M.O. 294.

The Meteorological Magazine

Air Ministry :: Meteorological Office

Vol. 62

Nov. 1927

No. 742

LONDON : PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE.

To be purchased directly from H.M. STATIONERY OFFICE at the following addresses: ADASTRAL HOUSE, KINGSWAY, LONDON, W.C.2; 120, GEORGE STREET, EDINBURGH; YORK STREET, MANCHESTER; 1, ST. ANDREW'S CRESCENT, CARDIFF; 15, DONEGALL SQUARE WEST, BELFAST; or through any Bookseller.

World Weather Records.*

The investigation of relationships between the meteorological conditions in different parts of the world by means of correlation coefficients, which is associated especially with the names of Sir Gilbert Walker and Professor F. M. Exner, has demonstrated unexpected connexions between pairs of stations often far distant, and has added considerably to our knowledge of the circulation of the atmosphere. The calculation of correlation coefficients is itself a sufficiently laborious process, but probably an even greater impediment to the study of world meteorology by this method has been the labour of collecting data for a number of stations over long periods, and the difficulty of assuring oneself that the figures, when collected, are not vitiated by changes in the height of the barometer above sea-level, in the hours of observation or in the exposure of the thermometers or rain-gauge. There may easily be some discontinuity in the series which, while small enough to stand a chance of escaping notice, is yet large enough to spoil the series for the purposes of correlation. Professor Exner was fully alive to this difficulty, and at the International Meteorological Conference at Utrecht

**Smithsonian Miscellaneous Collections, Vol.* 79. World Weather Records, collected from official sources by Dr. Felix Exner, Sir Gilbert Walker, Dr. G. C. Simpson, H. Helm Clayton, Robert C. Mossman; assembled and arranged for publication by H. Helm Clayton. Published under grant from John A. Roebling (Publication 2913). City of Washington, August 22nd, 1927, pp. vii.+1199.

Wt 69—P 1 1000 11/27 M & C

in 1923 he brought forward a proposal for the compilation by all Meteorological Services of long series of meteorological data for selected stations in their areas, at intervals of 500 or 1,000 kilometres. Monthly and annual means of pressure, temperature and precipitation were to be included, and the tables were to go back as far as possible, provided homogeneity was maintained. The last point was strongly emphasised. The International Conference passed a resolution supporting the proposal, and invited the following gentlemen to see to the execution of the resolution :—

Dr. (Sir Gilbert) Walker for the stations of Asia.
Prof. Exner for the stations of Europe.
Mr. Clayton for the stations of America.
Dr. Simpson for the stations of Africa, Australasia and the Oceans.
Mr. R. C. Mossman afterwards took charge of the collection of data from South America.

The compilation was commenced at the end of 1923, the collectors writing to the Directors of the various meteorological services in their areas for copies of their long records, with full explanations of the corrections applied to the readings, etc. The various Directors, almost without exception, realised the importance of the scheme, and contributed their best efforts to its furtherance, and in spite of the great amount of labour involved the work went forward steadily, and by September, 1926, when the International Meteorological Committee met in Vienna, the collection of the data was practically completed.

The question of publication had at first been left in abeyance, but at that meeting Mr. H. H. Clayton was able to announce that the cost of publication would be defrayed by an American donor, Mr. John A. Roebling. The work was to be published by the Smithsonian Institution of Washington, and Mr. Clayton agreed to act as Editor to see the tables through the press.

Copies of the completed volume have now been received in this country, and present an imposing appearance. Issued as Volume 79 of the Smithsonian Miscellaneous Collections, the book comprises 1,199 octavo pages, and bears the title *World Weather Records*, which, grandiose as it seems at first sight, is yet nothing more than a simple statement of fact, for the book includes tables for 385 stations in all latitudes from Upernivik in 72° 47′ N., to Laurie Island in the South Orkneys in 60° 44′ S. Of these stations, 25 are in Africa, 101 in Asia, 62 in Europe, 93 in North America, 43 in South America, and 61 in Australasia and the Oceanic Islands. The arrangement of this great mass of material naturally required considerable forethought ; the investigator might require a station by name, or the nearest station to some particular point. It was also necessary to decide whether to keep all the tables for each station together, or whether to collect in separate parts all the pressures, all the temperatures and all the rainfalls. Various suggestions were made, but no one is likely to quarrel with the arrangement actually adopted, which is " alphabetically by grand divisions." That is, all the stations in Africa are arranged alphabetically, then all those in Asia, and so on ; at the foot of each table are given the monthly averages for the whole period. The tables are completed by an appendix giving the monthly relative sunspot numbers from 1749 to 1925. They are followed by a double index, first an alphabetical index of stations and countries, and then a geographical index arranged by ten-degree zones of latitude in the order in which the stations would appear in the Réseau Mondial ; this index gives also the co-ordinates of the stations. One could have wished that it had not been necessary to separate the notes and explanations from the tables themselves, but where so much is given, one must not cavil, and it is easy to see that this arrangement has saved a great deal of space. Incidentally some of these notes give the history of the stations in great detail, and are instructive examples of the art or science of handling meteorological statistics. In the matter of units, the collectors have adopted a wise compromise by publishing all the tables in the units in which they were supplied. Where practice in different countries is so diverse, it would have been invidious to select one set of units rather than another as a standard, quite apart from the enormous labour and risk of error involved in making the conversions.

The material presented in this publication will be of incalculable assistance to meteorological research. To take an example which is only one among many, some years ago monthly charts of deviation of pressure from normal over the northern hemisphere were required for as long a period as possible. With the help of a few compilations, such as the 73 stations collected by the Solar Physics Committee, it was found possible to construct such charts for the period 1873 to 1900, but the years from 1901 until the beginning of the Réseau Mondial in 1910 could not be undertaken, because it would have been necessary to extract almost all the data year by year from the various monthly and annual reports, while some of it had not even been published and would have had to be obtained by correspondence. Had this volume been available then, the charts could have been drawn in half the time. Thus all meteorologists will agree with the final words of Mr. Clayton's preface : " Meteorology stands deeply indebted to Mr. John A. Roebling for providing the means to publish this long-desired collection of fundamental data, which cannot but be of great use in future theoretical and practical researches," but they will wish to add their thanks to all the Directors and others who have co-operated, to the five collectors, and especially to Mr. Clayton for his labours, which must indeed have been herculean, in assembling and arranging the matter and seeing it through the Press.

Every year adds its quota to the meteorological statistics garnered in the monthly and annual reports issued by the various meteorological services. The tables in *World Weather Records* mostly end in 1920 (the American stations and some others extend to 1923, or even 1925), and in another few years the investigator will find himself faced by the labour of extracting the data for the years 1921 to 1930, to add to those in the present volume, before he is able to begin his calculations. But the international effort so worthily began cannot be allowed to lapse, and means must be found to issue a supplementary volume every ten years, as envisaged in Professor Exner's original proposal.

Official Publications

Annual Report of the Meteorological Committee to the Air Council for the year ended 31st March, 1927. (M.O. 298.)

The year under review is the seventy-second year of the Meteorological Office. The report follows the lines of those for previous years, the chief features of interest for this year being: the review of the work of the British Climatology Division, resulting in the decision to discontinue the weekly issues of the Weekly Weather Report and publish it in future as an annual volume; the establishment of a civilian meteorological service in Egypt and Palestine, with headquarters at Heliopolis; and the international meteorological meetings held in September, 1926, at Zürich and Vienna.

Discussions at the Meteorological Office

The subjects for discussion for the next meetings will be :—

November 21st. *Untersuchungen über die jährliche Periode der Niederschläge in Europa.* By G. Hellmann (Berlin, Sitz Ber. Ak. Wiss., No. 11, 1924, pp. 122-52). *Opener*—Dr. J. Glasspoole.

December 5th. *Application à l'Afrique du Nord de la méthode Norvegienne de prévision du temps.* By L. Petitjean (Alger, 1927). *Opener*—W. C. Kaye, B.Sc.

Correspondence

To the Editor, *The Meteorological Magazine*

The Play of the Winds

The article on the above subject in the September number of the *Meteorological Magazine,* relating to opposing air currents in the lower atmosphere over Liverpool on the morning of Friday, June 10th, affords an opportunity of considering to what extent local topography of the land may affect the course of the wind.

In the first place it is highly probable that the easterly current over Norfolk on June 9th was related to the high pressure over the Fenlands on June 10th, and this supply of air could conceivably travel slowly towards Liverpool. From an examination of the topography of Liverpool and its environs, the open course of the River Mersey between Bromborough, on the one side, and Garston, on the other, would supply the only likely passage for a light southerly wind—whilst the mouth of the river would pilot a northerly wind towards Liverpool. Clearly then, local topography would have reinforced the existing meteorological conditions of " converging winds " towards Liverpool.

It might be interesting to here record an example of " diverging winds " in the lower atmosphere produced by a light flow of air towards a natural barrier. The phenomenon was observed at Dundee some while ago, but was sufficiently impressive as to cause the date to be noted—July 5th, 1923. As with Liverpool, so does Dundee possess a large number of tall factory chimneys. The southern side of the town is undulating, and is bounded by the Firth of Tay, but at approximately three miles to the north of this southern boundary is a prominence—The Law—a hill which rises to a height of 572 feet above sea level. It was at the summit of this hill, and looking towards the south, that I observed one afternoon the smoke drift from factory chimneys, assisted by a light southerly wind, approach, and then, as if divided by a wedge, split into two currents, the one travelling eastwards and the other westwards. Truly a natural cause, but a rather unnatural sight.

P. R. ZEALLEY.

Larkhill. October 5th, 1927.

Monthly Distribution of Storms

Having for many years past noticed a certain tendency for storms, and such like atmospheric disturbances, to occur with greater frequency on about the middle of the month than on any other day thereof, I took the trouble about ten days ago to tabulate the exact number of these occurrences—for the whole of the nineteenth century—from a volume of Haydn's *Dictionary of Dates.* A copy of the results, which can easily be verified, is shown in Table 1 Roughly speaking, the number of storms would appear to gradually increase up to about the 11th, 12th and 13th, and then to gradually abate numerically.

It is difficult to accept the notion that our arbitrary calendar has any effect on storms, and it is equally difficult to my mind to regard " chance " as having anything to do with the figures.

E. G. MILWARD.

Lyndhurst, Westland Green, Little Hadham, Herts. October 15th, 1927.

TABLE I. Total number of storms 523.

Date	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th	
Storms	11	22	15	5	4	12	20	14	20	24	29	36	29	14	20	
Date	16th	17th	18th	19th	20th	21st	22nd	23rd	24th	25th	26th	27th	28th	29th	30th	(31st)
Storms	26	12	14	10	17	15	14	14	23	14	26	19	15	14	6	(9)

[The odds against a distribution of this nature arising by chance are appreciable. If 514 events (i.e., omitting nine which occurred on the 31st) were distributed at random amongst 30 days, an irregular series of figures would result. These figures, like any random succession of numbers, could be expressed as a Fourier series, but the probable amplitude of any term would be only 1·3 events. The numbers found by Mr. Milward give a well-marked 30-day wave with an amplitude of 4·2 events, and the probability of an amplitude of this size arising by chance is one in about 500 (this supposes that all the 514 events tabulated by Mr. Milward are independent). As some of the storms extended over and are entered to more than one date, these odds should be decreased, and if we suppose that on an average one storm is entered to two successive days, the odds come down to only one in thirty. The 30-day wave has its maximum on the 14th, and its minimum on the 29th.

By way of a test, the dates of a number of gales and thunderstorms given by E. J. Lowe (*Chronology of the Seasons*) from 1514 to July, 1752, were tabulated, with the following results :—

Dates ..	1st-5th	6th-10th	11th-15th	16th-20th	21st-25th	26th-30th	Total
Gales ..	19	13	13	9	13	21	88
Thunderstorms	20	17	21	14	18	18	108
All Storms ..	39	30	34	23	31	39	196

Both gales and thunderstorms show a similar 30-day wave, though it is much more regular in the case of the gales than in the thunderstorms. The combined figures have an amplitude of 1·2 events on a total of 196, or 0·6 per cent., which agrees well with Mr. Milward's 4·2 on a total of 514, or 0·8 per cent. The maximum frequency occurs on the 1st, and the minimum on the 16th, or thirteen days before the dates calculated from Mr. Milward's figures. At first sight this discrepancy appears fatal, but in September, 1752, eleven days were added to the calendar (which is why the count was stopped in that year), and in the majority of Lowe's records the dates have not been corrected for this change of calendar. If we add these eleven days, we get for 1514-1750 the maximum on the 12th, minimum on the 27th, a good agreement with the nineteenth century.

The data in the *Dictionary of Dates* include storms all over the world, but the majority refer to the British Isles: those quoted from Lowe refer only to the British Isles.

The effect is best shown in the winter, but persists throughout the year, as is shown by the following table, which was compiled by tabulating month by month the entries in Haydn's *Dictionary of Dates* from 1800 to 1900:—

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug	Sept.	Oct.	Nov.	Dec.
No. of storms	70	35	39	15	16	23	11	51	41	68	60	68
Date of maximum	17th	12th	8th	3rd	13th	13th	10th	15th	12th	21st	17th	6th
Amplitude per cent.	1·3	3·2	2·2	0·9	2·1	0·3	2·3	1·9	1·6	3·0	1·1	0·8

In this table the "date of maximum" is the day of the month on which the sine curve with a 30-day period which best fits the observations, reaches its maximum, and the amplitude per cent. is the amplitude of that sine curve, multipled by 100 and divided by the number of storms in that month. The probable percentage amplitude which would be given by a number of events distributed among thirty days at random is, for fifteen events, 1·4 per cent., for thirty events, 1·0 per cent., and for sixty events, 0·7 per cent. The amplitude found exceeds the chance amplitude for all months except April and December, and is more than twice the chance amplitude in February, March, August and October. In ten of the months the dates of maximum occur between the 8th and 17th.

The phenomenon was next sought in the daily values of pressure at Greenwich, which have been conveniently summarised for the years 1854 to 1873 in one of the publications of the Royal Observatory, but no trace was found there of any periodicity of pressure with a length of thirty days. Actually, the lowest daily mean occurs on the 8th, and the lowest 5-day mean on the 21st to 25th.

From the statistics quoted above, the balance of probabilities seems to be rather in the direction of the existence of a real tendency for storms to occur in the middle of the month, but it is very difficult to find any satisfactory meteorological basis, and the matter requires further investigation before it can be finally accepted. The irregular lengths of the calendar months do not constitute a serious objection, for if the phenomena be regarded as due to a periodicity of exactly one-twelfth of the year, or 30·44 days, the dates of maxima would not vary by more than about two days throughout the year. An alternative and perhaps more likely hypothesis would be that a recurrence of *about* thirty days starts afresh each year at approximately the same time.—C. E. P. BROOKS.]

Irregular Optical Phenomenon

The following particulars refer to an irregular optical phenomenon observed from the meteorological station at Grayshott shortly before 9h. G.M.T. to-day. At 8h. 35m. the sun was shining through light cirrus. An iridescent band, perfectly straight, was seen vertically above the sun. The red was nearest the sun, the blue being furthest away. The width of the band was about $1\frac{1}{2}°$, the length $4\frac{1}{2}°$, and the distance from the sun about 9°-10°. The sky beneath the line was darker than that above it. The phenomenon was visible for about five minutes. At 8h. 55m. it reappeared. The band was longer, with ends curved down. It was slightly further away from the sun (*circa* 11°), and much brighter, lasting for over an hour. There were no coronæ or halos visible.

S. E. ASHMORE.

Windwhistle Cottage, Grayshott, Hindhead, Surrey. September 25th, 1927.

Minimum Temperatures as recorded in the Stevenson Screen and in an adjacent Transport Shed with an open end

The investigation was prompted by repeated enquiries from Officers on the Unit for the actual differences likely to occur between the minimum temperatures inside and outside the shed used as an Officers' garage. The garage is one end of the Station Transport Shed which is situated just inside the camp, and about 150 yards away from the Stevenson Screen. The open side faces west-north-west and the height of the shed is about 35 to 40 feet. A wooden lock-up box, thoroughly ventilated by means of a system of holes on all sides, was fixed to a support in the middle of the shed at a height of $4\frac{1}{2}$ feet above the ground. The series of readings which lasted about a month (January, 1926) included a cold spell not normally experienced at this station. The minimum thermometer in the shed was set and read at 18h. and 9h. respectively, and compared carefully with the Stevenson screen readings (shade minimum) for the same times.

The three main factors that regulate the differences in temperature under such circumstances are, the radiation effect and the wind speed and direction. In Table I. are given the differences that occur between the two thermometers with different shade minima and show clearly how the greatest differences occur at the lowest temperature ; Table II. gives the

TABLE I. DIFFERENCES OF MINIMUM TEMPERATURES WITH DIFFERENT SHADE MINIMA.

15°—30° F.		30°—39° F.		39°—42° F.	
Shade min.	Diff.	Shade min.	Diff.	Shade min.	Diff.
°F.	°F.	°F.	°F.	°F.	°F.
15·2	7·8	31·6	0·4	39·1	0·1
16·2	4·1	32·8	0·2	39·1	0·7
25·0	2·0	33·0	0·0	40·5	3·3
26·0	4·5	33·7	0·5	41·8	0·2
27·8	0·7	36·8	1·6	41·9	0·9
30·0	1·0	37·2	1·3	42·0	1·2
		38·8	—0·3	42·1	0·0

differences associated with different states of the sky (cloud amounts), and Table III. those differences associated with wind velocities. The period of time throughout is 18h. to 9h.

Some measure of the protection afforded by the shed is obtained by taking a mean of the values as recorded during the coldest period, January 12th to 22nd. For these ten occasions the mean difference works out at 2·1° F. More can probably be learned however by inspecting the individual occasions and treating each on its merits.

TABLE II. DIFFERENCES OF MINIMUM TEMPERATURES WITH DIFFERENT CLOUD AMOUNTS.

•b (0—2 tenths)		bc (3—7 tenths)		c or o (8—10 tenths)	
Weather	Diff.	Weather	Diff.	Weather	Diff.
	°F.		°F.		°F.
bm	7·8	bc	1·2	o-ossm	2·0
bmx	4·5	bz-bc	0·4	o-oms$_0$	1·0
cm-bmfx	4·1	bmx-bcx	0·2	cm-o	0·9
bw-bcwm$_0$	3·3	b-bcjp$_0$	0·1	c-cqos	0·7
bw-bx	1·6	cm$_0$-bmc	0·0	om$_0$	0·5
bm$_0$	1·3			bz$_0$c-c	0·2
bw	0·7			cm	0·0
				cm$_0$	0·0

The greatest difference 7·8° F. occurred on the night of January 15th—16th, with a screen temperature of 15·2° F. and a shed temperature of 23·0° F. There was little or no wind during the period preceding the fall in temperature, so that the big disparity in the readings was chiefly due to radiation which was set up by a clear sky and no wind. On the following night the screen temperature was about the same, but the difference

4·1° F was much smaller. In this case the shed temperature dropped down to 20·3° F., the screen recording 16·2° F., a light north-west wind finding easy access to the middle of the shed and an overcast sky reducing the fall due to radiation outside to a minimum. A difference of 2·0° F. on January 14th—15th is worth investigating in reference to a difference of 4·5° F. on January 20th—21st, the screen temperature being about the same in each case (one 25° F. and the other 26° F. respectively).

TABLE III. DIFFERENCES OF MINIMUM TEMPERATURES WITH DIFFERENT MEAN WIND SPEEDS AND DIRECTIONS.

Wind 0—10 m.p.h.		Wind 10—15 m.p.h.		Wind 15—30 m.p.h.	
Direction	Diff.	Direction	Diff.	Direction	Diff.
Calm	7·8° F.	S	1·6° F.	SSW	1·2° F.
Calm	4·5	S to SE	0·9	NW	1·0
NW	4·1	E to S	0·5	NE	0·7
SSW	3·3	SSW	0·2	S	0·7
ENE	2·0	SW	0·0	E	0·4
E	1·3	E to SE	0·0	SW	0·1
W	0·2			SW to W	−0·3

The night of January 14th—15th was overcast with snow falling, so that radiation would be almost negligible, whereas on January 20th—21st the sky was clear, so producing the radiation effect. In other words the difference of 2·5° F. appears to be practically all a radiation effect. Both nights were calm.

In the same way the other occasions could be discussed, and it would be found that there is little difference between the two sets of readings, apart from the occasions when the radiation effect is operating, and that is usually of course in calm weather. On days of strong wind the readings are usually about the same. Opportunites for making comparisons during frost periods are rare in this part of England, and it is thought that the figures do give information which has not been available before.

C. W. LAMB.

R.A.F. Station, Felixstowe. July 30th, 1927.

NOTES AND QUERIES

The Hours of Reading the 1-foot Earth Thermometer

Captain E. R. Taylor, of Ardgillan, Balbriggan, has been following up a suggestion by Mr. Baxendell, of Southport, that 9 a.m. is not a good hour for the daily reading of the 1-foot earth thermometer. At that depth the diurnal range is still appreciable, but owing to the lag resulting from the time occupied by the downward conduction of the daily temperature wave 9h.

falls near the minimum. As the diurnal increase is more rapid than the decrease, the maximum probably occurs near 17h. or 18h., and in 1921 Mr. Baxendell initiated a second reading at 17h. At Ardgillan a reading at 17½h. was instituted on March 5th, 1924. Capt. Taylor now sends us an analysis of the results, summarised in the accompanying table, from which it appears that the reading at 17 or 17½h. averages as much as 1·6° F. higher than that at 9h., the difference being greatest in early summer and least in winter.

3 years 1924/5—1926/7	Apr.-June	July-Sept.	Oct.-Dec.	Jan.-Mar.	Year
Ardgillan					
9h.	52·7	60·0	45·2	41·8	49·9
17½h.	55·0	62·0	46·0	42·9	51·5
Diff.	2·3	2·0	0·8	1·1	1·6
Southport					
9h.	54·5	62·0	43·2	40·2	50·0
17h.	57·1	64·0	43·8	41·3	51·6
Diff.	2·6	2·0	0·6	1·1	1·6

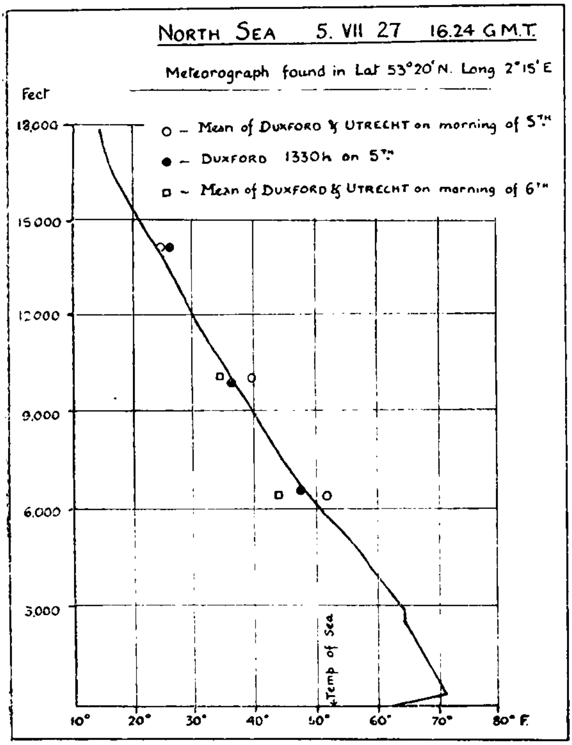
It is to be remarked that the diurnal wave of temperature does not penetrate with appreciable amplitude to a depth of 4 feet, so that for observations at that depth the hour of observation is of little importance.

Sounding Balloon Ascent over the North Sea

On the evening of July 5th a sounding balloon apparatus was released from H.M.S. *Fitzroy*, with a Dines Meteorograph attached.

The apparatus consisted of two Hutchinson balloons arranged in tandem, the upper balloon (2,016 grammes), which acted as the lifter, was inflated to give a free lift of 7 lb., and was attached to an automatic dropper set to release it at a height of 5½ kilometres. The lower balloon (800 grammes) was given a lift of 3½ lb., and was permanently attached to the line carrying the instruments, for the purpose of steadying it on its downward flight, and for preventing it going into the sea. At the bottom end of the line was attached a sea anchor float made of canvas, and weighing approximately 3 lb., which served to anchor the balloon, and so prevent it drifting with the wind. On the day in question a moderate S.E. breeze was blowing, with cloudy weather and good visibility, but the weather conditions were generally unsettled.

On being released, the apparatus took a north-westerly course, gradually veering to the eastward as its height increased, the balloons were followed by means of a sextant for eleven minutes, and then disappeared into cloud; the estimated height at that time was 7,000 feet. From a report received from the Meteorological Office earlier in the day the wind at 20,000 feet was estimated to reach a speed of 60 m.p.h., and it was therefore reckoned that the apparatus should be picked up 36°, 25 miles from the position from which it was released. The ship thereupon proceeded to this position, but no trace of the apparatus was found. On July 15th the meteorograph was recovered by a trawler, after having been at the bottom of the North Sea for ten days. The instrument was little damaged, and will be used again after adjustment and cleaning up.



The record has been examined by Mr. L. H. G. Dines at Kew Observatory, and has been found to be quite legible. It gives a very remarkable surface temperature inversion, as shown on the accompanying diagram. Mr. Dines was able to trace on the record the point when the instrument went into the sea, where the pressure increased greatly; the temperature recorded at this point was 53° F., and the temperature of the sea taken on board H.M.S. *Fitzroy* agrees favourably with this, and verifies the accuracy of the record.

In examination of the weather chart for 18h. on July 5th it is noted that the temperature over France and Germany was much higher than that existing over the British Isles. The warm air, with a surface temperature of nearly 80°, having a lapse rate rather less than the dry adiabatic, flowed northward, and in its progression over the North Sea was cooled by contact with a colder sea, and this cooler air was apparently spread upwards by turbulence through about 330 feet.

It is known that inversions of temperature of this kind must frequently be formed over the sea during the summer months, but in the absence of direct measurement their presence can only be inferred. It is particularly fortunate that the instrument was ultimately recovered in the present case, when such a striking example of an inversion of this type was encountered.

L. G. GARBETT.

Note on the Lasting Qualities of Small Rubber Balloons.

As is well known, observations of upper wind velocity and direction made on behalf of the Meteorological Office, involve the use of small rubber balloons which are filled with hydrogen and then released. In the ordinary course, cheap balloons of the type manufactured for use as toys are found quite satisfactory, but failure occurs occasionally, the balloon bursting either during inflation or within a short time of its release. It has been found that such failures are due to two distinct causes :—

(A) Development of weak spots or pin holes in the rubber.

(B) Deterioration of the fabric of the balloon in storage.

With regard to (A) there is reason to suspect that liability to develop weak spots is associated with certain dyes, used to tint the rubber sheet, and investigations are proceeding at the factories supplying the balloons.

The other source of trouble, that due to deterioration of the fabric, is to a considerable extent in the hands of the observers using the balloons. It has always been emphasised that, as far as possible, the balloons should be used when fresh. Any attempt to preserve balloons for long periods is almost certain to result in a considerable proportion of failures. Deterioration is found to be accelerated by variations of temperature, and the best place to store balloons is, therefore, one in which such variation is not great. Any ordinary living room or general office usually fulfils these requirements.

In order to obtain more precise data as to the period during which balloons can safely be stored under exceptional conditions, an experiment has recently been carried out by the Instruments Division in collaboration with the Meteorological Office, Heliopolis. A number of balloons recently delivered by the manufacturer were forwarded without special protection, by parcels post in July last, to Heliopolis, where they were divided into three batches. The first batch was returned immediately upon receipt of the balloons, the second after storage for one month, and the third batch after storage for two months. In each case the balloons were undyed, and were found to be in perfect condition. It seems reasonable to conclude, therefore, that balloons may ordinarily be expected to survive the journey to the tropics and two months' storage during the hot weather without appreciable deterioration. It should not ordinarily be necessary to store balloons for a period exceeding two months, even in the tropics.

Further evidence has recently come to hand which indicates that a period of two months may even be greatly exceeded without failure. Before H.M.S. *Renown* left this country to convey T.R.H. the Duke and Duchess of York for a six months' cruise round the world, a number of pilot balloons were put on board in order that observations might be taken by the Meteorological Officer. Some of these balloons were unused at the end of the cruise, and were returned to the Meteorological Office, where they were tested and found to be in perfect condition. Some of the balloons referred to were dyed. It is not intended to assert that this standard of performance could be expected from all pilot balloons, but it does indicate that small rubber balloons of good manufacture are considerably more durable than has sometimes been supposed.

A Somersetshire Weather Diary

The Meteorological Office has recently received on loan from the Right Honorable Henry Hobhouse, of Hadspen House, Castle Cary, a manuscript weather register covering the period 1828 to 1854, with a record for part of the year 1805.

The diarist was the late Rt. Hon. Henry Hobhouse (1776-1854). After distinguished services to the State he retired in 1827, and commenced his weather record in 1828 at Hadspen House. This was maintained until his death in 1854. He was well known for his extensive knowledge of the State Archives, and edited the State Papers of Henry VIII. All his meteorological observations were made at Hadspen House, which is situated about 1½ miles east-south-east of Castle Cary, Somerset. It is 420 feet above mean sea level, on the south-west side of a wooded hill which rises to about 500 feet. The observations are both eye and instrumental, the latter comprising temperature and pressure. At first these are given twice daily, but in the later years only once daily. There is no record of rainfall. Gaps of a few weeks are frequent in the summer months, especially in the later years of the record. No precise information is given of the type or exposure of the instruments, and such information is, unfortunately, not now available.

The instrumental readings themselves are of little permanent value. As is usual in old manuscript records, the barometric readings are all low. The mean pressure for January from this record was reduced and found to be 29·33 in. After allowing about 0·42 in. for lack of correction for height above mean sea level, the value, 29·75 in., so obtained is still about 0·3 in. below the normal mean pressure for January. Difficulties also exist as to the temperature readings. Up to September, 1849, the temperature is given as at the time of observation, but after this date the single reading of temperature is replaced by two readings called " highest " and " lowest " respectively. It is impossible to say what is intended by these figures. They are not genuine maximum and minimum temperatures, as on some days credited with frost the " lowest " reading is over 40° F. The only hint as to exposure is a note made in July, 1847, to the effect that " on bright mornings the Thermometer on the East side of the House is 3 or 4 degrees higher than that on the West."

RAIN DAYS—HADSPEN HOUSE.

Year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1828	8	9	6	17	17	11	20	20	14	7	11	12
1829	5	8	9	21	7	13	17	16	24	14	3	3
1830	4	6	5	17	14	17	19	24	20	11	13	12
1831	6	...	...	13	6	14	13	14	14	17	8	10
1832	7	2	11	11	13	13	6	18	6	15	15	10
1833	8	16	6	14	4	16	12	6	13	9	11	17
1834	16	8	7	7	8	...	18	16	7	7	8	7
1835	7	...	11	10	14	10	7	10	23	16	13	4
1836	14	8	19	16	3	14	12	18	17	11	21	10
1837	12	...	...	...	...	...	11	17	11	13	...	12
1838	2	7	8	11	...	...	15	10	9	12	10	11
1839	14	...	...	9	9	13	20	11	21	11	16	16
1840	18	...	5	6	...	...	19	9	14	12	14	4
1841	11*	9*	16	14	...	...	17	18	16	17	10	15
1842	8	...	13*	3	11*	4*	10	12	14	6	16	6
1843	15	6	8	18	18	14*	...	...	4	17	12	3
1844	10	9	5	5	...	...	10*	15	10	16	11	5
1845	11	6	4	10	...	...	15	17	12	10	11	13
1846	15	8	16	15	...	...	...	13*	8	17	...	4
1847	5	6	12	11	...	...	6	11	12	12	3	12
1848	9	12	15	17	...	...	17	23*	9	16	4	12
1849	11	7	2	13	...	...	9*	8	9	4	8	5
1850	6	10	2	...	...	...	10*	14*	9	6	1	4
1851	15	3	13	5	...	...	9*	11	6	11	7	3
1852	11	8	2	2	...	...	6	13	9	...	...	...
1853	14	6	7	7	...	...	...	9	8	...	...	5
1854	10	7*	7	6	...	...	...	...	...	...	...	...

* A number of observations have been missed rendering the exact total uncertain.
A ... signifies that so many observations have been missed that it is impossible to give any figures at all.

The valuable part of the record is undoubtedly the weather diary, which includes some phenological observations. The weather diary gives a day-to-day account of the weather, which, although often restricted to a single word, is nevertheless sufficient for the construction of tables showing the number of occurrences of rain, snow, thunder, and other elements. In this connexion it is interesting to note that the diarist attached some importance to sunset as a determining moment in the course of weather. Such phrases as " rain continued till sunset," " wind rises after sunset " and " wind W., changes at sunset to E." are common. The phenological records deal with the arrival and departure of the swallow, the first hearing of the cuckoo, the date of blossoming of a number of trees, dates of harvesting and sundry other observations. A summary of the eye observations has been prepared, and will be deposited in the Library of the Meteorological Office.

DAYS WITH SNOW—HADSPEN HOUSE.

Year	Jan.	Feb.	Mar.	April	May	Oct.	Nov.	Dec.
1828	4	2	0	0	0	0	0	0
1829	6	1	1	1	0	0	1	6
1830	9	5	0	3	0	0	0	7
1831	3	...	...	0	0	0	1	1
1832	2	0	2	0	0	0	1	0
1833	0	2	6	0	0	0	1	1
1834	0	0	0	1	0	0	0	0
1835	3	...	1	2	0	0	0	2
1836	5	4	2	3	0	0	0	5
1837	3	...	...	...	0	0	...	2
1838	4	2	0	4	0	2	0	0
1839	5	...	...	1	2	0	1	0
1840	0	...	2	1	0	0	0	4
1841	6 ?	1	0	0	0	0	2	2
1842	4	...	0	0	0	0	0	0
1843	3	3	0	5	0	0	0	0
1844	2	7	0	0	0	0	1	2
1845	2	4	7	0	0	0	0	2
1846	0	0	1	0	0	0	...	1
1847	3	8	2	2	0	0	0	1
1848	6	0	2	2	0	1	1	0
1849	1	1	0	5	0	0	0	1
1850	2	0	4	...	0	0	0	0
1851	0	0	1	0	0	0	1	0
1852	1	1	0	0	0	0	...	0
1853	0	17	7	1	2 ?	0	...	...
1854	5	0	1	0	0	...	...	5

No snow is recorded in the months June, July, August and September.
A ... signifies that so many observations have been missed that it is impossible to give any figures at all.

Our thanks are due to the Rt. Hon. Henry Hobhouse for so kindly granting an opportunity for inspecting and studying this interesting record, which he has now presented to the Royal Meteorological Society Library.

C. E. BRITTON.

Prize Competition for Teachers

The Council of the Royal Meteorological Society, with a view to encouraging the study of weather in schools, invite teachers to send in essays on that subject.

The Council consider that the essay should include a description of the work which is actually being carried out or has been carried out by the teacher and his class. The essays should be limited to 2,000 words, but may be accompanied by examples of pupils' work. They should be received by the Society not later than June 30th, 1928.

It is proposed to allot three prizes of £5, £3, and £2, but these amounts may be varied at the discretion of the Council. It is hoped to publish the winning essay or essays in the *Quarterly Journal*, in which event 40 reprints will be supplied to the author.

Radiation from the Sky

RADIATION MEASURED AT BENSON, OXON, 1927.

Unit: one gramme calorie per square centimetre per day.

ATMOSPHERIC RADIATION only (dark heat rays)

Averages for Readings

		July	Aug.	Sept.
Cloudless days :—				
Number of readings	n	1	1	4
Radiation from sky in zenith ...	πI	600	658	496
Total radiation from sky ...	J	630	690	524
Total radiation from horizontal black surface on earth ...	X	788	816	689
Net radiation from earth ...	X—J	158	126	165

DIFFUSE SOLAR RADIATION (luminous rays).

Averages for Readings between 9 h. and 15 h. G.M.T.

		July	Aug.	Sept.
Cloudless days :—				
Number of readings	n_0	0	0	1
Radiation from sky in zenith ...	πI_0	..	..	22
Total radiation from sky ...	J_0	..	..	38
Cloudy days :—				
Number of readings	n_1	2	2	2
Radiation from sky in zenith ...	πI_1	153	100	130
Total radiation from sky ...	J_1	110	170	95

Unit for I = gramme calorie per day per steradian per square centimetre.
Unit for J and X = gramme calorie per day per square centimetre.
For description of instrument and methods of observation, see *The Meteorological Magazine*, October, 1920, and May, 1921.

Reviews

A Group of Solar Changes. By C. G. Abbot. Size 9¾ by 6½, pp. 16. Washington D.C. Smiths. Inst. Misc. Coll., Vol. 80, No. 2, 1927.

Dr. Abbot is untiring in his search for new proofs of the reality of fluctuations in the solar constant. The present paper is primarily devoted to a new method of comparison, which " depends on the selection of moments when the sun is equally high above the horizon, the atmosphere equally clear, the quantity of atmospheric water vapour identical, and the month of the year the same," so that the reduction in the intensity of radiation by the atmosphere is very nearly the same, any small differences being eliminated by taking groups of similar days. The mean seasonal or annual values obtained in this way agree closely with the general mean values previously obtained ; thus supporting the reality of the variations from year to year, and they also agree with the variations of the relative sunspot number, though "the increase of solar radiation attending a given increase of sunspot numbers is decidedly greater when the total spottedness is small than when it is large."

The harmonic analysis of 77 months of solar radiation values shows a well-marked periodicity of $25\frac{2}{3}$ months which is common in meteorological series. Unfortunately these results are only given graphically, the amplitudes and phases not being stated in figures. Curves are also given to show the close similarity between the monthly means of solar radiation and first the ultra-violet radiation recorded by Pettit, secondly the intensity of long-range radio-signals.

C. E. P. Brooks.

Climatología Agrícola. By Enrique Alcaraz. Size $8\frac{1}{2} \times 6$, Vol. I, pp. 216 + 22 charts. Vol. II., pp. 371 + 14 charts. *Illus.* Madrid, 1925.

This extensive and well produced treatise, in two volumes, consists of three main sections :—

General and descriptive climatology.

Climate in its relation to agriculture, vegetation, flora, fauna and their distribution over the globe.

A detailed study of the climate and agricultural activities of the Iberian Peninsula.

General climatology is developed along the usual lines. At the end of the first volume reproductions from standard works are included to illustrate the normal distribution in winter and summer of temperature and pressure over the globe, of winds over the oceans,and the main tracks of depressions across Europe. There are also maps of each of the continents showing land above and below 200 metres.

For the purposes of descriptive climatology, climates are classified as follows :—

Equatorial.

Tropical ; sub-divided into normal, monsoon and desert.

Sub-tropical ; sub-divided into normal, monsoon and desert.

Temperate ; sub-divided into normal, monsoon and desert.

Frigid ; sub-divided into normal and desert.

There are thus twelve general types of climate in the author's classification. Tables of temperature and rainfall for selected stations illustrating the characteristics of each type are given. Maps at the end of the second volume show the distribution of the types over each of the continents.

A general discussion on soil formation and the adaptation of animals and plants to varying soils and climate, as well as descriptions of the flora, fauna, vegetation and agricultural activities peculiar to each of the climatic types, are included in this work.

The author's discussion of the climate of the Iberian Peninsula and its bearing on agricultural activities is thorough. In this section, sub-tropical and temperate climates are sub-divided into oceanic, continental, "transition" and "sub-desert" types. The map of the Peninsula and part of the north coast of Africa, coloured to show the regional distribution of these climatic types in that area, is particularly interesting and instructive. The whole work forms one of the most complete text-books of agricultural meteorology available.

M. T. Spence.

Obituary

Mr. J. Ernest Grubb.—We regret to learn of the death on October 9th, in his 85th year, of Mr. Grubb at his house at Seskin, Carrick-on-Suir, not far from Waterford. Mr. Grubb was born at Clonmel, but lived practically all his life at Carrick, where he was a prominent figure in public affairs. Throughout his life he took a keen interest in meteorology. From 1865-1870 he contributed rainfall records from Deerpark Lodge, near Carrick, to the Meteorological Office, and in 1900 he established a climatological station at Seskin, at which the usual observations have been taken twice a day ever since. During the troublous times in Ireland between 1920 and 1923, the respect in which he was held on both sides, and especially his being a Quaker, enabled him to assist in reconciling the warring elements. His son writes "during the disturbances in this district a few years ago, the taking of the observations were never missed, because my father explained to the Irregulars who were in the neighbourhood what the meteorological instruments were, and that it was necessary to visit them at night. Hence, when they saw our lantern on the top of the hill they did not fire at it." For many years he contributed to *Symons' Meteorological Magazine*, and later to the *Meteorological Magazine*, his last communication being on a horizontal rainbow he had seen on April 8th, 1926. We are glad to learn that his son and two daughters are continuing all the observations.

The Weather of October, 1927

Quiet dry anticyclonic conditions prevailed generally during the earlier part of the month, but from the 19th onwards the weather was warm and unsettled, with gales at times. A complex low pressure system, which passed across the British Isles on the 1st and 2nd, caused gales on many parts of the coast, and heavy rain in Scotland and Wales, *e.g.*, 2·24 in., fell at Ford and 1·37 in. at Llanuwchyllyn (Merioneth) on the 1st. In the rear of these depressions an anticyclone spread in from the Atlantic and remained centred over or near these islands until the 16th. Much fog developed locally at night or in the early morning, and persisted upon some occasions during the daytime also in a few places. In many parts, however, the weather was very fine and warm by day, 72° F. at Huddersfield on the 7th, though cold at night, 24° F. (in the screen) at West Linton on the 5th. During this period the weather was on the whole dry, though towards the later part a good deal of cloud developed, the days were colder, and showers became more frequent. After the 15th the centre of the anticyclone moved still further south-west, and westerly winds prevailed over the whole kingdom, causing a general rise in temperature. Maximum readings of over 60° F. were recorded in many places, 67° F. being reached at Cambridge on the 25th, and night minima were remarkably high, especially on the morning of the 27th, when 60° F. was read at two or three stations, and 61° F. at Bath. Although these warm conditions set in about the 16th, the weather continued mainly fair and dry until the 21st, when a depression advancing eastwards across Ireland caused general heavy rain. From then until the end of the month the conditions were rainy and windy; among the heaviest rainfalls being 2·99 in. on the 24th and 2·90 in. on the 26th at Festiniog (Merioneth), 2·28 in. at Rathnew (Wicklow) on the 21st, 1·88 in. at Brecon on the 27th. Widespread, destructive gales were experienced on the 28-29th, when an intense depression passed rapidly across the central regions of the British Isles, Gusts of over 70 m.p.h. were registered at various stations, one of 96 m.p.h. at Southport, and one of 89 m.p.h. at Weaver Point (Cork). Mean hourly wind velocities exceeding 50 m.p.h. occurred at numerous places, the highest one being 70 m.p.h. at Southport.

Pressure was above normal over south-western and central Europe, the British Isles, Iceland and Bermuda, the greatest excess being 6·5 mb. at Isafjord. Pressure was below normal over Scandinavia and the greater part of the North Atlantic, the deficit amounting to 8·4 mb. at Horta and 5·3 mb. in eastern Norrland. Temperature was above normal and rainfall below normal from Spitsbergen to Zürich and Lisbon except in Scotland, where the rainfall was above normal, and Sweden, where the temperature was below normal and the rainfall about 40 per cent. above normal.

A severe storm swept across the North Sea and Denmark on the 2nd, doing damage to shipping and communications. Heavy rain followed by floods occurred in Bourgas, Bulgaria on the 13th, in the valleys of the Drave and Morava, in Yugoslavia on the 21st, and at Skutari, Albania on the 23rd. The first snow of the winter fell in the Eifel district on the 9th. After a gale, which damaged forests and telephone lines, snow fell heavily on the 23rd in the Alps down to a level of 2,700 ft., and the roads over the Alpine passes became blocked. The severe storm experienced over the British Isles on the 28th-29th, passed across the North Sea to Denmark on the 30th, causing some loss of life.

Heavy rain caused damage to the Sind-Pishin section of the North-western railway of India on the 2nd. On the 4th and 5th serious floods were reported along the banks of the Irrawaddy River, in the Insein district near Rangoon.

Useful rains fell in many parts of Queensland during the early part of the month, and later heavy rain fell in many of the agricultural districts of South Australia, but large parts of these districts still need rain.

Unusual weather conditions prevailed in the United States during the first days of the month, 85° F. was the maximum temperature recorded at New York, 90° F. at Albany and 97° F. at Lancaster (Philadelphia) on the 1st, while heavy snow fell at Laramie, Wyoming. Heavy rain fell in the eastern United States between the 2nd and 20th, and floods occurred in many parts, especially Pennsylvania. At the end of the month serious floods began again in New England. The southern limit of freezing weather was generally more northerly than usual throughout the month. Storms occurred at Rio de Janeiro on the 8th, and the high tides flooded parts of the town.

Many gales occurred in the Atlantic.

The special message from Brazil states that the rainfall in the northern and central regions was scarce, being ·7 in. and 2·1 in. below normal respectively, but plentiful in the southern regions, with ·5 in. above normal. Eight anticyclones passed across the country during the month, but the weather was generally unsettled, with an abnormally low temperature over the country as a whole. Gales were frequent in the south. The condition of the crops, except cocoa, was satisfactory. Pressure at Rio de Janeiro was 0·1 mb. above normal, and temperature 0·5° F. above normal.

Rainfall, October, 1927—General Distribution

England and Wales ..	69	per cent. of the average 1881-1915.
Scotland	139	
Ireland	94	
British Isles	90	

Rainfall: October, 1927: England and Wales

CO.	STATION.	In.	Per-cent. of Av.	CO.	STATION.	In.	Per-cent of Av.
Lond.	Camden Square	1·29	49	*Leics*	Thornton Reservoir ..	1·99	71
Sur.	Reigate, The Knowle ..	2·20	70	„	Belvoir Castle	2·01	74
Kent.	Tenterden, Ashenden ..	1·84	53	*Rut.*	Ridlington	2·03	...
„	Folkestone, Boro. San.	1·08	...	*Linc.*	Boston, Skirbeck	2·74	100
„	Margate, Cliftonville ..	0·91	31	„	Lincoln, Sessions House	1·49	58
„	Sevenoaks, Speldhurst.	1·87	...	„	Skegness, Marine Gdns.	2·09	76
Sus.	Patching Farm	2·42	61	„	Louth, Westgate	1·81	56
„	Brighton, Old Steyne .	2·02	52	„	Brigg	1·51	51
„	Tottingworth Park	3·71	89	*Notts.*	Worksop, Hodsock	1·71	65
Hants	Ventnor, Roy. Nat. Hos.	1·98	50	*Derby*	Derby	2·17	83
„	Fordingbridge, Oaklnds	2·52	61	„	Buxton, Devon. Hos. ..	3·91	80
„	Ovington Rectory	...	...	*Ches.*	Runcorn, Weston Pt. ..	2·56	74
„	Sherborne St. John ...	1·87	53	„	Nantwich, Dorfold Hall	2·88	...
Berks	Wellington College ...	1·19	36	*Lancs*	Manchester, Whit. Pk.	2·46	75
„	Newbury, Greenham ..	2·55	73	„	Stonyhurst College	4·25	95
Herts.	Benington House	1·94	71	„	Southport, Hesketh Pk	3·05	86
Bucks	High Wycombe	2·68	86	„	Lancaster, Strathspey.	3·78	...
Oxf.	Oxford, Mag. College ..	1·90	68	*Yorks*	Wath-upon-Dearne ...	1·65	60
Nor.	Pitsford, Sedgebrook ..	1·93	72	„	Bradford, Lister Pk. ..	3·74	107
„	Oundle	1·43	...	„	Oughtershaw Hall	8·97	...
Beds.	Woburn, Crawley Mill.	1·20	45	„	Wetherby, Ribston H. .	2·39	80
Cam.	Cambridge, Bot. Gdns.	1·60	68	„	Hull, Pearson Park ...	1·90	64
Essex	Chelmsford, CountyLab	1·93	79	„	Holme-on-Spalding ...	2·03	...
„	Lexden, Hill House ...	2·13	...	„	West Witton, Ivy Ho. .	4·14	...
Suff.	Hawkedon Rectory ...	2·10	78	„	Felixkirk, Mt. St. John	2·41	84
„	Haughley House	1·97	...	„	Pickering, Hungate ...	2·58	...
Norf.	Beccles, Geldeston	2·35	83	„	Scarborough	1·99	64
„	Norwich, Eaton	2·60	83	„	Middlesbrough	2·19	73
„	Blakeney	2·17	83	„	Baldersdale, Hury Res.	3·13	...
„	Little Dunham	2·84	91	*Durh.*	Ushaw College	1·56	45
Wilts.	Devizes, Highclere	1·90	61	*Nor.*	Newcastle, Town Moor.	1·55	48
„	Bishops Cannings	2·17	65	„	Bellingham, Highgreen	3·41	...
Dor.	Evershot, Melbury Ho.	4·49	97	„	Lilburn Tower Gdns. ..	2·48	...
„	Creech Grange	3·10	...	*Cumb*	Geltsdale	2·57	...
„	Shaftesbury, Abbey Ho.	2·46	63	„	Carlisle, Scaleby Hall .	1·92	57
Devon	Plymouth, The Hoe ...	2·51	63	„	Seathwaite M.	...	...
„	Polapit Tamar	2·94	61	„	Keswick, High Hill ...	7·55	...
„	Ashburton, Druid Ho. .	3·90	64	*Glam.*	Cardiff, Ely P. Stn.	4·08	85
„	Cullompton	2·31	56	„	Treherbert, Tynywaun	10·61	...
„	Sidmouth, Sidmount ..	1·56	42	*Carm*	Carmarthen Friary	3·76	66
„	Filleigh, Castle Hill ...	3·47	...	„	Llanwrda, Dolaucothy.	6·86	108
„	Barnstaple, N. Dev. Ath.	2·22	49	*Pemb*	Haverfordwest, School	3·40	63
Corn.	Redruth, Trewirgie ...	2·95	56	*Card.*	Gogerddan	4·97	94
„	Penzance, Morrab Gdn.	2·66	57	„	Cardigan, County Sch. .	2·12	...
„	St. Austell, Trevarna ..	2·40	46	*Brec.*	Crickhowell, Talymaes	4·30	...
Soms	Chewton Mendip	3·79	79	*Rad.*	Birm. W. W. Tyrmynydd	5·27	80
„	Street, Hind Hayes ...	2·40	...	*Mont.*	Lake Vyrnwy	8·91	156
Glos.	Clifton College	2·57	68	*Denb.*	Llangynhafal	3·14	...
„	Cirencester, Gwynfa ..	2·09	63	*Mer.*	Dolgelly, Bryntirion ..	5·76	95
Here.	Ross, Birchlea	2·65	80	*Carn.*	Llandudno	2·11	59
„	Ledbury, Underdown.	2·08	68	„	Snowdon, L. Llydaw 9	18·25	...
Salop	Church Stretton	2·68	74	*Ang.*	Holyhead, Salt Island.	2·96	74
„	Shifnal, Hatton Grange	1·97	70	„	Lligwy	3·46	...
Worc.	Ombersley, Holt Lock.	1·56	58	*Isle of Man*			
„	Blockley, Upton Wold.	1·86	57		Douglas, Boro' Cem. ..	4·40	97
War.	Farnborough	1·59	50	*Guernsey*			
„	Birminghm, Edgbaston	1·77	64		St. Peter P't. Grange Rd	1·59	35

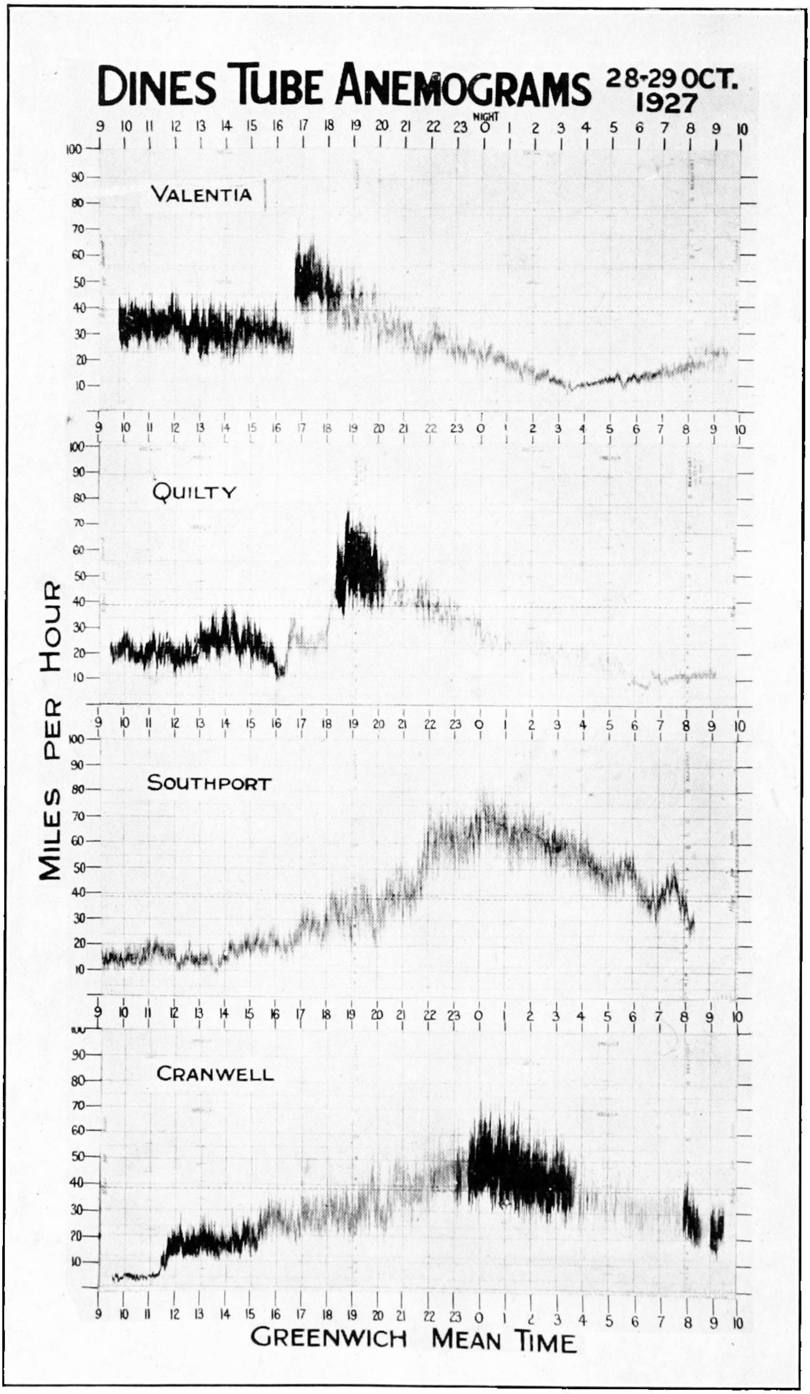
Rainfall: October, 1927: Scotland and Ireland

CO.	STATION.	In.	Per-cent. of Av.
Wigt.	Stoneykirk, Ardwell Ho	5·08	140
,,	Pt. William, Monreith	4·59	...
Kirk.	Carsphairn, Shiel	9·26	...
,,	Dumfries, Cargen	4·90	112
Roxb	Branxholme	...	...
Selk	Ettrick Manse	8·83	...
Berk.	Marchmont House	2·71	71
Hadd	North Berwick Res.	3·01	102
Midl	Edinburgh, Roy. Obs.	3·13	120
Lan	Biggar	...	...
,,	Leadhills	...	...
Ayr	Kilmarnock, Agric. C.	4·43	126
,,	Girvan, Pinmore	5·45	109
Renf.	Glasgow, Queen's Pk.	4·76	147
,,	Greenock, Prospect H.	7·91	147
Bute.	Rothesay, Ardencraig.	6·16	140
,,	Dougarie Lodge	4·22	...
Arg	Ardgour House	9·88	...
,,	Manse of Glenorchy	9·24	...
,,	Oban	7·26	...
,,	Poltalloch	6·57	133
,,	Inveraray Castle	10·91	156
,,	Islay, Eallabus	5·64	118
,,	Mull, Benmore	17·60	...
,,	Tiree	6·28	...
Kinr.	Loch Leven Sluice	5·57	...
Perth	Loch Dhu	9·85	138
,,	Balquhidder, Stronvar.	8·31	...
,,	Crieff, Strathearn Hyd.	6·12	156
,,	Blair Castle Gardens	4·38	141
Forf.	Kettins School	4·57	160
,,	Dundee, E. Necropolis.	5·26	198
,,	Pearsie House	6·07	...
,,	Montrose, Sunnyside	...	...
Aber.	Braemar, Bank	5·59	149
,,	Logie Coldstone Sch.	3·90	120
,,	Aberdeen, King's Coll.	3·34	111
,,	Fyvie Castle	3·91	...
Mor	Gordon Castle	4·32	137
,,	Grantown-on-Spey	4·25	143
Na	Nairn, Delnies	3·93	167
Inv.	Ben Alder Lodge	5·47	...
,,	Kingussie, The Birches	4·05	...
,,	Loch Quoich, Loan	14·10	...
,,	Glenquoich	16·83	168
,,	Inverness, Culduthel R.	4·31	...
,,	Arisaig, Faire-na-Squir	6·24	...
,,	Fort William	7·53	106
,,	Skye, Dunvegan	7·54	...
R&C	Alness, Ardross Cas.	6·70	174
,,	Ullapool	6·75	...
,,	Torridon, Bendamph	9·03	113
,,	Achnashellach	9·69	...
,,	Stornoway	7·37	142
Suth.	Lairg	4·73	...
,,	Tongue	6·22	148
,,	Melvich	7·92	216
Suth.	Loch More, Achfary	10·53	135
Caith	Wick	4·00	135
Ork	Pomona, Deerness	6·15	162
Shet.	Lerwick	3·56	90
Cork.	Caheragh Rectory	5·33	...
,,	Dunmanway Rectory.	6·06	101
,,	Ballinacurra	3·31	82
,,	Glanmire, Lota Lo.	3·83	92
Kerry	Valentia Obsy.	4·34	78
,,	Gearahameen	8·50	...
,,	Killarney Asylum	4·84	90
,,	Darrynane Abbey	5·00	99
Wat.	Waterford, Brook Lo.	3·01	77
Tip	Nenagh, Cas. Lough	2·81	83
,,	Roscrea, Timoney Park	2·08	...
,,	Cashel, Ballinamona	2·44	68
Lim.	Foynes, Coolnanes	2·24	59
,,	Castleconnell Rec.	2·17	...
Clare	Inagh, Mount Callan	4·23	...
,,	Broadford, Hurdlest'n.	3·29	...
Wexf	Newtownbarry	4·26	...
,,	Gorey, Courtown Ho.	3·85	109
Kilk.	Kilkenny Castle	2·60	83
Wic.	Rathnew, Clonmannon	3·77	...
Carl.	Hacketstown Rectory.	3·58	94
QCo.	Blandsfort House	2·33	66
,,	Mountmellick	2·66	...
KCo.	Birr Castle	2·13	...
Dubl.	Dublin, FitzWm. Sq.	2·79	104
,,	Balbriggan, Ardgillan.	3·78	140
Me'th	Beauparc, St. Cloud	3·52	...
,,	Kells, Headfort	3·30	99
W.M	Moate, Coolatore	2·95	...
,,	Mullingar, Belvedere	2·77	89
Long	Castle Forbes Gdns.	3·71	114
Gal	Ballynahinch Castle	5·98	100
,,	Galway, Grammar Sch.	2·68	...
Mayo	Mallaranny	5·89	...
,,	Westport House	3·15	70
,,	Delphi Lodge	6·61	...
Sligo	Markree Obsy.	2·64	64
Cav'n	Belturbet, Cloverhill.	2·74	94
Ferm	Enniskillen, Portora	2·05	...
Arm.	Armagh Obsy.	2·24	82
Down	Fofanny Reservoir	8·18	...
,,	Seaforde	3·80	107
,,	Donaghadee, C. Stn.	3·26	113
,,	Banbridge, Milltown	3·20	116
Antr.	Belfast, Cavehill Rd.	3·45	...
,,	Glenarm Castle	4·58	...
,,	Ballymena, Harryville	4·11	111
Lon	Londonderry, Creggan	4·11	112
Tyr	Donaghmore	3·38	...
,,	Omagh, Edenfel	3·23	88
Don	Malin Head	4·43	150
,,	Dunfanaghy	4·36	99
,,	Killybegs, Rockmount.	4·28	77

Climatological Table for the British Empire, May, 1927

STATIONS	PRESSURE: Mean of Day M.S.L. mb.	PRESSURE: Diff. from Normal mb.	TEMPERATURE Absolute: Max. °F.	TEMPERATURE Absolute: Min. °F.	TEMPERATURE Mean Values: Max. °F.	TEMPERATURE Mean Values: Min. °F.	TEMPERATURE Mean Values: ½ max. and min. °F.	TEMPERATURE Mean Values: Diff. from Normal °F.	TEMPERATURE Mean: Wet Bulb. °F.	Relative Humidity %	Mean Cloud Am'nt 0—10	PRECIPITATION: Am'nt in.	PRECIPITATION: Diff. from Normal in.	PRECIPITATION: Days	BRIGHT SUNSHINE: Hours per day	BRIGHT SUNSHINE: Percentage of possible.
London, Kew Obsy.	1018·0	+ 2·1	75	33	64·0	46·0	55·0	+ 1·6	47·8	80	5·2	1·09	− 0·63	7	7·7	49
Gibraltar	1015·2	− 0·9	79	52	73·9	59·4	66·7	+ 1·2	58·8	84	4·9	0·77	− 0·96	4	...	...
Malta	1015·2	+ 0·2	84	59	72·1	62·4	67·3	+ 1·4	62·5	79	5·6	0·13	− 0·28	1	9·0	64
St. Helena	1014·2	+ 3·0	68	56	64·8	58·9	61·9	− 1·7	59·3	89	3·3	3·32	− 0·83	19	...	...
Sierra Leone	1012·1	+ 0·9	92	70	88·7	73·7	81·2	− 0·3	76·8	80	5·8	9·52	− 1·95	21	...	...
Lagos, Nigeria	1009·8	− 1·2	90	72	87·5	76·1	81·8	0·0	77·1	82	5·5	8·19	− 2·28	15	...	...
Kaduna, Nigeria	1014·7	+ 1·6	94	...	88·8	...	...	...	71·9	70	1 8	6·33	+ 0·39	13	...	...
Zomba, Nyasaland	1016·7	+ 1·6	83	48	75·6	54·2	64 9	− 0·9	...	76	5·0	0·11	− 0·93	3	...	...
Salisbury, Rhodesia	1017·4	+ 0·2	81	37	73·8	46·3	60·1	− 0·5	53·4	53	1·5	0·22	− 0·32	2	8·7	77
Cape Town	1020·6	+ 2·6	89	39	66·8	50·0	58·4	− 0·5	50 9	85	4·4	2·99	− 0·84	10	...	...
Johannesburg	1021·0	+ 1·0	78	28	66·0	45·1	55·5	+ 1·1	44·3	46	1·6	0·00	− 0·76	0	9·1	84
Mauritius	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bloemfontein	...	...	78	26	66·8	38·9	52·9	+ 0·2	42·0	64	3·2	0·00	− 1·18	0	...	...
Calcutta, Alipore Obsy.	1003·7	+ 0·2	99	70	94·7	77·8	86·3	+ 0·3	79·1	81	5·6	4 91	− 0·84	6*	..	...
Bombay	1007·6	+ 0·2	93	77	90·8	80·8	85·8	− 0·1	77·5	75	4·7	0·00	− 0·55	0*	...	...
Madras	1005·2	− 0·2	109	77	99·8	82·0	90·9	+ 1·0	78·3	61	4·8	0·37	− 0·70	2*	...	...
Colombo, Ceylon	1009·2	+ 0·6	89	71	86·9	77·3	82·1	− 0·4	78·7	80	9·0	22·65	+ 9·97	22	4·8	39
Hongkong	1008·6	− 0·8	89	66	80·5	72·3	76·4	− 1·0	73·2	85	8·3	25·45	+13·85	19	3·8	29
Sandakan	...	...	91	74	89·0	75·7	82·3	− 0·3	77·5	83	...	7·34	+ 1·43	14	...	...
Sydney	1016·2	− 2·4	78	42	66·8	50·6	58·7	− 0·1	51·3	71	3·1	1·63	− 3·50	8	6·8	65
Melbourne	1017 4	− 2·1	73	51	61·3	46·9	54·1	0·0	48·4	72	6·7	1·91	− 0·27	15	4·0	33
Adelaide	1019·6	− 0·5	83	38	66·1	49·5	57·8	− 0·1	50·3	59	5·9	2·19	− 0·57	15	5·2	51
Perth, W. Australia	1018·9	+ 0·4	86	43	68·8	51·2	60·0	− 0·6	54·9	71	5·0	4·85	− 0·09	12	6·2	59
Coolgardie	1019 4	− 0·4	86	36	69·6	45·7	57·7	+ 0·1	40·0	56	3·2	0·83	− 0·53	4	...	...
Brisbane	1017·5	− 1·3	83	45	75·5	53·6	64·5	0·0	56·3	61	2·2	0·02	− 2·81	1	9 0	84
Hobart, Tasmania	1010·9	− 4·7	67	36	56·7	44·3	50·5	+ 0·1	44·4	68	6·1	2·87	+ 1·01	18	4·3	44
Wellington, N.Z.	1014·9	− 0·7	63	36	57·9	46·0	51·9	− 0·8	49·4	78	7·5	5·77	+ 1 09	13	4·1	42
Suva, Fiji	1011·7	− 1·1	90	69	84·5	72·9	78·7	+ 2·2	74·7	85	6·6	8·17	− 1·99	18	4·6	41
Apia, Samoa	1011·2	+ 0·1	87	71	85·6	75·2	80·4	+ 2·0	77·4	79	4·3	7·59	+ 2·08	15	7·8	68
Kingston, Jamaica	1013·6	+ 0·5	91	70	88·4	72·0	80·2	+ 0·5	72·1	79	3·2	1·47	− 2·92	9	9·1	70
Grenada, W.I.	1009·9	− 2·6	89	70	85·9	74·9	80·4	+ 0·8	75·2	72	5·4	3 46	− 1·13	16	...	...
Toronto	1011·9	− 2·9	89	35	60·7	44·8	52·7	0·0	46·6	72	7·0	3·22	+ 0·22	16	5 2	35
Winnipeg	1014·3	0·0	72	31	56·2	40·9	48·5	− 3·1	41·4	74	6·2	4·70	+ 2·40	12	4·1	27
St. John, N.B.	1012·2	− 1·8	64	31	54·8	39·9	47·3	− 0·4	43·3	73	6·5	2·36	− 1·35	18	5·2	35
Victoria, B.C.	1018·2	+ 1·8	68	40	57·7	45·2	51·5	− 1·6	47·8	73	6·3	0·77	− 0·53	7	8 3	55

*For Indian stations a rain day is a day on which 0·1 in. or more rain has fallen.


DINES TUBE ANEMOGRAMS 28-29 OCT. 1927
NIGHT
VALENTIA
QUILTY
SOUTHPORT
CRANWELL
MILES PER HOUR
GREENWICH MEAN TIME