, Greenham..	1·03	26	39	*Lancs*	Manchester, Whit. Pk.	3·74	95	108
Herts.	Benington House	1·29	33	53	,, ..	Stonyhurst College....	4·96	126	98
Bucks	High Wycombe	1·17	30	50	,, ..	Southport, Hesketh Pk	3·12	79	90
Oxf..	Oxford, Mag. College..	1·18	30	53	,, ..	Lancaster, Strathspey.	3·61	92	...
Nor .	Pitsford, Sedgebrook..	1·41	36	58	*Yorks*	Sedbergh, Akay	4·82	122	86
,, .	Eye, Northolm.....	...	..	...	,, .	Wath-upon-Dearne ...	2·67	68	111
Beds.	Woburn, Crawley Mill.	1·19	30	52	,, .	Bradford, Lister Pk...	3·30	77	122
Cam.	Cambridge, Bot. Gdns.	1·10	28	47	,, .	Wetherby, Ribston H..	4·26	108	156
Essex	Chelmsford, CountyLab	·90	23	41	,, .	Hull, Pearson Park ...	2·40	61	82
,, .	Lexden, Hill House...	1·14	29	...	,, .	Holme-on-Spalding ...	3·20	81	...
Suff .	Hawkedon Rectory ...	1·61	41	62	,, .	West Witton, Ivy Ho..	3·14	80	...
,, .	Haughley House.....	1·19	30	...	,, .	Felixkirk, Mt. St. John	3·01	76	106
Norf.	Beccles, Geldeston....	1·33	34	62	,, .	Pickering, Hungate ...	3·90	99	...
,, .	Norwich, Eaton	2·54	65	107	,, .	Scarborough.....	2·61	66	94
,, .	Blakeney	1·49	38	66	,, .	Middlesbrough	2·02	51	74
,, .	Swaffham	1·25	32	48	,, .	Baldersdale, Hury Res.	2·97	75	84
Wilts.	Devizes, Highclere....	1·30	33	45	*Durh.*	Ushaw College	2·71	69	93
,, .	Bishops Cannings	1·52	39	49	*Nor .*	Newcastle, Town Moor.	2·27	58	78
Dor .	Evershot, Melbury Ho.	1·27	32	40	,, .	Bellingham, Highgreen	4·34	110	...
,, .	Creech Grange	·94	24	...	,, .	Lilburn Tower Gdns...	2·71	69	...
,, .	Shaftesbury, Abbey Ho.	1·04	26	36	*Cumb*	Geltsdale.....	4·14	105	...
Devon	Plymouth, The Hoe...	1·53	39	50	,, .	Carlisle, Scaleby Hall .	4·09	104	100
,, .	Polapit Tamar	2·08	53	65	,, .	Seathwaite M.	8·10	206	70
,, .	Ashburton, Druid Ho..	2·25	57	60	*Glam.*	Cardiff, Ely P. Stn.....	3·90	99	90
,, .	Cullompton	3·02	77	99	,, .	Treherbert, Tynywaun	9·32	237	...
,, .	Sidmouth, Sidmount ..	1·09	28	39	*Carm*	Carmarthen Friary....	4·70	119	101
,, .	Filleigh, Castle Hill ...	4·28	109	...	,, .	Llanwrda, Dolaucothy.	6·12	155	111
,, .	Barnstaple,N.Dev.Ath.	2·59	66	78	*Pemb*	Haverfordwest, School	3·70	94	89
Corn.	Redruth, Trewirgie ...	2·61	66	76	*Card.*	Gogerddan.....	5·52	140	113
,, .	Penzance, Morrab Gdn.	2·10	53	66	,, .	Cardigan,County Sch. .	4·35	110	...
,, .	St. Austell, Trevarna..	2·23	57	62	*Brec .*	Crickhowell, Talymaes	4·20	107	...
Soms	Chewton Mendip	3·44	87	77	*Rad .*	Birm.W.W.Tyrmynydd	5·45	138	101
,, .	Street, Hind Hayes ...	2·18	55	...	*Mont.*	Lake Vyrnwy	5·77	147	112
Glos..	Clifton College	2·74	70	78	*Denb.*	Llangynhafal	2·89	73	...
,, .	Cirencester, Gwynfa..	2·02	51	66	*Mer .*	Dolgelly, Bryntirion..	5·75	146	102
Here.	Ross, Birchlea.....	...	..	...	*Carn.*	Llandudno	3·52	89	117
,, .	Ledbury, Underdown.	2·88	73	110	,, .	Snowdon, L. Llydaw 9	13·20	335	...
Salop	Church Stretton	2·54	65	78	*Ang .*	Holyhead, Salt Island.	3·22	82	101
,, .	Shifnal, Hatton Grange	2·09	53	74	,, .	Lligwy	2·67	68	...
Staff.	Tean, The Heath Ho...	...	..	...	*Isle of Man*				
Worc.	Ombersley, Holt Lock.	1·95	50	73		Douglas, Boro' Cem...	3·68	93	97
,, .	Blockley, Upton Wold.	1·76	45	60	*Guernsey*				
War.	Farnborough	1·81	46	66		St. Peter P't,Grange Rd	1·41	36	60

Rainfall: August, 1926: Scotland and Ireland

CO.	STATION	In.	mm.	Per-cent. of Av.	CO.	STATION.	In.	mm.	Per-cent of Av.
Wigt.	Stoneykirk, Ardwell Ho	3·62	92	97	*Suth.*	Loch More, Achfary...	8·94	227	153
„ .	Pt. William, Monreith .	3·14	80	...	*Caith*	Wick	2·02	51	73
Kirk.	Carsphairn, Shiel.	5·25	133	...	*Ork .*	Pomona, Deerness	2·87	73	100
„ .	Dumfries, Cargen.....	4·95	126	113	*Shet .*	Lerwick	3·70	94	123
Roxb	Branxholme	3·73	95	116					
Selk .	Ettrick Manse.....	5·55	141	...	*Cork.*	Caheragh Rectory	3·28	83	...
Berk.	Marchmont House	3·04	77	92	„ ..	Dunmanway Rectory.	3·34	85	71
Hadd	North Berwick Res....	1·95	50	62	„ ..	Ballinacurra	2·57	65	69
Midl	Edinburgh, Roy. Obs..	1·95	50	63	„ ..	Glanmire, Lota Lo. ...	2·90	74	80
Lan .	Biggar	2·95	75	89	*Kerry*	Valencia Obsy.	4·37	111	91
„ .	Leadhills	5·90	150	...	„ .	Gearahameen	3·00	76	...
Ayr .	Kilmarnock, Agric. C..	3·51	89	90	„ .	Killarney Asylum.....	3·39	86	77
„ .	Girvan, Pinmore.....	3·21	82	72	„ .	Darrynane Abbey	2·89	73	66
Renf.	Glasgow, Queen's Pk..	3·03	77	86	*Wat .*	Waterford, Brook Lo..	2·47	63	65
„ .	Greenock, Prospect H..	5·09	129	94	*Tip .*	Nenagh, Cas. Lough...	3·31	84	84
Bute.	Rothesay, Ardencraig.	5·23	133	107	„ .	Tipperary	3·07	78	...
„ .	Dougarie Lodge	4·57	116	...	„ .	Cashel, Ballinamona ..	2·46	62	69
Arg .	Ardgour House	10·11	257	...	*Lim .*	Foynes, Coolnanes	2·56	65	66
„ .	Manse of Glenorchy..	7·95	202	...	„ .	Castleconnell Rec.	2·79	71	...
„ .	Oban	5·05	128	...	*Clare*	Inagh, Mount Callan ..	5·00	127	...
„ .	Poltalloch	6·09	155	124	„ .	Broadford, Hurdlest'n.	3·81	97	...
„ .	Inveraray Castle.....	7·74	197	118	*Wexf*	Newtownbarry	2·54	65	...
„ .	Islay, Eallabus.....	5·21	132	120	„ .	Gorey, Courtown Ho...	2·34	59	70
„ .	Mull, Benmore	12·80	325	...	*Kilk.*	Kilkenny Castle	3·71	94	107
Kinr.	Loch Leven Sluice	2·24	57	58	*Wic .*	Rathnew, Clonmannon	2·73	69	...
Perth	Loch Dhu	6·75	171	100	*Carl .*	Hacketstown Rectory .	3·49	89	86
„ ..	Balquhidder, Stronvar.	4·87	124	80	*QCo..*	Blandsfort House.....	3·08	78	78
„ ..	Crieff, Strathearn Hyd.	2·81	71	67	„	Mountmellick	2·89	73	...
„ ..	Blair Castle Gardens ..	2·73	69	81	*KCo.*	Birr Castle.....	2·93	74	77
„ .	Coupar Angus School..	2·63	67	79	*Dubl.*	Dublin, FitzWm. Sq...	2·29	58	75
Forf.	Dundee, E. Necropolis.	2·29	58	68	„ .	Balbriggan, Ardgillan .	3·79	96	111
„ .	Pearsie House.....	2·54	65	...	*Me'th*	Drogheda, Mornington	...	..	...
„ .	Montrose, Sunnyside..	1·70	43	61	„ .	Kells, Headfort.....	5·13	130	124
Aber.	Braemar, Bank	1·73	44	51	*W.M*	Mullingar, Belvedere .	4·73	120	114
„ .	Logie Coldstone Sch. ..	1·13	29	36	*Long*	Castle Forbes Gdns....	3·34	85	82
„ .	Aberdeen, King's Coll..	1·32	34	48	*Gal .*	Ballynahinch Castle ..	6·00	152	109
„ .	Fyvie Castle	1·49	38	...	„ .	Galway, Grammar Sch.	2·89	73	...
Mor .	Gordon Castle.....	1·63	41	51	*Mayo*	Mallaranny.....	6·02	153	...
„	Grantown-on-Spey....	2·24	57	70	„ .	Westport House.....	3·62	92	89
Na .	Nairn, Delnies.....	1·56	40	65	„ .	Delphi Lodge	7·51	191	...
Inv..	Ben Alder Lodge	3·69	94	...	*Sligo*	Markree Obsy.	4·28	109	99
„ .	Kingussie, The Birches	2·28	58	...	*Cav'n*	Belturbet, Cloverhill..	2·93	74	79
„ .	Loch Quoich, Loan....	10·75	273	...	*Ferm*	Enniskillen, Portora ..	...	..	...
„ .	Glenquoich	...	..	...	*Arm .*	Armagh Obsy.	3·24	82	89
„ .	Inverness, Culduthel R.	1·69	43	...	*Down*	Warrenpoint	3·66	93	...
„ .	Arisaig, Faire-na-Squir	4·58	116	...	„ .	Seaforde	3·56	90	95
„ .	Fort William.....	7·25	184	118	„ .	Donaghadee, C. Stn...	3·11	79	93
„ .	Skye, Dunvegan.....	5·81	148	...	„ .	Banbridge, Milltown .	3·66	93	105
„ .	Barra, Castlebay	3·04	77	...	*Antr.*	Belfast, Cavehill Rd. .	4·14	105	...
R&C	Alness, Ardross Cas. ..	2·01	51	68	„ .	Glenarm Castle.....	4·18	106	...
„ .	Ullapool.....	2·93	74	...	„ .	Ballymena, Harryville	4·44	113	104
„ .	Torridon, Bendamph..	4·94	125	75	*Lon .*	Londonderry, Creggan	4·06	103	87
„ .	Achnashellach	6·02	153	...	*Tyr .*	Donaghmore	3·76	96	...
„ .	Stornoway	4·06	103	102	„ .	Omagh, Edenfel	4·04	103	95
Suth.	Lairg	2·61	66	...	*Don .*	Malin Head	3·09	79	88
„ .	Tongue Manse.....	2·55	65	80	„ .	Dunfanaghy	3·40	86	77
„ .	Melvich School.....	3·05	77	102	„ .	Killybegs, Rockmount.	3·56	90	64

Climatological Table for the British Empire, March, 1926

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.	1018·5	+ 5·1	60	31	50·4	38·8	44·6	+ 2·2	39·6	82	7·4	5	— 38	4	3·3	28
Gibraltar	1019·4	+ 2·4	74	46	65·5	54·2	59·9	+ 2·4	53·1	79	6·0	42	— 80	11	...	...
Malta	1014·5	— 0·3	72	45	62·1	53·0	57·5	+ 0·4	53·9	83	5·6	37	— 1	8	6·6	55
St. Helena	1012·5	+ 3·3	71	60	68·1	62·2	65·1	— 1·7	63·9	91	4·0	94	— 31	21	...	...
Sierra Leone	1011·8	+ 1·1	93	73	90·5	76·7	83·6	+ 1·2	76·2	77	4·3	3	— 26	1	...	...
Lagos, Nigeria	1008·4	— 1·0	93	73	91·4	79·2	85·3	+ 2·0	79·8	81	8·6	70	— 25	8	...	...
Kaduna, Nigeria	1012·0	+ 0·9	103	60	95·6	66·7	81·1	0·0	59·3	20	3·0	0	— 11	0	...	...
Zomba, Nyasaland	1016·7	+ 1·1	85	61	81·5	65·1	73·3	+ 2·1	...	87	8·2	367	+143	21	...	...
Salisbury, Rhodesia	1010·7	+ 0·1	81	53	77·7	59·9	68·8	+ 0·6	62·9	79	5·0	304	+190	19	6·7	55
Cape Town	1017·1	+ 2·6	98	51	77·8	59·8	68·8	+ 0·7	60·5	79	3·4	6	— 17	4	...	...
Johannesburg	1015·3	+ 1·6	81	46	74·0	54·3	64·1	+ 0·8	56·9	71	3·2	70	— 43	12	7·7	63
Mauritius	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bloemfontein	...	...	92	49	78·7	55·5	67·1	— 0·3	60·0	78	4·5	97	— 4	13	...	...
Calcutta, Alipore Obsy.	1011·7	+ 1·8	95	63	88·2	69·1	78·7	— 1·4	70·4	83	4·3	113	+ 76	10*	...	...
Bombay	1011·8	+ 0·9	89	72	86·5	74·7	80·6	+ 1·1	71·9	76	1·9	0	— 1	0*	...	...
Madras	1012·1	+ 1·2	95	71	90·6	75·4	83·0	+ 1·9	77·1	79	2·5	0	— 5	0*	...	...
Colombo, Ceylon	1010·9	+ 0·5	93	72	90·3	74·4	82·3	+ 1·0	77·7	69	4·9	146	+ 31	13	9·5	79
Hong Kong	1017·9	+ 1·8	82	55	68·0	60·8	64·4	+ 1·1	60·5	82	9·4	123	+ 52	15	3·1	25
Sandakan	...	...	92	74	88·0	75·1	81·5	+ 0·4	76·9	77	...	26	—178	2	...	...
Sydney	1018·5	+ 2·3	100	58	75·9	63·3	69·6	+ 0·3	65·2	71	7·1	310	+188	14	4·7	38
Melbourne	1019·1	+ 2·1	101	46	77·8	57·0	67·4	+ 2·9	59·0	58	6·2	35	— 22	5	6·2	50
Adelaide	1018·9	— 1·8	101	50	81·5	60·7	71·1	+ 1·3	58·8	44	4·7	0·3	— 27	1	8·4	69
Perth, W. Australia	1017·5	+ 2·2	98	53	79·3	60·5	69·9	— 1·2	61·7	61	4·5	49	+ 30	7	8·4	68
Coolgardie	1017·3	+ 2·5	101	50	80·4	58·8	69·6	— 2·1	59·6	60	2·7	38	+ 19	7	...	...
Brisbane	1017·5	+ 3·1	94	62	84·5	67·2	75·9	+ 1·6	69·6	69	5·0	49	— 92	11	7·6	62
Hobart, Tasmania	1018·6	+ 4·6	84	35	69·5	51·6	60·5	+ 1·1	53·2	64	6·9	20	— 23	10	6·7	54
Wellington, N.Z.	1022·0	— 4·8	74	40	65·9	51·0	58·5	— 2·0	55·3	71	6·2	113	+ 28	7	6·7	54
Suva, Fiji	1009·5	+ 1·0	90	68	82·7	74·5	78·6	— 1·5	75·5	88	7·6	235	—138	20	5·4	44
Apia, Samoa	1009·0	— 0·2	89	72	85·2	75·9	80·5	+ 1·2	78·6	81	7·5	400	+ 56	24	4·5	37
Kingston, Jamaica	1014·8	— 0·1	91	68	87·6	70·0	78·8	+ 1·7	68·5	86	1·6	3	— 23	2	2·2	18
Grenada, W.I.	1015·0	+ 2·3	87	71	84·7	73·2	78·9	+ 1·2	72·7	73	5·8	21	— 49	11	...	...
Toronto	1014·8	— 2·2	48	— 1	32·0	20·1	26·1	— 2·8	20·8	70	5·5	74	+ 7	11	5·5	46
Winnipeg	1021·4	+ 2·6	57	— 18	26·7	8·1	17·4	+ 3·0	...	...	5·5	16	— 12	9	5·4	46
St. John, N.B.	1009·5	— 4·7	45	— 2	32·1	16·4	24·3	— 4·1	19·3	71	5·1	123	+ 8	10	5·5	46
Victoria, B.C.	1021·9	+ 6·1	63	38	55·9	42·8	49·3	+ 6·1	45·0	78	5·6	14	— 51	9	6·5	55

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