
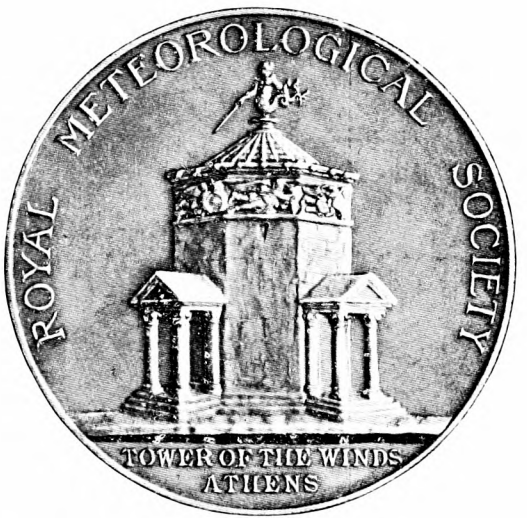


THE SYMONS MEMORIAL MEDAL OF THE ROYAL METEOROLOGICAL SOCIETY.

# SYMONS'S METEOROLOGICAL MAGAZINE.

Edited by HUGH ROBERT MILL, D.Sc., LL.D.

VOLUME THE THIRTY-SIXTH.

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SYMONS'S

# METEOROLOGICAL MAGAZINE.

No. CCCCXXI.] FEBRUARY, 1901. VOL. XXXVI.

## LAND MARKS IN OUR HISTORY.

THE end of the nineteenth century, and the close of the Victorian era which has been coincident with the greater and more progressive part of it, dwarf all the other milestones of contemporary history. The death of the Queen, after a reign unexampled for length and prosperity, has plunged the nation and the empire into a mourning without parallel.

During the nineteenth century all the physical sciences have been born again with new powers and fresh equipment, and the Victorian era has witnessed their growth into maturity. Of the direct influence on the progress of science of the tranquil reign of the best and most justly beloved of British monarchs, much can be said, but this is not the place to say it. We may recall, as a pleasant thought for the meteorologist, that our finest days have acquired, and will probably retain in popular speech, the happy synonym of "Queen's Weather."

In the lecture, which the late Mr. Symons delivered to the Royal Meteorological Society, on the occasion of the Diamond Jubilee, in 1897, he called attention to the striking contrast between the instrumental equipment of the student of weather in the first, and in the sixtieth year of the Queen's reign. He went further, and compiled a curious document, a "British Rainfall" for 1837, comprising the 161 complete records of rainfall, which were all that could be discovered as having been recorded in that year.* By his own unwearied exertions, Mr. Symons was able to enlist the co-operation of an army of volunteer workers, and to gather in from the more educated public of 1898, nearly 3,500 complete records.

In commencing the thirty-sixth volume of this magazine, we are painfully aware that for it also an era has ended. Some change must mark every new departure, but here we trust that it will be a change of manner only, not of aim.

There are fortunately precedents for retaining the name of the founder of a scientific journal in its title after his guiding hand has been removed by death. "Silliman's Journal" had a long and

* *Quart. Journ. Roy. Met. Soc.*, **23** (1897), 207-210.

honoured career in America, and the memory of the late eminent geographer, Dr. A. Petermann, is enshrined in the famous German geographical monthly known as "Petermanns Mitteilungen." But, if no precedent had existed, we should in this case have created one, for the individuality of the founder so permeated the first thirty-four volumes of the magazine, that the name of Symons has acquired a right to remain in the title for ever, as a memorial of the first editor, and an incentive and example to his successors.

We shall strive to follow the guiding principle which Mr. Symons set before him, to make the magazine "a full chronicle of the progress of meteorology," and while the magazine will be, as heretofore, a medium for communication with the observers of the Rainfall Organization, we hope to be able to touch upon all aspects of the latest meteorological work, and to secure the co-operation of leading meteorologists in all countries.

With very limited space, which we hope an advance in the circulation of the magazine may ultimately enable us to increase, it is necessary to study conciseness before every other literary grace. We trust that it may be possible, in the future, as it has been in the past, to combine brevity of expression with accuracy of statement.

We are happy to feel that in conducting the British Rainfall Organization jointly, the invaluable experience of Mr. Sowerby Wallis will be available to advise us in the task of Editorship, of which we have relieved him, and in the execution of which we confidently hope for help from the suggestions and criticisms of our readers.

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## THE PRESSURE OF THE WIND.

By R. H. Curtis.

In some recent numbers of this magazine* the question of the maximum strength of the wind was discussed, and in order to facilitate the comparison of the force observed at various places the *velocity* of the wind, so far as anemometrical measurements of that element were available, was quoted. For many purposes, however, it is more useful to know the *pressure* the wind exerts, than the rate at which it moves; and whenever velocity only is recorded by the anemometer it is certainly desirable to be able to determine the equivalent pressures. A knowledge of the rate at which masses of air move across the Earth's surface is, of course, most important in discussing questions connected with the general circulation of the atmosphere; but meteorology has another, and, perhaps, more obviously practical purpose, which is to utilize the observations made by its innumerable observers in throwing light upon allied ques-

* *Symons's Met. Mag.*, **35** (1900) 49-54, 65-66.

tions, whose solution may be a matter of considerable concern to many who are not meteorologists; and when the answer happens to involve a knowledge of the strength of the wind, it is, as a rule, its pressure rather than its velocity which is required.

For example: the engineer is concerned with the safety of his structures, and the ship designer, or the sailor, with the stability of his vessels, and each requires to know the maximum wind-*pressure* per unit of surface which he may expect, and for which he must provide in his designs. For this information they turn to the meteorologist, whose business it is to observe, more or less continuously, this very phenomenon amongst others, and who might therefore reasonably enough be expected to have the required data ready to hand. Unfortunately, the confession has to be made that, in the instances specified, the engineer would not get the reliable answer which he needs, owing largely to the fact that hitherto meteorologists have given far too little attention to observations in this particular branch of their science. Yet few questions could be of more immediate practical importance, for the correctness, or otherwise, of the answer to it, may involve the saving or waste of large sums of money, or the safety of innumerable lives.

A good deal of attention was directed to the subject of wind-pressure in 1880, after the collapse of the Tay Bridge while a train was crossing it, during a gale on the evening of December 28th, 1879. One direct result of that catastrophe was the appointment of a committee to "consider the question of wind-force on railway structures." This committee got together statements as to the maximum wind-pressure and velocity which had been observed at various places at home and abroad, and arrived at the conclusion that the maximum pressure, which was likely to be experienced over a large surface, was 56 lbs. per square foot; but that, to ensure safety, bridges and similar structures ought to be built to withstand pressures of *four* times that amount. That this estimated pressure of 56 lbs. was greatly in excess of anything ever likely to be experienced in any part of this country is now tolerably certain; and although it is, no doubt, well to err in such matters on the safe side, yet there is a limit beyond which it becomes useless to extend the margin of safety, and it is more than useless to do so when it also means an extravagant expenditure of public money.

It has been stated, for example, that if the engineer who designed the Tower Bridge had not been obliged to provide for a wind-pressure, which is practically certain never to be approached in the position where the bridge stands, its cost would have been much lower, whilst the structure would still have been left with a very ample margin of safety.

Sir J. Wolfe Barry, the engineer of the bridge, said, at the Institution of Civil Engineers, "He had appreciated at the time that such a pressure (56 lbs. per square foot) was excessive —that no such pressure was produced by wind on large surfaces

in this country—that it never had been, and that it never could be, realised . . . . But we were blessed—or otherwise—with a Board of Trade, which had laid it down, on what he thought must have been insufficient premises, that all structures must be adequate to resist a wind-pressure of 56 lbs. per square foot. . . . . The result no doubt was that much more money had been spent than was really required."*

Against this statement it will no doubt be asked, have not wind-pressures much greater than 56 lbs. per square foot been registered by anemometers in the British Isles, and if so, may they not occur again? And the somewhat paradoxical answer is that such pressures have certainly been recorded, but that it is almost equally certain they did not really occur.

The simple fact is that, from various causes, a great amount of misconception has arisen upon the subject, not a little of which has been directly due to faults inherent in the form of pressure anemometer, which has been most generally used in England during the last half-century, and which has been responsible for these very remarkable records.

The earliest anemometer, of which we have any account, was the pressure-plate instrument described by Hook, in the first volume of the *Philosophical Transactions*, in which a swinging board, being "exposed to the wind, so that the flat side may be right up against it, the number of degrees . . . . to which the wind blows up or raises that flat side, shows the force or strength of the wind, in proportion to the resistance of the flat side of the instrument."

Since 1667, when this description was published, all kinds of contrivances have been introduced to "show the force or strength of the wind," some of which have been designed to automatically register their indications. Most of them have, however, for one reason or another, been very little used; but one which was designed by Mr. Osler, of Birmingham, in 1836, is an exception to this rule, and has been employed at many observatories in this country and abroad, and is still in use at Greenwich, Bidston and elsewhere. This instrument, which is known as "Osler's pressure-plate," may be briefly described as a plate which is kept facing the wind, by whose force it is driven against some springs placed behind it, the resistance of which affords a measure of the wind's strength.

In a severe gale, which occurred on March 9th, 1871, the anemometer of this type in use at the observatory on Bidston Hill, near Liverpool, registered the extraordinary pressure of 90 lbs. per square foot; and on other occasions pressures of 80 lbs. 70 lbs., and 65 lbs. have also been recorded at the same place.

Referring to these exceptional records, the committee on wind-force just mentioned, remark in their report: "We are satisfied that these records are not referable to instrumental error, depending

* "Proc. Inst. Civil Engineers," **127**, p. 78.

on the recording instrument being carried by its momentum beyond the position of equilibrium under the wind pressure acting at the moment, but represent a real phenomenon."

Coming from such an authority, this statement is of course entitled to careful consideration ; but one cannot resist the conviction that those who made it were not fully aware of, or did not realise, the exact conditions under which this anemometer works.

Its scale was graduated under steadily augmented pressures, in which the inertia of the plate could have no effect; but in a gale of wind the plate is subject to a very different kind of action, namely, a succession of impulses, sharply applied and quickly succeeding each other, under the influence of which it is certain, from theoretical considerations alone, that it must oscillate in such a way as to yield a greatly exaggerated record, although it may not be possible to say exactly what the maximum limit of the error which might be produced would be. But this fact at once throws a doubt upon the high records we have quoted, and the doubt is strengthened by other considerations.

There are in this country many very exposed structures, standing high above the ground, in places where they experience the full force of the wind; and, although a wind-pressure of much less than 60 lbs. per square foot would suffice to topple them over, yet they have successfully withstood those very gales in which even higher pressures than 60 lbs. have been recorded. Indeed, it is fairly certain that a wind-force of less than 60 lbs. per square foot, to say nothing of a force 50 per cent. greater, would have sufficed to carry away the Bidston anemometer itself.

*To be continued.*

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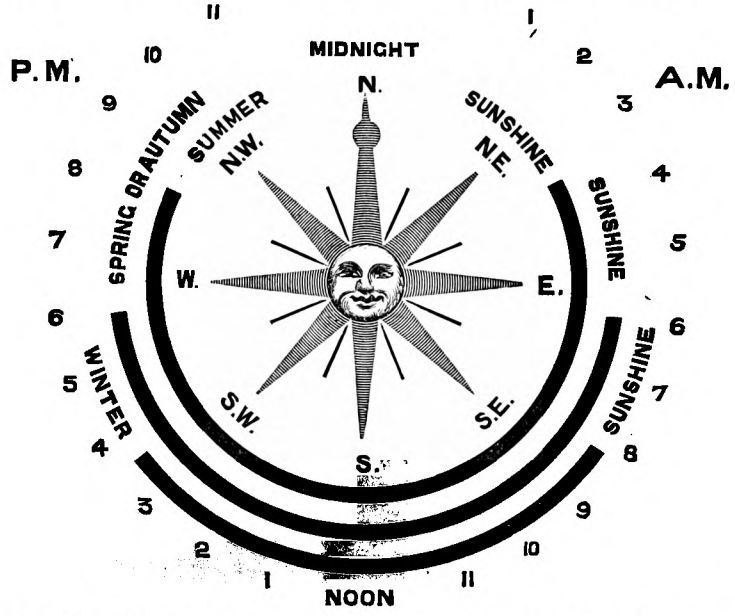
## WEATHER RECORDS AT SLOUGH.

THE importance of preserving old registers of weather has frequently been insisted on in these pages, and this can best be done by the personal researches of meteorological observers, each in his own locality. An excellent example of such a collection in the making is before us in the form of "Meteorological Notes applying to South Buckinghamshire," compiled and privately printed by Mr. Richard Bentley, of Upton, Slough. These notes comprise a number of interesting facts about the weather of Slough and its immediate neighbourhood. Instrumental observations at Slough began in the later part of the eighteenth century, when Sir William Herschel established his observatory there, while for non-instrumental observations, old writings yield a store of droughts, floods, snow-

storms and frosts, reaching back, if the printer has not played a trick with us, to the year 9 A.D., in one instance. When, referring to very early statements, however briefly, we think it would be well to cite the authority in every case, so that mere rumours, repeated many years after the alleged event, may not be confused with contemporary records by responsible chroniclers.

A classification of the rainfall of the period 1874-1899 is given in the form of two tables, one giving the falls for each summer half-year, April 1st to September 30th, the other for each winter half-year, October 1st to March 31st. On averaging the figures, we find practical equality between the two half-years, 12·35 in. as the average of 25 summer half-years, and 12·52 in. as the average of 26 winter half-years, the latter figure for 25 half-years being reduced




to 12·51, if the last half-year of the series is omitted, or increased to 12·70 if the first half-year of the series is omitted. The maxima and minima are, for the summer half-year, 25·16 in. and 4·64 in.; for the winter half-year, 19·10 in. and 5·48 in., the summer rains being the more variable.

We are indebted to Mr. Bentley for the opportunity of reproducing the accompanying diagram, which shows graphically the number of hours of possible sunshine, and the hours and compass bearing of sunrise and sunset at the solstices and equinoxes for the latitude of Slough, 51° 30′ N., which is also the latitude of the south of London.

Mr. Bentley will be glad to receive any additional early notices of weather, floods, earthquakes, or other recurrent phenomena, in the neighbourhood of Slough.

## THE HEAVY RAINFALL OF DECEMBER 30TH, 1900.

*To the Editor of Symons's Meteorological Magazine.*

A weather chart drawn at, say, 12 o'clock noon, on December 30th, would, I think, have been interesting. The depression over the north-west of Ireland, shown by the 8 a.m. chart of that day, seems to have dispersed or been swallowed up in the far more intense system which moved during the day up the English Channel.

The Daily Weather Report of the Meteorological Office, for the 31st December (8 a.m.), states that the former system moved eastwards to the north of England (there is little trace of it in the 6 p.m. chart of the 30th), and that the latter system was a secondary. The former depression apparently did not move S.E. wards over the S.W. and S. counties of England. I think the point is of interest, as there is nothing in the shifts of wind, as recorded in London, to show that this was not the case, and one would suppose, from a first inspection of the charts of the 30th December, that it was so.

The heavy rain was caused by the secondary, which moved up the channel and thence south-eastwards past Dieppe.

F. DRUCE.

65, *Cadogan Square, S. W., February 3rd*, 1901.

[The fact that the centre of the cyclone in the 6 p.m. chart of December 30th (*Times*, December 31st), is represented on the middle of the south coast of England, in a position intermediate between those of the centres at 8 a.m. on the 30th and 31st, misled us, and we can see no indication in the isobars that the very deep depression was a secondary. A chart for noon on the 30th would certainly have been very interesting in showing the movements of the depressions. The note in the text of the Weather Report escaped our attention, and we are grateful for this correction, for two reasons: first, because it corrects an error, and, second, because it shows how vigilant our readers are.—ED. *S.M.M.*]

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## THE SEVERE FROST OF JANUARY 8TH & 9TH.

A SUDDEN, short, but very severe, fall of temperature was experienced in the south of England on the night between January 8th and 9th, and many readings under 15° are recorded.

Miss Pasley writes:—

At Botley Hill, January 8th was a day of constant heavy snow-showers, the snow lying eventually about 2 inches deep, there was no wind, and it was only just freezing. It cleared up towards evening, and the temperature fell very fast; a thermometer on the

house-wall outside a window showed 14° at 10 p.m., and had 11° as its minimum. Two thermometers in the garden, hung against posts, about eighteen inches from the ground, registered 5°, and two others, exposed to the sky, about two feet above the ground, gave minimum readings of 2° and 3°. At Botley Rectory the garden thermometer showed 2°, while in another garden a reading of 0° is reported. The thermometers were not verified and had no Kew certificates. The frost was so intense, that the footprints of a man across a lawn appeared as burnt brown patches, when the snow, which had protected the rest of the grass, disappeared. The gardeners all say that the temperature began to rise before 11.30 p.m., so that the period of extreme cold must have been very short indeed. At 7.30 a.m., on the 9th, the thermometer was at 30°.

Colonel Johnston, R.E., Director of the Ordnance Survey, kindly informs us that the certified thermometers at the Ordnance Survey Office in Southampton (about 5 miles from Botley Hill), showed minima of 13°·1 in a screen, and 11°·1 on the grass; and it will be observed in our monthly table, that 5° in the shade (and 2° on the grass) was registered at Hartley Wintney, 20 miles north-east of Botley; and at Alderbury, 20 miles to the northwest, the minimum was 11°.

Mr. E. L. M. Colvile, of Kempsey, Bournemouth, writes:—

The frost of the night of January 8th–9th was very severe here, a minimum of 15°·2 being recorded in the Stevenson screen. A Richard thermograph, in the same screen, showed a fall from about 31°·3 at 3 p.m. on the 8th to 16°·3 at 1 a.m. on the 9th, after which there was a rapid rise to 32°·0 at 9 a.m., 44°·5 at 1·30 p.m., and a maximum of 46°·0 about 9 p.m. At 2 p.m., on the 9th, when the fall of snow had practically ceased, the depth to which it lay on level ground was 4 inches.

At Blandford, in Dorset, the minimum was 0°·9, and at Winterbourne Steepleton, near Dorchester, 12°.

A sudden frost like this is of extreme interest, showing that a very low minimum may occur in a comparatively warm month; but the moral we wish to impress is the importance of using verified instruments for every observation. Unverified instruments can never be trusted, and it is only tantalising to reflect on the chance that they may not be bearing false witness after all.

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## ROYAL METEOROLOGICAL SOCIETY.

THE Annual General Meeting of this Society was held at the Institution of Civil Engineers, Great George Street, Westminster, on January 16th, Dr. C. Theodore Williams, President, being in the chair.

The following gentlemen were elected Fellows:—Mr. A. J. D. Biddle, Rev. G. J. Bridges, Mr. W. A. Browne, LL.D., Miss T. H. B. Collinson, Mr. H. Cox, Mr. F. Davis, Mr. A. Deed, Mr. G. E. Ellis, Prof. C. J. W. Lowber, D.Sc., Capt. W. S. Main, Mr. G. S. Odling, Mr. F. E. Pirkis, Mr. F. Sandeman, Mr. R. W. Saul, Dr. W. H. Symons, and Mr. A. G. Thompson.

Mr. F. C. Bayard read the report of the Council for the year 1900, a year which, it stated, will long be memorable in the annals of the society, as marking the jubilee of its existence, and owing to the great loss which it sustained in the death of its distinguished Fellow, Mr. G. J. Symons, F.R.S. On February 21st, Mr. Symons resigned the Presidency, owing to illness, and the Council appointed the Treasurer and former President of the Society, Dr. C. Theodore Williams, to fill the vacant chair. The vacancy in the Treasurership was filled by the appointment of Mr. R. Inwards.

The Society's silver medal, to cadets on H.M.S. "Worcester," was awarded to Cadet R. A. Melhuish, for the best essay on "The Meteorology of the Indian Ocean."

The Council had requested Mr. Marriott to write some account of the books and pamphlets in the Symons bequest, which it was believed would give a better idea of the value of the noble bequest than a mere list of the titles of about 2,200 books and 4,000 pamphlets.

The Council reported an increase of 55 in the number of Fellows over those of the previous year; the total on December 31st being 620.

The report of the Council having been adopted, the thanks of the Society were given to the President, the Council, and the Committees for their services during the past year, and also to the Council of the Institution of Civil Engineers, for the generous permission to meet in their rooms.

Dr. C. Theodore Williams then delivered the Presidential address, on "The Climate of Norway and its Factors," for a report of which we regret that there is no space.

The following officers and Council were elected for the ensuing year:—

*President*, Mr. W. H. Dines, B.A.; *Vice-Presidents*, Mr. R. Bentley, F.L.S., Mr. R. Inwards, F.R.A.S., Mr. Baldwin Latham, M.Inst. C.E., and Sir Cuthbert E. Peek, Bart.; *Treasurer*, Dr. C. Theodore Williams; *Secretaries*, Mr. F. C. Bayard, LL.M., and Mr. E. Mawley, F.R.H.S.; *Foreign Secretary*, Dr. R. H. Scott, F.R.S.; *Council*, Capt. A. Carpenter, R.N., Mr. W. H. M. Christie, C.B., F.R.S., Mr. R. H. Curtis, Mr. H. N. Dickson, F.R.S.E., Mr. W. Ellis, F.R.S., Major L. Flower, Mr. C. Hawksley, M.Inst. C.E., Capt. M. W. Campbell Hepworth, F.R.A.S., Dr. H. R. Mill, F.R.S.E., Mr. W. N. Shaw, F.R.S., Mr. H. Sowerby Wallis, and Capt. D. Wilson-Barker, F.R.S.E.

## REVIEWS AND BOOKS RECEIVED.

*The Rosarian's Year Book for* 1901, edited by the Rev. H. HONYWOOD D'OMBRAIN, B.A. London: Bemrose and Sons. 1901, 60 pp.

THIS graceful little annual, dedicated "to the rose-loving public," contains an article on Rose Weather in 1900, by Mr. Edward Mawley, divided into the seasons of Ripening, Sleeping, Awakening and Blossoming.

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*Report on the Rainfall in Hertfordshire in the year* 1899, by JOHN HOPKINSON, F.L.S. From the "Transactions of the Hertfordshire Natural History Society," December, 1900.

THE rainfall of 45 stations is tabulated, the arrangement being according to the river-basins in which the stations lie. The whole is discussed with reference to the months of the year. As a whole the number of wet days averaged 148, less than in any of the 50 preceeding years, except 1884 and 1887.

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*The Weather of* 1900 *at Hodsock Priory, Worksop, with Tables for the* 25 *years,* 1876 *to* 1900. By HENRY MELLISH. Privately printed, pp. 14 and table.

IN addition to a general account of the weather of the year, tables are given, showing the means and extremes of each month for temperature, and rainfall, together with monthly means of pressure, humidity, sunshine, cloud and wind, while a special table gives the annual averages for each year, from 1879 (1876 for some values) to 1900.

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The International Congresses of Meteorology and Aeronautics at Paris, by A. LAWRENCE ROTCH. Reprinted from *Science*, **12** (1900), 796-799.

Meteorological Observations taken in Hertfordshire in the year 1899, by JOHN HOPKINSON. Reprinted from the *Transactions* of the Hertfordshire Natural History Society, **10** (1900), 223-232.

Annual Report of the Museums and Meteorological Observatory of the County Borough of Bolton for 1900. Bolton, 1901, pp. 16.

Meteorological Observations made at the Adelaide Observatory and other places in South Australia during the year 1897. By SIR CHARLES TODD, F.R.S. Adelaide, 1900. Folio, pp. 96 and 78. *Maps.*

Brief Sketch of the Meteorology of the Bombay Presidency for 1899-1900. Folio, pp. 18. Diagrams.

Annual Report of the Central Meteorological Observatory of Japan for the year 1898, by K. NAKAMURA. Part I., Tokio (1900). 4to, pp. 270.

## METEOROLOGICAL NEWS.

THE International Meteorological Committee has issued a circular to meteorologists in all countries, requesting that all barometer readings recorded after January 1st, 1901, be corrected to normal gravity, as well as to sea-level and the freezing-point. In northern Europe this correction only affects the third place of decimals, and may be disregarded when the barometer is registered only to hundredths of an inch.

SIMULTANEOUS balloon ascents were made on January 10th for meteorological observations in the upper atmosphere at West Ham, Bath, Paris, Berlin, Strasburg, and St. Petersburg.

THE *Monthly Weather Review*, for October, 1900 (published at the end of December), contains a translation of a paper on the dynamic principle of the circulatory movements in the atmosphere, by Prof. V. Bjerknes, of Stockholm. The paper applies the methods of Kelvin and Helmholtz for the study of frictionless fluids to the particular case of the atmosphere, introducing the various necessary restrictions, and thus deducing theoretically the conditions of atmospheric circulation. The author lays down a theory, the great importance of which is that it gives a rational dynamic principle according to which the facts of observation can be grouped. The theory also applies to the movements of the ocean, and Professor Bjerknes lays stress on the value of studying oceanic and atmospheric movements as part of one great problem.

THE Report of the Meteorological Council for the year ending 31st March, 1900, has recently been published, and contains the usual reports on the work of this important public department. Considerable changes have taken place in the staff of the office since the previous Report was issued. On the death of Lieutenant Baillie, in June, 1899, the position of Marine Superintendent was filled by the appointment of Captain M. W. Campbell Hepworth, R.N.R., whose experience as a meteorological observer at sea is of long standing. When Dr. R. H. Scott retired from the office of Secretary in February, 1900, the distinguished physicist, Mr. W. N. Shaw, F.R.S., of Cambridge, was appointed his successor. The seat on the Meteorological Council thus vacated has been filled by Professor G. H. Darwin, of Cambridge. A plan providing for superannuation after long service in the Meteorological Office, has been adopted, and the scientific worker in this department is released from a disability which made the Meteorological Office less attractive than other branches of the Civil Service.

Mr. W. N. SHAW, F.R.S., Secretary of the Meteorological Council, is delivering a series of four lectures, on the "Physics of the Atmosphere," in the University of Cambridge during February.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, AUGUST, 1900.

| STATIONS. (*Those in italics are South of the Equator.*) | Absolute. Maximum. Temp. | Date. | Absolute. Minimum. Temp. | Date. | Average. Max. | Min. | Dew Point. | Humidity. | Absolute. Max. in Sun. | Min. on Grass. | Total Rain. Depth. | Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0-100 | ° | ° | inches | | |
| London, Camden Square | 86·7 | 17 | 48·1 | 5 | 72·7 | 54·1 | | ... | 129·9 | 45·3 | 2·81 | 17 | 5·6 |
| Malta | 89·7 | 27 | 64·3 | 17 | 84·9 | 70·7 | 68·8 | 77 | 148·2 | 62·0 | ·02 | 1 | 1·3 |
| *Cape of Good Hope* | 70·7 | 2 | 35·1 | 7 | 62·2 | 47·4 | 48·2 | 77 | ... | ... | 2·76 | 11 | 4·9 |
| *Mauritius* | 76·4 | 22 | 54·6 | 10 | 73·6 | 62·3 | 58·2 | 73 | 141·7 | 45·3 | 1·79 | 12 | 5·5 |
| Calcutta | 93·9 | 25 | 76·4 | 5 | 89·1 | 78·9 | 78·8 | 87 | 159·0 | 75·0 | 16·28 | 25 | 8·7 |
| Bombay | 85·9 | 18 | 75·0 | 1 | 83·8 | 77·5 | 76·5 | 87 | 134·9 | 73·2 | 17·62 | 29 | 9·0 |
| Colombo, Ceylon | 89·2 | 25*a* | 73·0 | 5 | 87·2 | 77·3 | ... | 83 | 148·0 | 71·0 | 7·35 | 15 | 5·5 |
| *Melbourne* | 61·9 | 6 | 35·9 | 21 | 56·4 | 42·4 | 40·9 | 76 | 124·3 | 28·5 | 2·34 | 18 | 6·4 |
| *Adelaide* | 67·9 | 6 | 39·8 | 4 | 59·3 | 45·2 | 44·3 | 77 | 131·6 | 31·6 | 4·14 | 21 | 5·8 |
| *Sydney* | 70·1 | 16 | 40·7 | 21 | 61·0 | 46·4 | 41·3 | 73 | 119·3 | 30·0 | ·71 | 8 | 3·0 |
| *Wellington* | 65·0 | 8 | 37·0 | 30 | 56·1 | 45·8 | 42·1 | 73 | 110·0 | 29·6 | 4·59 | 18 | 4·9 |
| *Auckland* | 65·0 | 19 | 44·0 | 1 | 59·4 | 49·7 | 45·7 | 71 | 130·0 | 41·0 | 3·91 | 24 | 7·2 |
| Jamaica, Halfway Tree | 95·0 | 24 | 71·0 | 22 | 89·5 | 72·4 | 71·3 | 77 | ... | ... | ... | ... | 2·2 |
| Trinidad | 91·0 | 31 | 66·0 | 31 | 84·6 | 71·4 | 71·2 | 77 | 163·0 | 61·0 | 11·07 | 22 | ... |
| Grenada | 88·0 | 31 | 72·0 | 14 | 84·6 | 74·3 | 70·9 | 71 | 162·8 | ... | 7·40 | 25 | 4·4 |
| Toronto | 98·0 | 6 | 51·3 | 2 | 83·1 | 62·5 | 63·5 | 76 | 126·5 | 44·8 | 2·75 | 11 | 4·5 |
| Fredericton New Brunswick | 92·7 | 26 | 43·5 | 13 | 74·6 | 54·0 | 53·2 | 62 | ... | ... | 1·78 | 7 | 5·1 |
| Winnipeg, Manitoba | 88·2 | 19 | 45·0 | 27 | 79·4 | 55·5 | ... | ... | ... | ... | 3·66 | 11 | 5·8 |
| Victoria, British Columbia | 79·0 | 1 | 44·1 | 26 | 66·3 | 52·4 | | ... | ... | ... | ·61 | 6 | 5·4 |

*a*—and 26.

REMARKS.

MALTA.—Adopted mean temp. 76°·7, or 1°·3 above average. Mean hourly velocity of wind 9·1 miles, or 1·9 above average. Mean temp. of sea 78°·6. TS on 19th, L on 17th. J. F. DOBSON.

*Mauritius.*—Mean temp. of air 0°·9, of dew point 1°·0, and rainfall ·65 in. below, their respective averages. Mean hourly velocity of wind 10·0 miles, or 2·4 below average; extremes, 24·5 on 18th and 1·8 on 16th, prevailing direction E.S.E. L on 30th. T. F. CLAXTON.

*Adelaide.*—A very cold and wet month. Mean temp. 1°·8, below average of 43 years, only one previous August colder. Rain very heavy over all central and S. districts; one of the wettest Augusts ever experienced, seven to fourteen inches fell on the mountains to E. of Adelaide. C. TODD, F.R.S.

*Sydney.*—Temp. 1°·2 below, humidity 8·6 below, and rainfall 2·41 in. above, their respective averages. H. C. RUSSELL, F.R.S.

*Wellington.*—Generally fine during early part of month, wet from 14th to 24th, with strong N.W. wind. Mean temp. 2°·9 above, and rain ·61 in. below, their respective averages. R. B. GORE.

*Auckland.*—A showery month, rain being registered on 24 days; but the total rainfall slightly below the average. Mean temp. 2° above the average.
T. F. CHEESEMAN.

TRINIDAD.—Rain ·75 in. above the 30 years average. J. H. HART.

*Rainfall at Adelaide.*—The Adelaide newspapers have published a diagram showing the rainfall of that city for each year from 1839 to 1899 inclusive. The average rainfall for the 61 years is 20·84 in. The driest year was 1876 with 13·43 in., and the wettest year was 1889, when 30·87 in. fell. The rainfalls of the wettest and driest years were thus 164 and 71 per cent. of the average respectively.

# SUPPLEMENTARY TABLE OF RAINFALL, JANUARY, 1901.

| Div | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| I. | Uxbridge, Harefield Pk.. | ·92 | XI. | Castle Malgwyn ..... | 3·43 |
| II. | Dorking, Abinger Hall . | 1·36 | ,, | Builth, Abergwesyn Vic. | 6·49 |
| ,, | Birchington, BeresfordLge. | ·47 | ,, | Rhayader, Nantgwillt ... | ... |
| ,, | Hailsham ..... | ·63 | ,, | Lake Vyrnwy ..... | 5·86 |
| ,, | Crowborough..... | 1·16 | ,, | Corwen, Rhug ..... | 2·72 |
| ,, | Ryde, Thornbrough ..... | ... | ,, | Criccieth, Talarvor ..... | 2·55 |
| ,, | Emsworth, Redlands ... | 1·32 | ,, | I. of Anglesey, Lligwy.. | 1·36 |
| ,, | Alton, Ashdell ..... | 1·55 | ,, | I. of Man, Douglas ..... | 2·71 |
| III. | Newbury, Welford Park | 1·68 | XII. | Stoneykirk, Ardwell Ho. | 2·58 |
| ,, | Oxford, Magdalen Coll.. | 1·00 | ,, | New Galloway, Glenlee | ... |
| ,, | Banbury, Bloxham ..... | 1·18 | ,, | Moniaive, Maxwelton Ho. | 3·71 |
| ,, | Northampton, Sedgebrook | ·99 | ,, | Lilliesleaf, Riddell ..... | 1·98 |
| ,, | Huntingdon, Brampton. | ·91 | XIII. | N. Esk Res. [Penicuick] | 2·75 |
| ,, | Wisbech, Bank House... | ·73 | XIV. | Glasgow, Queen's Park.. | 2·68 |
| IV. | Southend ..... ..... | ·63 | XV. | Inveraray, Newtown ... | 4·62 |
| ,, | Colchester, Lexden ..... | ·38 | ,, | Ballachulish, Ardsheal... | 6·00 |
| ,, | Saffron Waldon, Newport | ·55 | ,, | Islay, Eallabus..... ... | 3·70 |
| ,, | Rendlesham Hall ..... | ·78 | XVI. | Dollar..... | 2·96 |
| ,, | Swaffham ..... | ·67 | ,, | Balquhidder, Stronvar... | 5·62 |
| V. | Salisbury, Alderbury ... | 1·56 | ,, | Coupar Angus Station... | 2·09 |
| ,, | Bishop's Cannings ..... | 1·60 | ,, | Blair Atholl ... ..... | 2·81 |
| ,, | Blandford, Whatcombe . | 2·43 | XVII. | Keith H.R.S..... | 2·28 |
| ,, | Druid, Ashburton..... | 5·21 | ,, | Forres H.R.S. ... ..... | 1·41 |
| ,, | Okehampton, Oaklands. | 4·73 | XVIII. | Fearn, Lower Pitkerrie.. | 1·59 |
| ,, | Hartland Abbey ..... | 2·47 | ,, | S. Uist, Askernish ..... | 2·22 |
| ,, | Lynton, Glenthorne ... | 3·55 | ,, | Invergarry..... | 4·72 |
| ,, | Probus, Lamellyn ..... | 3·69 | ,, | Aviemore, Alvie Manse. | 2·07 |
| ,, | Wellington, The Avenue | 2·79 | ,, | Loch Ness, Drumnadrochit | 3·44 |
| ,, | North Cadbury Rectory | 2·88 | XIX. | Invershin ..... | 3·73 |
| VI. | Clifton, Pembroke Road | 2·07 | ,, | Durness..... | 4·38 |
| ,, | Ross, The Graig ..... | 1·52 | ,, | Watten H.R.S..... | 2·00 |
| ,, | Wem, Clive Vicarage ... | 1·92 | XX. | Dunmanway, Coolkelure | 8·63 |
| ,, | Wolverhampton, Tettenhall | 1·47 | ,, | Cork, Wellesley Terrace | 5·33 |
| ,, | Cheadle, The Heath Ho. | 2·16 | ,, | Killarney, District Asyl. | 5·96 |
| VII. | Coventry, Priory Row... | 1·17 | ,, | Caher, Duneske ..... | 5·20 |
| ,, | Market Overton ..... | 1·12 | ,, | Ballingarry, Hazelfort... | 2·26 |
| ,, | Grantham, Stainby ..... | ·77 | ,, | Limerick, Kilcornan ... | ... |
| ,, | Horncastle, Bucknall ... | ·57 | ,, | Miltown Malbay ..... | 3·49 |
| ,, | Worksop, Hodsck Priory | 1·08 | XXI. | Gorey, Courtown House | 3·91 |
| VIII. | Neston, Hinderton ..... | 2·04 | ,, | Moynalty, Westland ... | 4·30 |
| ,, | Southport, Hesketh Park | 1·58 | ,, | Athlone, Twyford ..... | 3·35 |
| ,, | Chatburn, Middlewood. | 3·65 | ,, | Mullingar, Belvedere ... | 3·70 |
| ,, | Duddon Val., Seathwaite Vic. | 5·43 | XXII. | Woodlawn ..... | 3·74 |
| IX. | Melmerby, Baldersby ... | 1·52 | ,, | Crossmolina, Enniscoe .. | 5·31 |
| ,, | Scalby, Silverdale ..... | 1·81 | ,, | Collooney, Markree Obs. | 3·81 |
| ,, | Ingleby Greenhow Vic.. | 1·78 | XXIII. | Enniskillen, Model Sch. | 3·97 |
| ,, | Middleton, Mickleton ... | 1·64 | ,, | Warrenpoint..... | 4·94 |
| X. | Haltwhistle, Unthank H. | ... | ,, | Belfast, Springfield ..... | 3·05 |
| ,, | Bamburgh ..... | 1·94 | ,, | Bushmills, Dundarave.. | 2·49 |
| ,, | Keswick, The Bank..... | ... | ,, | Stewartstown ..... | 3·15 |
| XI. | Llanfrechfa Grange ..... | 3·44 | ,, | Killybegs ..... | 4·31 |
| ,, | Treherbert, Tyn-y-waun | 6·65 | ,, | Horn Head ..... | 3·54 |
| ,, | Llandovery ..... | 4·17 | | | |

# JANUARY, 1901.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1880-9. | Greatest Fall in 24 hours. Dpth | Date | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date | Min. Deg. | Date. | No. of Nights below 32°. In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches. | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | ·55 | — 1·16 | ·09 | 7 | 12 | 55·0 | 27 | 20·5 | 9 | 12 | 22 |
| II. | | Tenterden ..... | ·97 | — 1·02 | .20 | 7 | 16 | 55·0 | 27 | 20·0 | 8 | 16 | 22 |
| ,, | | Hartley Wintney ..... | 1·26 | — ·69 | ·16 | 18 | 18 | 54·0 | 21 | 5·0 | 9 | 13 | 17 |
| III. | | Hitchin ..... ..... | ·78 | — ·93 | ·19 | 19 | 15 | 53·0 | 27 | 21·0 | 8 | 17 | ... |
| ,, | | Winslow (Addington) ..... | 1·16 | — ·55 | ·37 | 27 | 14 | 54·0 | 27 | 17·0 | 9 | 17 | 20 |
| IV. | | Bury St. Edmunds (Westley) | ·70 | — ·99 | ·19 | 27 | 10 | 52·0 | 27 | 14·0 | 9 | ... | ... |
| ,, | | Norwich (Brundall) ..... | ·74 | ... | ·14 | 25 | 15 | 53·0 | 27 | 22·0 | 9 | 16 | 25 |
| V. | | Winterbourne Steepleton ... | 2·68 | ... | ·53 | 18 | 21 | 51·9 | 27 | 12·0 | 9 | 15 | 19 |
| ,, | | Torquay (Cary Green) ... ..... | 3·34 | ... | ·81 | 18 | 21 | 53·5 | 21 | 22·5 | 9 | 7 | ... |
| ,, | | Polapit Tamar [Launceston].. | 3·95 | + ·62 | ·93 | 26 | 21 | 52·3 | 16 | 15·7 | 9 | 13 | 16 |
| VI. | | Stroud (Upfield) ..... | 1·35 | — ·86 | ·29 | 18 | 17 | 50·0 | 21*a* | 26·0 | 31 | 16 | ... |
| ,, | | Church Stretton (Woolstaston) | 2·14 | — ·32 | ·36 | 29 | 15 | 53·0 | 21 | 22·0 | 9 | 11 | 29 |
| ,, | | Worcester (Diglis Lock) ..... | 1·65 | — ·21 | ·31 | 19 | 22 | ... | ... | ... | ... | ... | ... |
| VII. | | Boston ..... | ·57 | — ·81 | ·21 | 19 | 5 | 50·0 | 21 | 21·0 | 9 | 17 | ... |
| ,, | | Hesley Hall [Tickhill]..... | ·98 | — ·43 | ·27 | 19 | 16 | 53·0 | 21*b* | 19·0 | 16 | 15 | ... |
| ,, | | Derby (Midland Railway)..... | 1·50 | — ·10 | ·35 | 19 | 20 | 53·5 | 22 | 25·5 | 9 | 13 | ... |
| VIII. | | Manchester (Plymouth Grove) | 1·79 | — ·53 | ·45 | 19 | 14 | 53·0 | 22 | 25·0 | 8 | 12 | 20 |
| IX. | | Wetherby (Ribston Hall) ... | 2·10 | + ·44 | ·95 | 19 | 17 | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) ..... | 5.45 | — ·93 | ·83 | 26 | 21 | ... | ... | ... | ... | ... | ... |
| ,, | | Hull (Pearson Park). ... ..... | ·63 | — 1·04 | ·08 | 25 | 15 | 53·0 | 22 | 26·0 | 29 | 18 | 23 |
| X. | | Newcastle (Town Moor) ..... | 1·43 | — ·38 | ·23 | 7 | 14 | ... | ... | ... | ... | ... | ... |
| ,, | | Borrowdale (Seathwaite)..... | 8·95 | — 5·90 | 1·35 | 18 | 19 | 49·8 | 26 | 24·7 | 10 | 10 | ... |
| XI. | WALES. | Cardiff (Ely)..... | 2.30 | — 1·26 | ·61 | 26 | 18 | ... | ... | ... | ... | ... | ... |
| ,, | | Haverfordwest ..... | 4·83 | + ·21 | 1·23 | 18 | 20 | 51·3 | 27 | 25·3 | 9 | 6 | 18 |
| ,, | | Aberystwith (Gogerddan) ... | 2·69 | — 1·56 | ·50 | 18 | 13 | 48·0 | 16*c* | ... | ... | ... | ... |
| ,, | | Llandudno..... | 1·68 | — ·85 | ·39 | 19 | 18 | 53·0 | 14 | 25·0 | 9 | 4 | ... |
| XII. | SCOTLAND. | Cargen [Dumfries] ..... | 3·52 | — 1·06 | ·46 | 26 | 17 | 50·0 | 17*d* | 26·0 | 6, 29 | 8 | ... |
| XIII. | | Edinburgh (Royal Observatory) | 1·83 | ... | ·33 | 19 | 13 | 50·4 | 22 | 24·2 | 29 | 13 | 19 |
| XIV. | | Colmonell ..... | 3·29 | — 1.55 | ·90 | 25 | 13 | 54·0 | 24 | 30·0 | 5*f* | 7 | ... |
| XV. | | Tighnabruaich ..... ..... | 4.49 | ... | ·72 | 26 | 15 | 45·0 | 20 | 24·0 | 28 | 13 | ... |
| ,, | | Mull (Quinish)..... | 4·49 | — 1·74 | ·47 | 24 | 22 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Leven Sluices ..... | 1·92 | — 1·38 | ·48 | 27 | 11 | ... | ... | ... | ... | ... | ... |
| ,, | | Dundee (Eastern Necropolis) | 1·65 | — ·88 | ·30 | 30 | 20 | 51·2 | 21 | 24·4 | 28*g* | 14 | ... |
| XVII. | | Braemar ..... .. | 3·25 | + .47 | ·82 | 25 | 18 | 48·0 | 21 | 15·6 | 10 | 19 | 25 |
| ,, | | Aberdeen (Cranford) ... ..... | 2·21 | — ·51 | ·41 | 29 | 22 | 53·0 | 21 | 25·0 | 9, 28 | 19 | ... |
| ,, | | Cawdor (Budgate) ..... | 1·87 | — ·35 | ·46 | 25 | 13 | ... | ... | ... | ... | ... | ... |
| XVIII | | Strathconan [Beauly] ..... | 2·35 | — 2·19 | ·60 | 10 | 7 | ... | ... | ... | ... | ... | ... |
| ,, | | Glencarron Lodge..... | 5·97 | — 4·42 | ·94 | 21 | 19 | 57·7 | 14 | 23·6 | 10 | 11 | ... |
| XIX. | | Dunrobin ..... | 2·99 | + ·37 | ·63 | 26 | 14 | 52·0 | 21*e* | 25·8 | 28 | 11 | ... |
| ,, | | S. Ronaldshay (Roeberry) ... | 3·51 | + ·22 | ·72 | 26 | 19 | 50.0 | 21 | 27·0 | 25 | 9 | ... |
| XX. | IRELAND. | Darrynane Abbey..... | 4·33 | — ·93 | ·97 | 18 | 24 | ... | ... | ... | ... | ... | ... |
| ,, | | Waterford (Brook Lodge) ... | 4·15 | + ·63 | 1·33 | 18 | 18 | 53·5 | 26 | 26·0 | 23 | 13 | ... |
| ,, | | Broadford (Hurdlestown) ... | 2·98 | — ·15 | ·65 | 18 | 23 | ... | ... | ... | ... | 10 | ... |
| XXI. | | Carlow (Browne's Hill) ..... | 3·56 | + ·49 | ·67 | 18 | 18 | ... | ... | ... | ... | ... | ... |
| ,, | | Dublin (Fitz William Square) | 2·67 | + ·53 | ·94 | 9 | 17 | 53·8 | 22 | 29·1 | 30 | 3 | 11 |
| XXII. | | Ballinasloe ..... ..... | 3·30 | — ·14 | ·73 | 18 | 21 | 49·0 | 21*e* | 18·0 | 9 | 19 | ... |
| ,, | | Clifden (Kylemore) ..... .. | 5·37 | — 2·60 | ·58 | 12 | 22 | ... | ... | ... | ... | ... | ... |
| XXIII | | Seaforde..... | 3·85 | + ·44 | ·43 | 18 | 18 | 51·0 | 21 | 22·0 | 23 | 13 | 15 |
| ,, | | Londonderry (Creggan Res.). | 3·51 | — ·15 | ·66 | 26 | 20 | ... | ... | ... | ... | ... | ... |
| ,, | | Omagh (Edenfel) ..... | 3·54 | + ·03 | ·56 | 11 | 20 | 51·0 | 22 | 27·0 | 9, 29 | 11 | 16 |

+ Shows that the fall was above the average ; — that it was below it.

*a*—and 22, 27. *b*—and 22, 26. *c*—and 17, 22, 23. *d*—and 21, 22. *e*—and 22. *f*—and 8, 9. *g*—and 29.

# METEOROLOGICAL NOTES ON JANUARY, 1901.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

TENTERDEN.—A cold month and dry generally. Several inches of S fell on the 8th, mostly before 9 a.m. Windy on 19th and 20th, and in the last week with a violent WNW gale on 27th. Fog on 5 days. Sunshine 73 hours.

HARTLEY WINTNEY.—The early part was mild, but cold showers and falling temp. prevailed at the end. There was a very severe frost on the 9th, min. temp. on grass 2°·0. S occurred on 4 days, and fog on 4. Severe N.W. gale on 27th, followed by a slight fall of S. Ozone on 16 days with mean of 4·9.

WINSLOW, ADDINGTON.—From 1st to 9th there were low max. temps., particularly on 6th, 7th and 8th, with S on each day. Intense frost on 9th, followed by a great increase in the max. temp. on 10th. From the 17th to 27th the max. temp. was rather high for the season, that on 27th being 54°, when there was a heavy gale, uprooting some fine old elm trees. Dense fog on 5th, 11th and 12th. Very heavy rime all day on 5th.

BURY ST. EDMUNDS, WESTLEY.—The driest January in 44 years, except in 1880, with ·15 in. of R, and in 1889, with ·69 in. A mild month, the max. temp. being below 32° on only 2 days. T on 28th. S on 9th and 28th.

NORWICH, BRUNDALL.—R more than an inch deficient. At 3.40 p.m. on the 28th great darkness prevailed, almost like midnight, accompanied by a violent TS, lasting 20 minutes, with heavy H and S.

WINTERBOURNE STEEPLETON.—On the 4 days, 15th to 18th, 1·33 in. of R fell, which is about equal to that which fell during the other 17 rainy days of the month. The first 10 days were cold, the min. being 12° on the 9th, but a rapid thaw set in that afternoon. Although the wind was mainly from the westward the nights were colder than usual. Fog on 11th 12th and 18th.

TORQUAY, CARY GREEN.—R 1·13 in. above the average. Mean temp. 42°·3, or 0°·4 above the average. Duration of sunshine 82 hours 45 mins., being 20 hours 25 mins. above the average; six sunless days. Mean ozone 4·2; greatest 9·0 on 21st, with W. wind; least 0·5 on 15th and 24th, with E. wind.

POLAPIT TAMAR [LAUNCESTON].—Generally cold, and in the second half wet and stormy. Thick fog on 2nd and 18th; H on 26th, 28th and 30th.

CHURCH STRETTON, WOOLSTASTON.—S on 8th, and from 28th to 30th. Severe N.W. gale, lasting 48 hours, on 26th and 27th.

HULL, PEARSON PARK.—Fog on 17 days, S or sleet on 7 days.

## WALES.

HAVERFORDWEST.—Cold and stormy, with very little bright sunshine, the total being 19·8 hours. A TS occurred at about 1.15 a.m. on 31st, lasting about an hour, the L was vivid, but distant; some H fell.

ABERYSTWITH, GOGERDDAN.—An open month, but with very little sunshine. A little H and S on 29th and two following days.

LLANDUDNO.—The first week was bright, the last stormy. H on 25th, 27th, 28th and 29th. T on 29th and 30th.

## SCOTLAND.

CARGEN [DUMFRIES].—A dull, damp and unseasonable month. Three inches of S on 28th.

COLMONELL, CLACHANTON.—Mean temp. 39°·3, or 2°·2 above the average of 25 years. S on 8th, 25th and 27th. T and L on 25th.

TIGHNABRUAICH, CRAIGANDARAICH.—In the first half there was a high bar., with little R, but cold with E. winds; during the latter half the wind was chiefly N.E. and N., and blowing strong with S and low bar.

ABERDEEN, CRANFORD.—Free from S till 25th, after which the ground continued white.

S. RONALDSHAY, ROEBERRY.—The first 20 days were very fine, the latter part was changeable, with gales, R, S and frost. Mean temp. 38°·8, or 0°·5 above the average of 11 years.

IRELAND.

DARRYNANE ABBEY.—Except for a few fine days at the beginning, it was a wet, wild month. Gale on 27th and 28th. S on 29th and 30th, H on 30th.

BROADFORD, HURDLESTOWN.—A fairly fine month. R ·02 in. above and rainy days 1 above, the average of 16 years. Gales from S.E. on 12th, S.W. on 15th, and W. on 27th. S on 9th, 28th, 29th and 30th.

DUBLIN, FITZWILLIAM SQUARE.—An average January, as regards pressure, temp. and R. Mean temp. 41°·9, or 0°·5 above the average. Fog on 5 days; high winds on 16 days, reaching the force of a gale on 4. S or sleet on 6 days, and H on 5. The daily average of bright sunshine was 2·1 hours.

EDENFEL, OMAGH.—A mild and wet month, with mean temp. above the average, chiefly because of the absence of severe frost.

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## THE NEW RAINFALL AVERAGE ADOPTED IN THE GENERAL TABLE.

WHEN Mr. Symons adopted the average rainfall of the decade 1880-89, he pointed out the great importance of ensuring continuity and completeness in such a table as that on p. 14, and explained that, by using the averages of the decade just passed, it was possible to give the difference from the average at a larger number of stations than by adhering to the figures formerly employed, or by taking a 20 years' average.

It would certainly be best to adopt the average of a long period, say 50 years, but few records exist to enable such an average to be calculated, and no shorter period can be certainly relied upon as completely eliminating the effects of abnormal years, or even months. We must be content with what we can get, and, therefore, we have adopted the average rainfall of the ten years 1890-99, a period covered by the records of most of the stations in the table. The total amount of rain varies very greatly even in places which lie near together, but the relative amount of rain which falls in summer and winter does not vary so much. So, while keeping the figures for the average annual rainfall of ten years, we have found it possible to use the average monthly distribution of rainfall for a longer period. What we have done, therefore, is this: the percentage of rain which fell in each month was calculated for the period 1870-99 for 30 stations, and the average yearly fall for the decade, 1890-99, at these stations was apportioned among the different months of the year in this proportion. At the remaining stations, for which no long records existed, the mean yearly rainfall for 1890-99 was apportioned according to the monthly percentages of neighbouring stations; thus the monthly distribution at Winslow, Addington, is calculated from that at Camden Square and Geldeston.

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# THE PRESSURE OF THE WIND.

BY R. H. CURTIS.

(*Concluded from p. 5*).

A wind-force of 30 lbs. per square foot, or a little more, will suffice to overturn an ordinary railway carriage; and, although in some parts of Great Britain these run over very exposed places, where they are in no way shielded from the wind, yet instances of their having been overturned are extremely rare; and even when this has occurred there has generally been some contributory cause, such as inclination of the carriage.

Fortunately, however, the Meteorological Council has begun a series of comparisons at their experimental anemometer station at Holyhead, for the purpose of getting some reliable data upon the point, and in their last report they have published some very interesting results which it may be useful to quote, because the report itself may probably enough never find its way into the hands of many who are interested in the subject.

What the Council has done has been to erect by the side of their other anemometers, on an exposed site in the harbour, a pressure-plate anemometer similar in principle to Osler's, but differing from it in this important respect, that it is not free to oscillate under the varying wind pressure as the other is. A given pressure having been applied to the plate, it is firmly held in the position to which it is moved thereby, until a still stronger force is applied to it, to move it yet further back. Under this arrangement there can be no possible question of the plate "being carried by its momentum beyond the position of equilibrium under the wind-pressure acting at the moment;" it reaches its maximum position step by step, and it will faithfully record the *maximum* pressure whatever it may be.

By the side of this instrument is a Dine's pressure-tube anemometer, and also an anemometer designed by Sir G. G. Stokes, and both of these record, but in different ways, the pressure of the wind also. Put briefly, the result is that the records of these anemometers coincide in a remarkable manner with those of the non-oscillating

pressure-plate; and during the period of three or four years in which they have been at work, a pressure of 20½ lbs. per square foot is the *maximum* which has been registered by either of them.

But during two of these years a similar pressure-tube anemometer has been at work at the Bidston Observatory, by the side of the plate which was responsible for the high pressures that have been already mentioned. The pressures this instrument yielded during this interval were practically the same as those got at Holyhead, the maximum being 22½ lbs., instead of the 20½ lbs. recorded in the same gale at Holyhead; so that one may fairly say that the maximum winds at the two places, although between 60 and 70 miles apart, were of nearly the same strength. Yet, while this was so, the Osler plate at Bidston recorded a *maximum* pressure of 63 lbs. (!) as against the 22½ lbs. by the pressure-tube beside it, and the 20½ lbs. by both the plate and pressure-tube at Holyhead.

A plate similarly arranged to prevent oscillation has also been erected at Southport, and Mr. Baxendell's report upon the comparisons he has been making between it and the two pressure-tube anemometers by its side is awaited with much interest; I believe however, I may say, from some observations Mr. Baxendale has already kindly shown me, that it will fully support the facts observed at Holyhead, and that the non-oscillating plate at Southport has been found to give the same pressures as the pressure-tube anemometers, with no maximum, up to the present time, much exceeding 20 lbs. per square foot. All this tends to throw doubt upon the enormous recorded pressure of 90 lbs., or even 60 lbs., per square foot, and to show that it was not a real phenomenon, but must have been due to the inertia of the plate which registered it.

If this proves to be the fact, then the highest pressure fairly recorded in the British Islands as yet, remains that of 30 lbs. per square foot, corresponding to the velocity of 100 miles per hour, registered by Sir Cuthbert Peek, at Rousdon, in March, 1897. Very possibly this pressure may be exceeded at some time or other, but I venture to think not to any great extent; and it seems that a wind-pressure over a large surface of 30 lbs. per square foot, with of course a fair margin for safety, would be a much more reasonable basis for calculation than the 56 lbs. per square foot recommended by the Wind-Pressure Committee, based as that was upon what appears to have been exaggerated data.*

But, at this point we come back to where we were just now, with reference to the position of the meteorological observer in this matter. As regards some elements, observations are made in abundance, and the difficulty lies in getting people to properly discuss those already obtained, rather than in getting observers to take more. But the

* The Committee consisted of Sir W. G. Armstrong, W. H. Barlow, Sir J. Hawkshaw, Prof. Stokes, and Col. W. Yolland, R.E.

instrumental observation of wind force has certainly been greatly neglected hitherto; partly, perhaps, because the instruments are costly; partly because of difficulties in securing for the instruments a suitable exposure; and also possibly because of a doubt in the minds of some as to the value of the results.

But in the non-oscillating pressure-plate we have referred to, each of these objections or difficulties is fairly met. It is not expensive, or it need not be; it can be easily set up if the site is suitable for wind observations at all, and when erected it requires no more attention than does a thermometer; and, lastly, the observations, if properly made, would be most useful in supplying data which are really needed.

Wind-force is an element which varies greatly in different places. The same force is not experienced inland as on the coast, and it is probably very different on our eastern and western coasts: high or exposed plateaux will often experience winds of a strength seldom or never felt in lower or less open situations; and, therefore, there is a real need for each of these classes of locality to be properly represented by suitably exposed anemometers. There is no doubt that when this need for the work to be done is recognized, it will not be long before those who are in a position to do it will take it up; and, judging from the way in which meteorologists in this country have worked in other directions, when it is undertaken it will certainly be satisfactorily done.

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## MARCH THUNDERSTORMS.

We do not know whether the quaint adage as to the effect of the first thunderstorm of this month referred to by Robert Browning—

> "The morn when first it thunders in March
> The eel in the pond gives a leap, they say,"

has any justification in fact or in popular tradition. But if the poet is right the eel had his leap early this year. Sharp thunderstorms are reported from various places in the south of England on March 1st. Rev. H. A. Boys, of North Cadbury Rectory, Somerset, writes on March 1st: "A short, smart squall of wind, rain and hail, with both thunder and lightning, occurred to-day from 0.26 to 0.35 p.m., passing rapidly from W.S.W. to E.N.E. At 3.15 p.m. there was another sharp squall of rain with two or three claps of thunder." Thunder and lightning were observed at Brixton about 1 p.m., and a sudden shower fell at the same time in North London. A ketch was struck by lightning and sunk in the Bristol Channel, and a building was damaged in Cornwall. At Stroud a small thunderstorm occurred at 6.30 p.m. on March 2nd. On March 3rd thunder was reported in the east of England; on the 5th, lightning was seen

at Stornoway and Pembroke. London was startled by a sudden hail-shower and a single lightning flash and thunderclap at 11.35 a.m. on the 6th, when a church in Dalston was struck and set on fire. On the 7th lightning was reported "as a rarity" from Sussex; so that, except on the 4th, every day of the first week of March had its thunderstorm or thunderstorms.

## Correspondence.

### OCEAN RAINFALL BY RAIN GAUGE.

*To the Editor of Symons's Meteorological Magazine.*

I beg to draw the attention of those interested in Arctic and Antarctic exploration to a Report on Ocean Rainfall by me, which was communicated to the Geographical Societies of Manchester and Liverpool in 1897, apropos of the desirability of registering the rainfall at sea on board ship in high latitudes in both pre-polar regions.

I find that the highest latitudes recorded in the report extend to N. Atlantic 52°, N. Pacific 40°, S. Atlantic 51°, S. Indian 50°, S. Pacific 53°, so that there is left about 20 more degrees up to 70° N. and S. without any registration of rainfall at sea.

This work should be undertaken by means of marine rain gauges only and not by recording days or hours of duration of fall.. The gauges should be provided with snow tops to take in that form of precipitation.

W. S. BLACK, F.R.C.S.E., F.R.Met.Soc.

*Edinburgh, February, 1901.*

### THE SEVERE FROST OF JANUARY 8TH AND 9TH.

*To the Editor of Symons's Meteorological Magazine.*

I see that no London observations are mentioned in your notice of the severe frost in January, nevertheless the extreme cold *was* felt in this neighbourhood as the reading of my verified minimum thermometer on the surface of the snow shows conclusively. It registered 2°·3. Only on three nights in the last twenty-six years have I recorded a lower temperature on the ground, and only three times in that period have I recorded so large a difference (15°·7) between the shade and the grass minimum.

The hour of minimum temperature here must have been much later than it was further west, as the shade temperatures were:—Jan. 8th, 11 p.m., 29°·5, subsequent minimum 18°·0, Jan. 9th, 9 a.m., 28°·0 (when the grass thermometer read 29°·0).

WM. B. BUTLER.

*Crouch End, N.*

## RECURRENCE OF COLD AND WARM WEEKS.

*To the Editor of Symons's Meteorological Magazine.*

The question as to recurrence of weather at about equal intervals may of course be considered without reference to any outside influence (as, *e.g.*, that of the moon or sun). The following facts from recent records of Greenwich weather may be thought noteworthy in this connection.

By a "cold week" we may understand one in which at least four days are cold; by a "warm week," one in which at least four are warm.*

The week about 28th November, 1890, was a distinctly cold one (all its days cold). Starting from that date, let us measure off a series of intervals of 28 days, and note the character of the week about the terminal date in each case. How far can we thus go, finding a cold week at the end of each interval? The answer is, to 19th February, 1892, *i.e.*, through fifteen months. I may here give the terminal dates:—

1890: 28th Nov., 26th Dec. 1891: 23rd Jan., 20th Feb., 20th Mar., 17th April, 15th May, 12th June, 10th July, 7th Aug., 4th Sept., 2nd Oct., 30th Oct., 27th Nov., 25th Dec. 1892: 22nd Jan., 19th Feb.

Coming to 18th March, we are "pulled up" by a warm week.

Again, the week about 15th October, 1897, was a warm one. Now we find each week about the 15th warm, on to 15th March, 1899, *except* in the two months May and June, 1898.

It is right to point out that the former of these cases of recurrence falls in a period which was undoubtedly cold, with a considerable preponderance of cold days; and the latter in a warm period. And we should make allowance for this. Still, it does not seem to me to account altogether for such persistent repetition.

The following figures seem to show that in the 63 months from October, 1895, to December, 1900, there has been a tendency to warmer weather about the middle of the month, than at the ends:

| | + | − |
|---|---|---|
| Week, about 15th ..... | 48 | 15 |
| ,, ,, 4th ..... | 31 | 32 |
| ,, ,, 28th ..... | 34 | 29 |

Thus, while at the ends, we find the numbers (+ and −) nearly equal, the middle shows more than three times as many warm weeks as cold ones.

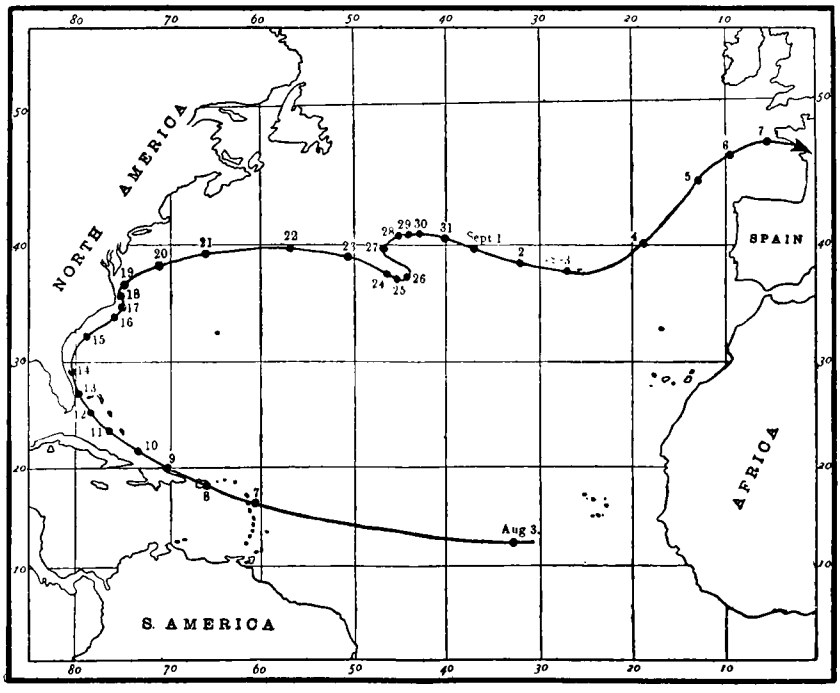
Many practical men, I imagine, must have noticed that the same kind of weather tends to return about the same time in each month, over a considerable period. If we could get some light as to when those long stretches of regular recurrence might be looked for, it would surely be a distinct gain.

ALEX. B. MACDOWALL.

* A "cold" day is assumed to be one the mean temperature of which is below the average for that day of the year, and a "warm" day one with a mean temperature above the average (see the *Weekly Return*).

## A FAR-TRAVELLED CYCLONE.

IN the *Monthly Weather Review*, of the United States Weather Bureau, for October, 1900, Mr. C. O. Paullin discusses the history of the disastrous Puerto Rican hurricane, of August, 1899. Thanks to the careful observations made on the British steamer, "Grangense," evidence of the existence of the depression which caused the hurricane was obtained on August 3rd in 11° 51′ N., 35° 42′ W., 1,800 miles E. by S. of the island of Guadeloupe. It is extremely rare to find a tropical cyclone so far to the east, and from the character of the storm, Mr. Paullin believes that it must have originated still nearer the African coast, probably about the longitude of the Cape Verde Islands. The accompanying chart, a reduction of that in the *Weather Review*, shows the track of the storm as it has been determined by innumerable observations both on land and at sea, the figures showing the positions of the centre at Greenwich noon, on successive days. Thus the great atmospheric eddy seems to have preserved its individual existence for at least forty days. The curious hesitancy in its course in mid-Atlantic was associated with an area of high barometric pressure immediately to the north. We are not aware of any other instance on record of a storm having twice crossed the Atlantic, first westward and then eastward.




NORTH ATLANTIC, SHOWING THE TRACK OF THE PUERTO RICA HURRICANE OF 1899.

## ROYAL METEOROLOGICAL SOCIETY.

THE Monthly Meeting of this Society was held on February 20th, at the Institution of Civil Engineers, Westminster, the President, Mr. W. H. Dines, B.A., being in the chair

The following gentlemen were elected Fellows :—Mr. P. Y. Alexander, Rev. J. B. Anaman, Mr. A. Baldwin, M.P., Mr. S. B. Bates, Mr. R. Clarke, Mr. J. W. Forrester, Mr. T. Hennell, Mr. L. C. Henry, Mr. G. H. B. Matthews, Mr. J. S. Remington, the Rajah A. V. Jugga Row, and Mr. S. Slefrig.

The President moved that a loyal and dutiful Address of condolence and homage be presented to the King, and on the motion being carried unanimously, the Address was read, the audience standing.

Mr. E. Mawley read his Report on the Phenological Observations for 1900, in which he said that during the greater part of the winter and spring the weather was cold and sunless, but in the summer and autumn the temperature was as a rule high, and there was an unusually high record of bright sunshine. Throughout the whole of the flowering season wild plants were much behind their average dates in blossoming; indeed, they were later than in any year since 1891. Such spring migrants as the swallow, cuckoo and nightingale were also later than usual in reaching our shores. Taking the British Isles as a whole, the crops of wheat, barley and oats were all under the average. The yield of hay was poor in the southern half of England, but elsewhere varied from a fair to an abundant crop. Turnips and swedes were almost everywhere deficient, but there was a heavy crop of mangolds. Potatoes were under the average. The year was a bountiful one as regards fruit, the yield of apples, plums and all smaller fruits being in excess of the average. Mr. Mawley illustrated his Report with lantern slides showing the state of vegetation at certain periods of the year.

Mr, T. P. Newman said that he had noticed on Christmas day, 1900, at Haslemere, as many as 53 varieties of plants in flower, including roses, which was more than he had ever observed before at that time of the year.

Mr. J. E. Clark described the state of flowering plants at Christmas time around Street, near Glastonbury, where, although the total number of blossoms was more than the average, the number of true spring flowers was less.

The President, Capt. A. Carpenter, Mr. F. C. Bayard, Mr. W. B. Tripp, and Mr. C. Harding, also took part in the discussion.

Mr. A. E. Watson, B.A., read a paper entitled, "A Review of Past Severe Winters in England, with deductions therefrom." From an examination of the records and descriptions of the severe winters of the last 300 years, he had come to the conclusion that they had been most frequent in the years ending with the figures 0-1 and 4-5 in each decade. He was also of opinion that the severe winter

in the middle of each decade was generally a late one (January to March), while that at the beginning or end of each decade was generally an early one (November to January).

A brief discussion followed the reading of this paper, in which the President, Mr. W. B. Tripp, Mr. E. Mawley, Mr. C. Harding, Dr. H. R. Mill, Mr. R. Bentley, Dr. R. H. Scott, and Mr. F. J. Brodie took part.

Mr. W. Marriott exhibited lantern slides of diagrams prepared by Mr. C. Aburrow, M.Inst.C.E., showing the monthly rainfall and the absolute maximum and minimum temperatures at Johannesburg for several years past. From these it appeared that 1900 had been the wettest year since 1894, and that July last had been unusually cold, the maximum temperature for that winter month not exceeding 54°.

## REVIEWS AND BOOKS RECEIVED.

*Beiträge zur Hydrographie Oesterreichs. Herausgegeben vom k.k. hydrographischen Central-Bureau. IV. Heft. Die Hochwasserkatastrophe des Jahres 1899, im österreichischen Donaugebiete.* Wien, 1900. Folio pp. 162. *Maps and Plates.*

THE floods in the Alpine provinces of Austria during September, 1899, will long be remembered, for they dispute with those of 1897 the bad eminence of being the worst experienced in the nineteenth century. Enormous damage was done, and over 400 square miles of land were submerged, a very serious matter when one recollects that most of the agriculture and the population of the Eastern Alps is concentrated in the narrow valley bottoms of the Danube tributaries which overflowed their banks. This volume contains a full history of the floods, with the readings of all the rain-gauges in the districts affected, and a fine coloured map on the scale of 12 miles to an inch, showing the rainfall of the week September 8–14, with separate transparent sheets bearing lines of equal rainfall for three of the individual days, intended to be laid over the general map to show the changes in the areas of heaviest rain. There are also readings of river levels from a great number of stations and innumerable tables of statistics showing the total volume of rain-water which fell in each of the tributary river-basins, on each day and for the whole period. The heaviest fall recorded was 11·30 in. in a gauge 7 feet above the ground at Mühlau, a station at an altitude of 2,470 feet; and the heaviest fall for the whole wet period of seven days was 26·20 in. at Altaussee, which is at an elevation of 3,100 feet. Both stations are surrounded by lofty mountains.

The Austrian Government established a flood-intelligence system in June, 1899, the plan of which includes three central offices to which the level of the water in the upper tributaries is telegraphed daily, and from which warnings are issued to the inhabitants of the

valleys down-stream when a flood is impending. The two country centres report to Vienna, where the rising of the Danube can thus be foreseen in advance. Experiments made with the object of holding back flood-water by weirs are being tried, and at Nussdorf the expense of an elaborate structure is said to have been saved in this one flood by the preservation from damage of the lower part of the valley. Numerous photographs and other illustrations diversify the statistics of the report.

It is interesting to note that amongst the disturbing causes of the climate of Europe at the time of the floods was the remarkably long-lived cyclone which is referred to on page 22 of this month's Magazine. It reached the centre of France on September 8th, and then seemed to die out, the immediate cause of the heavy rains being another low-pressure area in the east of Europe.

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*Report of the Meteorological Service of Canada for the year ending December 31st, 1897*, by R. F. STUPART. Ottawa, 1900. 4to. pp. 292. *Illustrations.*

THIS report contains an introduction describing the mode of exposure of thermometers in the official Canadian screen made of sheet-iron louvres, with a special sunshade facing the south. The weather forecasts of 1897 were verified in 85·5 per cent. of the cases. Forecasts are disseminated not only by telegraph, but by conspicuous signals on the luggage vans of trains traversing agricultural districts.

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*Atmospheric Radiation*, by FRANK W. VERY. U.S. Department of Agriculture, Weather Bureau. Washington, 1900. 4to, pp. 134. *Diagrams.*

A STUDY, with laboratory experiments and the discussion of observations in the free air, of the effects of radiation in the atmosphere, investigating the protective power of the air in retarding the rate of gain or loss of heat on the Earth's surface.

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*Ceylon. Administration Reports*, 1899. *Part II.: Scientific Meteorology.* Report of Mr. F. H. GRINLINTON. *Maps and Diagrams.* [Colombo, 1900].

MAPS of Ceylon are given, showing the mean annual rainfall, and the mean rainfall for the S.W. monsoon period (February–July), and the N.E. monsoon period (August–January).

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Sounding the Ocean of Air, by A. LAWRENCE ROTCH. London: Society for Promoting Christian Knowledge. 1900. pp. viii. + 184. *Illustrations.* Price 2s. 6d. *(To be reviewed)*,

The Distribution of Rainfall over the Land, by ANDREW J. HERBERTSON, Ph.D. *Maps and Plate.* London: John Murray. 1901. pp. iv. + 70. *(To be reviewed).*

City of Nottingham. The Meteorology of Nottingham for the year 1900. By ARTHUR BROWN and PHILIP BOOBBYER. *With large chart comparing death-rate with meteorological conditions.*

Observations Météorologiques Suédoises. Redigées sous la direction de l'Institut Central de Météorologie. Vol. **37**, 1895. Stockholm, 1900. 4to, pp. 158.

Jahrbuch des Königl. sächsischen meteorologischen Institutes, 1898. Jahrgang **16**, I. Abtheilung. Von. Prof. Dr. PAUL SCHREIBER. Chemnitz, 1900. 4to, pp. 78.

The State of the Ice in the Arctic Seas, 1900. Special print of the Nautical Meteorological Annual of the Danish Meteorological Institute, [Copenhagen, 1901]. 4to, pp. xviii. *Maps.*

## METEOROLOGICAL NEWS.

PROFESSOR S. C. HEPITES, Founder and Director of the Meteorological Service of Rumania, celebrated his fiftieth birthday on February 17th, at Bukharest. Letters of congratulation were addressed to him on the occasion, according to the pleasant continental custom, by his fellow-workers in Meteorology in all countries.

AMONGST the many fatal ice accidents of February, peculiar sadness attaches to that on Airthrey Loch, in Stirlingshire, where, on the 15th, Mr. F. P. Pullar, F.R.Met.Soc., lost his life in a heroic attempt to save others. Mr. Pullar, although only twenty-five years of age, had been a meteorological observer for more than five years, and had fitted up a very complete set of instruments, including deep earth-thermometers at his father's house, The Lea, Bridge of Allan. He recently presented a meteorological outfit to one of the field hospitals going out to South Africa. For several years Mr. Pullar had been engaged, together with Sir John Murray, of the *Challenger*, in making a complete survey of the Scottish lochs, sounding them and studying the distribution of temperature in the water. Few at so early an age have shown equal promise of a life of scientific usefulness.

THE METEOROLOGICAL COUNCIL will, commencing in April next, issue a monthly Pilot Chart of the North Atlantic and Mediterranean similar in its main features to the well-known Pilot Charts of the United States Hydrographic Office. A specimen, showing the general character of the new chart, has been issued, and the work appears well calculated to be useful to mariners and interesting to meteorologists. The advantage to British shipping, of a chart constructed on this side of the Atlantic from the data available at the Meteorological Office, is obvious; and if there is a friendly rivalry with the American charts it will be a guarantee that neither will be allowed to fall behind the other. The increasing importance attached to the study of oceanographical questions in relation to meteorology will ensure the hearty reception of the new chart by scientific workers. The price has been fixed at the moderate rate of 6d. monthly.

OUR NOTICE of the changes in the Meteorological Office,

incidental to the retirement of Dr. R. H. Scott, was inadvertently erroneous. Mr. Shaw did not vacate his seat on the Council on his appointment as Secretary, while Professor G. H. Darwin has been a member of the Council since 1885.

THE METEOROLOGISCHE ZEITSCHRIFT for December, 1900, reprints from the *Annalen der Physik* an article on "Globe Lightning," by Max Toepler. Although, the author says, the phenomena of no known method of electric discharge are exactly identical with those of globe lightning, great similarities are presented by the new and little-known method "Büschellichtbogen," a word that may be described as a "bunch-of-light arc," but which cannot be translated. This takes place in the free air, not in a vacuum tube, and masses of light separated from one another by extensive dark spaces form successively upon the discharging surface, either noiselessly or with a loud terminal spark. The changes in this form of discharge, due to the conductivity and number of the electrodes, are comparable, though on a small scale, to the various phenomena of globe lightning, which may thus be looked upon as resulting from the different grouping of the clouds and the Earth's surface when a state of electric tension exists between them.

RED RAIN fell in Sicily and many parts of southern Italy on Sunday, March 10th, alarming the peasants on account of its resemblance to blood. The red colour was due, it would appear, to dust or fine sand raised from the Sahara, and carried across the Mediterranean by a sirocco.

"CLIMAT," a new meteorological journal devoted to practical weather prediction, is announced as shortly to appear. The editor, Mr. N. A. Demchinsky, has discovered "that the chief factor in the weather is the moon's attraction," and he is bold enough to base upon this discovery, fortnightly predictions of the weather for Europe and North America, to be published a month in advance. "Climat" is to be issued in St. Petersburg, and the whole magazine will appear in parallel columns, giving the Russian, French, English, and German rendering of every article. We look forward to this magazine with some hope, for if the predictions are clear enough to be compared with the actual weather, we shall either be furnished with a storehouse of refutations of lunar influence, or else convinced of the truth of Mr. Demchinsky's discovery; while if they are not clear enough to be verified or confuted by comparison with facts, the system will stand condemned at the outset.

TERMS derived from the Greek, however convenient they may prove to the man of science, or however luminous they may be to the scholar, do not always escape the danger of being incomprehensible to the "Man in the Street." We note that a London daily paper, which it would be unkind to name, announced on February 21st, that Mr. Mawley had read a communication on "The *Phrenological* Observations of 1900" to the Royal Meteorological Society. (See p. 23).

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, SEPTEMBER, 1900.

| STATIONS. *(Those in italics are South of the Equator.)* | Absolute. Maximum. Temp. | Absolute. Maximum. Date. | Absolute. Minimum. Temp. | Absolute. Minimum. Date. | Average. Max. | Average. Min. | Average. Dew Point. | Average. Humidity. | Absolute. Max. in Sun. | Absolute. Min. on Grass. | TotalRain. Depth. | TotalRain. Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0-100 | ° | ° | inches | | |
| London, CamdenSquare | 80·4 | 16 | 42·6 | 4 | 70·4 | 50·1 | 50·8 | 75 | 120·3 | 39·9 | ·79 | 7 | 4·4 |
| Malta | 92·4 | 10 | 63·8 | 26 | 83·3 | 68·7 | 67·1 | 77 | 148·4 | 59·0 | ·10 | 1 | 3·1 |
| *Cape of Good Hope* | 84·5 | 9 | 42·1 | 1 | 67·4 | 50·7 | 52·0 | 77 | ... | ... | 1·42 | 7 | 4·3 |
| *Mauritius* | 78·8 | 30 | 57·0 | 27 | 75·2 | 63·9 | 59·1 | 72 | 143·2 | 48·0 | ·48 | 5 | 4·9 |
| Calcutta | 94·4 | 12 | 73·0 | 24 | 87·1 | 77·6 | 77·1 | 86 | 150·2 | 72·6 | 45·55 | 16 | 8·2 |
| Bombay | 87·4 | 6 | 75·2 | 21 | 85·1 | 77·5 | 75·9 | 84 | 137·5 | 71·8 | 7·49 | 21 | 6·4 |
| Colombo, Ceylon | 89·7 | 28 | 73·3 | 1 | 86·9 | 76·5 | 74·3 | 83 | 146·5 | 72·0 | 4·00 | 16 | 5·6 |
| *Melbourne* | 75·0 | 20 | 35·3 | 5 | 59·7 | 46·0 | 44·7 | 80 | 130·9 | 28·3 | 2·91 | 17 | 6·9 |
| *Adelaide* | 76·7 | 19 | 37·9 | 4 | 63·7 | 45·8 | 45·0 | 69 | 139·2 | 29·4 | 1·18 | 14 | 5·1 |
| *Sydney* | 73·0 | 19 | 44·5 | 2, 4 | 64·5 | 49·9 | 46·9 | 75 | 127·7 | 38·7 | 2·31 | 19*b* | 4·5 |
| *Wellington* | 68·0 | 13 | 35·0 | 8 | 55·9 | 44·3 | 40·9 | 71 | 113·0 | 27·0 | 6·09 | 20 | 5·3 |
| *Auckland* | 64·5 | 19 | 42·5 | 22 | 60·7 | 49·2 | 44·9 | 69 | 134·0 | 39·0 | 5·19 | 19 | 6·0 |
| Jamaica, Halfway Tree | 91·0 | 21 | 69·0 | 22 | 86·9 | 72·0 | 71·2 | 82 | ... | ... | 8·86 | 11 | 4·7 |
| Trinidad | 92·0 | 11*a* | 61·0 | 24 | 89·5 | 71·9 | 74·4 | 83 | 165·0 | 60·0 | 5·52 | 16 | ... |
| Grenada | 91·0 | 12 | 72·0 | 19 | 85·4 | 75·4 | 72·8 | 76 | 162·0 | ... | 4·79 | 20 | 4·0 |
| Toronto | 91·7 | 2 | 44·0 | 19 | 74·3 | 55·1 | 57·2 | 78 | 109·2 | 39·0 | 1·43 | 7 | 4·9 |
| Fredericton New Brunswick, Winnipeg, Manitoba | 92·2 | 3 | 29·5 | 20 | 68·1 | 45·9 | 46·9 | 65 | ... | ... | 2·64 | 7 | 5·3 |
| | 79·1 | 7 | 30·0 | 27 | 63·6 | 43·6 | ... | 81 | ... | ... | 4·22 | 16 | 5·7 |
| Victoria, British Columbia | 77·2 | 11 | 39·0 | 30 | 62·9 | 48·6 | .. | ... | ... | ... | 1·15 | 10 | 5·1 |

*a*—and 13, 30. *b*—and dew 4 days.

### REMARKS.

MALTA.—Mean temp. of air 74°·8, or 0°·2 below average. Mean hourly velocity of wind 6·9 miles, or 0·8 below average. Temp. of sea 77°·4. TSS on 4th and 15th, L on 19th. J. F. DOBSON.

*Mauritius.*—Mean temp. of air 0°·7, dew point 0°·8, and rainfall ·56 in. below, their respective averages. Mean hourly velocity of wind 10·1 miles, or 1·8 below average; extremes, 26·0 on 1st and 2·8 on 6th, 24th and 27th, prevailing direction E.S.E. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 0°·2 below, dew point 1°·1 above, and rainfall 1·01 in. below, their respective averages. Max. intensity of R 2·40 in. per hour for about 6 minutes on 30th. Mean hourly velocity of wind 9½ miles, prevailing direction S.W. A shock of earthquake was felt over the southern portion of the island at 4.15 a.m. on the 10th; average duration 10 seconds, average direction S.E. to N.W. H. O. BARNARD.

*Adelaide.*—Mean temp. of air 2°·3, below the average for 43 years. Rainfall ·56 in. below the average. C. TODD, F.R.S.

*Sydney.*—Mean temp. of air 1°·7 below, humidity 5·2 per cent. above, and rainfall ·73 in. below, their respective averages. H. C. RUSSELL, F.R.S.

*Wellington.*—Mean temp. of air 0°·8 below, and rainfall 1·83 in. above, their respective averages. A showery month, prevailing winds southerly or northerly, generally moderate; fog on 15th and 26th. R. B. GORE.

*Auckland.*—Mean temp. of air close to the average; rainfall 1·10 in. above the average. A stormy and squally month. T. F. CHEESEMAN.

TRINIDAD.—Rainfall 2·01 in. below the 30 years' average. J. H. HART.

# SUPPLEMENTARY TABLE OF RAINFALL, FEBRUARY, 1901.

| Div | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| I. | Uxbridge, Harefield Pk.. | 1·18 | XI. | Castle Malgwyn ..... | 2·73 |
| II. | Dorking, Abinger Hall . | 2·51 | ,, | Builth, Abergwesyn Vic. | 2·14 |
| ,, | Birchington, BeresfordLge. | ·89 | ,, | Rhayader, Nantgwillt ... | 2·62 |
| ,, | Hailsham ..... | 2·23 | ,, | Lake Vyrnwy ..... | 2·12 |
| ,, | Crowborough..... | 2·25 | ,, | Corwen, Rhug ..... | 1·56 |
| ,, | Ryde, Thornbrough ..... | ... | ,, | Criccieth, Talarvor ..... | 1·65 |
| ,, | Emsworth, Redlands ... | 1·48 | ,, | I. of Anglesey, Lligwy.. | 1·61 |
| ,, | Alton, Ashdell ..... | 2·40 | ,, | I. of Man, Douglas ..... | 2·51 |
| ,, | Newbury, Welford Park | 1·85 | XII. | Stoneykirk, Ardwell Ho. | 1·64 |
| III. | Oxford, Magdalen Coll.. | 1·22 | ,, | New Galloway, Glenlee | 1·60 |
| ,, | Banbury, Bloxham ..... | 1·59 | ,, | Moniaive, Maxwelton Ho. | 1·36 |
| ,, | Northampton, Sedgebrook | 1·24 | ,, | Lilliesleaf, Riddell ..... | 1·19 |
| ,, | Huntingdon, Brampton. | ·94 | XIII. | N. Esk Res. [Penicuick] | 2·30 |
| ,, | Wisbech, Bank House... | 1·17 | XIV. | Glasgow, Queen's Park.. | 1·40 |
| IV. | Southend ..... ..... | ·72 | XV. | Inveraray, Newtown ... | 2·58 |
| ,, | Colchester, Lexden ..... | ·76 | ,, | Ballachulish, Ardsheal... | 2·59 |
| ,, | Saffron Waldon, Newport | 1·12 | ,, | Islay, Eallabus..... | 3·08 |
| ,, | Rendlesham Hall ..... | ·92 | XVI. | Dollar..... | ·86 |
| ,, | Swaffham ..... | 1·19 | ,, | Balquhidder, Stronvar... | 1·72 |
| V. | Salisbury, Alderbury ... | 1·83 | ,, | Coupar Angus Station... | 1·14 |
| ,, | Bishop's Cannings ..... | 1·21 | ,, | Blair Atholl ... ..... | 1·07 |
| ,, | Blandford, Whatcombe . | 1·56 | XVII. | Keith H.R.S..... | 4·16 |
| ,, | Ashburton, Druid House | 1·81 | ,, | Forres H.R.S. ... ..... | 2·22 |
| ,, | Okehampton, Oaklands. | 1·86 | XVIII. | Fearn, Lower Pitkerrie.. | 2·01 |
| ,, | Hartland Abbey ..... | 1·67 | ,, | S. Uist, Askernish ..... | ·91 |
| ,, | Lynton, Glenthorne ... | ... | ,, | Invergarry..... | 3·35 |
| ,, | Probus, Lamellyn ..... | 1·94 | ,, | Aviemore, Alvie Manse. | 1·20 |
| ,, | Wellington, The Avenue | 1·18 | ,, | Loch Ness, Drumnadrochit | 2·80 |
| ,, | North Cadbury Rectory | 1·00 | XIX. | Invershin ..... | 3·12 |
| ,, | Clifton, Pembroke Road | 1·01 | ,, | Durness ..... | 3·40 |
| VI. | Ross, The Graig ..... | ·99 | ,, | Watten H.R.S..... | 3·00 |
| ,, | Wem, Clive Vicarage ... | 1·50 | XX. | Dunmanway, Coolkelure | 2·57 |
| ,, | Wolverhampton, Tettenhall | 1·66 | ,, | Cork, Wellesley Terrace | 1·44 |
| ,, | Cheadle, The Heath Ho. | 1·27 | ,, | Killarney, District Asyl. | 1·03 |
| ,, | Coventry, Priory Row... | 1·72 | ,, | Caher, Duneske ..... | 1·51 |
| VII. | Market Overton ..... | 1·38 | ,, | Ballingarry, Hazelfort... | 1·58 |
| ,, | Grantham, Stainby ..... | 2·65 | ,, | Limerick, Kilcornan ... | ... |
| ,, | Horncastle, Bucknall ... | 1·81 | ,, | Miltown Malbay ..... | ·49 |
| ,, | Worksop, Hodsck Priory | 1·03 | XXI. | Gorey, Courtown House | 1·84 |
| VIII. | Neston, Hinderton ..... | 1·40 | ,, | Moynalty, Westland ... | 1·30 |
| ,, | Southport, Hesketh Park | 1·57 | ,, | Athlone, Twyford ..... | 1·09 |
| ,, | Chatburn, Middlewood. | 1·52 | ,, | Mullingar, Belvedere ... | 1·81 |
| ,, | Duddon Val., Seathwaite Vic. | 3·55 | XXII. | Woodlawn ..... | 1·18 |
| IX. | Melmerby, Baldersby ... | 1·30 | ,, | Crossmolina, Enniscoe .. | 1·84 |
| ,, | Scalby, Silverdale ..... | 3·19 | ,, | Collooney, Markree Obs. | 2·00 |
| ,, | Ingleby Greenhow Vic.. | 2·99 | XXIII. | Enniskillen, Model Sch. | 1·38 |
| ,, | Middleton, Mickleton ... | ·84 | ,, | Warrenpoint..... | 1·76 |
| X. | Haltwhistle, Unthank H. | ... | ,, | Miltown, Banbridge..... | 1·43 |
| ,, | Bamburgh ..... | 1·91 | ,, | Belfast, Springfield ..... | 2·04 |
| ,, | Keswick, The Bank..... | 1·67 | ,, | Bushmills, Dundarave.. | 1·66 |
| XI. | Llanfrechfa Grange ..... | 1·21 | ,, | Stewartstown ..... | 1·14 |
| ,, | Treherbert, Tyn-y-waun | 3·39 | ,, | Killybegs ..... | 2·76 |
| ,, | Llandovery ..... | 1·24 | ,, | Horn Head ..... | 2·83 |

# FEBRUARY, 1901.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1890-9. | Greatest Fall in 24 hours. Dpth | Greatest Fall in 24 hours. Date | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Max. Date | Min. Deg. | Min. Date. | No. of Nights below 32°. In shade. | No. of Nights below 32°. On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches. | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | 1·21 | — ·26 | ·62 | 4 | 9 | 53·3 | 28 | 17·9 | 14 | 16 | 23 |
| II. | | Tenterden ..... | 1·84 | + ·14 | .70 | 4 | 14 | 49·0 | 28 | 18·0 | 16 | 17 | 20 |
| ,, | | Hartley Wintney ..... | 1·85 | + ·22 | ·85 | 4 | 16 | 51·0 | 28 | 17·0 | 14 | 15 | 17 |
| III. | | Hitchin ..... | 1·04 | — ·42 | ·27 | 28 | 11 | 50·0 | 28 | 16·0 | 13 | 18 | ... |
| ,, | | Winslow (Addington) ..... | 1·07 | — ·39 | ·31 | 4 | 13 | 51·0 | 28 | 15·0 | 14 | 17 | 22 |
| IV. | | Bury St. Edmunds (Westley) | ·85 | — ·69 | ·27 | 21 | 11 | 52·0 | 28 | 17·0 | 14 | 22 | ... |
| ,, | | Norwich (Brundall) ..... | 2·16 | ... | ·66 | 11 | 19 | 52·6 | 25 | 9·2 | 14 | 20 | 23 |
| V. | | Winterbourne Steepleton ... | 1·53 | ... | ·46 | 28 | 10 | 48·4 | 25 | 21·0 | 14 | 18 | 21 |
| ,, | | Torquay (Cary Green) ... ..... | 1·23 | ... | ·50 | 28 | 9 | 52·7 | 28 | 25·5 | 15 | 8 | ... |
| ,, | | Polapit Tamar [Launceston].. | 1·86 | — ·75 | ·58 | 26 | 11 | 51·3 | 28 | 18·4 | 15 | 17 | 22 |
| VI. | | Stroud (Upfield) ..... | 1·51 | — ·41 | ·38 | 26 | 12 | 51·0 | 28 | 21·0 | 13 | 17 | ... |
| ,, | | Church Stretton (Woolstaston) | 1·16 | — ·84 | ·31 | 28 | 12 | 53·0 | 28 | 17·5 | 14 | 20 | 26 |
| ,, | | Worcester (Diglis Lock) ..... | 1·12 | — ·39 | ·47 | 26 | 15 | ... | ... | ... | ... | ... | ... |
| VII. | | Boston ..... | 1·27 | — ·08 | ·35 | 26 | 12 | 50·0 | 25 | 24·0 | 7 | 21 | ... |
| ,, | | Hesley Hall [Tickhill]..... | ·91 | — ·54 | ·15 | 28 | 14 | 52·0 | 25 | 18·0 | 14*b* | 16 | ... |
| ,, | | Derby (Midland Railway)..... | 1·15 | — ·30 | ·26 | 26 | 17 | 53·0 | 28 | 16·0 | 14 | 16 | ... |
| VIII. | | Manchester (Plymouth Grove) | 1·48 | — ·38 | ·31 | 28 | 16 | 50·0 | 28 | 20·0 | 16 | 16 | 19 |
| IX. | | Wetherby (Ribston Hall) ... | 1·94 | + ·50 | ·60 | 4 | 12 | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) ..... | 2·49 | — 2·33 | ·73 | 26 | 16 | ... | ... | ... | ... | ... | ... |
| ,, | | Hull (Pearson Park). ... ..... | 2·03 | + ·31 | ·42 | 18 | 17 | 51·0 | 25 | 20·0 | 15 | 19 | 24 |
| X. | | Newcastle (Town Moor) ..... | 1·39 | — ·08 | ·17 | 24 | 18 | ... | ... | ... | ... | ... | ... |
| ,, | | Borrowdale (Seathwaite)..... | 5·34 | — 6·43 | 1·40 | 24 | 13 | 45·5 | 23 | 19·4 | 14 | 17 | ... |
| XI. | WALES. | Cardiff (Ely)..... | 1·09 | — 1·80 | ·27 | 4 | 12 | ... | ... | ... | ... | ... | ... |
| ,, | | Haverfordwest ..... | 2·25 | — 1·09 | ·64 | 1 | 12 | 49·9 | 28 | 22·0 | 15 | 11 | 22 |
| ,, | | Aberystwith (Gogerddan) ... | 2·71 | — ·44 | 1·18 | 1 | 13 | 50·0 | 25 | 18·0 | 14 | 19 | ... |
| ,, | | Llandudno..... | 1·37 | — ·58 | ·32 | 4 | 15 | 47·0 | 9, 25 | 25·5 | 14 | 4 | ... |
| XII. | SCOTLAND. | Cargen [Dumfries] ..... | 1·20 | ... | ·54 | 26 | 6 | 48·0 | 23 | 20·0 | 14 | 17 | ... |
| XIII. | | Edinburgh (Royal Observatory) | ·99 | ... | ·40 | 26 | 14 | 46·7 | 24 | 25·5 | 12*c* | 12 | 19 |
| XIV. | | Colmonell ..... | 3·19 | — ·22 | ·75 | 4 | 9 | 60·0 | 8 | 20·0 | 14 | ... | ... |
| XV. | | Tighnabruaich ..... | 2·95 | ... | ·83 | 24 | 11 | 45·0 | 27 | 23·0 | 13*c* | 16 | ... |
| ,, | | Mull (Quinish)..... | 3·33 | — 1·06 | ·73 | 26 | 20 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Leven Sluices ..... | 1·55 | — 1·23 | ·45 | 2*a* | 4 | ... | ... | ... | ... | ... | ... |
| ,, | | Dundee (Eastern Necropolis) | 1·35 | — ·78 | ·65 | 24 | 11 | 46·5 | 16 | 20·8 | 14 | 19 | ... |
| XVII. | | Braemar ..... .. | 1·41 | — 1·17 | ·30 | 25 | 14 | 40·6 | 9 | 0·5 | 14 | 25 | 27 |
| ,, | | Aberdeen (Cranford) ... ..... | 2·65 | + ·24 | ·63 | 24 | 24 | 48·0 | 8 | 13·0 | 13 | 23 | ... |
| ,, | | Cawdor (Budgate) ..... | 2·02 | + ·08 | ·42 | 24 | 19 | ... | ... | ... | ... | ... | ... |
| XVIII | | Strathconan [Beauly] ..... | 4·32 | + ·13 | 1·05 | 6 | 8 | .. | ... | ... | ... | ... | ... |
| ,, | | Glencarron Lodge..... | 4·41 | — 2·91 | ·74 | 24 | 22 | 45·0 | 26 | 20·4 | 14 | 16 | ... |
| XIX. | | Dunrobin ..... | 2·50 | + ·08 | ·68 | 24 | 11 | 47·8 | 8 | 25·0 | 14 | 15 | ... |
| ,, | | S. Ronaldshay (Roeberry) ... | 2·34 | — ·22 | ·47 | 25 | 25 | 46·0 | 22 | 24·0 | 11 | 16 | ... |
| XX. | IRELAND. | Darrynane Abbey..... | ·78 | — 3·24 | ·21 | 28 | 8 | ... | ... | ... | ... | ... | ... |
| ,, | | Waterford (Brook Lodge) ... | 1·93 | — ·98 | ·90 | 25 | 9 | 51·0 | 28 | 23·0 | 15 | 14 | ... |
| ,, | | Broadford (Hurdlestown) ... | ·96 | — 1·26 | ·20 | 1 | 16 | 66·0 | 11 | 22·0 | 14 | 12 | ... |
| XXI. | | Carlow (Browne's Hill) ..... | 1·79 | — ·76 | ·70 | 25 | 14 | ... | ... | ... | ... | ... | ... |
| ,, | | Dublin (Fitz William Square) | 1·20 | — ·75 | ·42 | 28 | 12 | 51·8 | 25 | 28·0 | 15 | 9 | 17 |
| XXII. | | Ballinasloe ..... ..... | ·98 | — 1·45 | ·24 | 1 | 15 | 58·0 | 26*a* | 18·0 | 12*d* | 22 | ... |
| ,, | | Clifden (Kylemore) ..... .. | 4·00 | — 1·91 | 1·03 | 28 | 12 | ... | ... | ... | ... | ... | ... |
| XXIII | | Seaforde..... | 1·46 | — 1·33 | ·28 | 28 | 16 | 48·0 | 25 | 24·0 | 13 | 13 | 14 |
| ,, | | Londonderry (Creggan Res.). | 2·26 | — ·45 | ·73 | 1 | 23 | ... | ... | ... | ... | ... | ... |
| ,, | | Omagh (Edenfel) ..... | 2·07 | — ·53 | ·48 | 1 | 17 | 50·0 | 28 | 23·0 | 20 | 14 | 17 |

+ Shows that the fall was above the average ; — that it was below it.
*a*—and 27. *b*—and 15. *c*—and 14. *d*—and 15.

# METEOROLOGICAL NOTES ON FEBRUARY, 1901.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

TENTERDEN.—A cold month, S on 8 days, but heavy falls only on the 4th and 5th, when most of the precipitation was rain. Duration of sunshine 58 hours.

HARTLEY WINTNEY.—The temp. was below the average, but there was less than the usual amount of fog, and S, although falling on 10 different days, never lay long on the ground. Bitter N. wind prevailed from the 3rd to 24th, with wet weather latterly. Ozone was noted on 6 days with a mean of 4·0.

WINSLOW, ADDINGTON.—A dry cold month with several sharp frosts of short duration. The weather was very variable throughout. The day temp. was generally low. A very dense fog occurred on the afternoon of the 19th; and on the 27th, a most unusual darkness was experienced about noon.

BURY ST. EDMUNDS, WESTLEY.—A cold wintry month with S on 6 days.

NORWICH, BRUNDALL.—The coldest February since 1895, and the most severe frost since that year. S fell on 13 days, was a foot deep on level ground on 13th; it covered the ground from 1st to 8th, and from 11th to 24th inclusive, 22 days in all.

WINTERBOURNE STEEPLETON.—Cold and generally dry. The mean temp. was 36°·0, whereas that of January was 38°·8. Fog on 28th.

TORQUAY, CARY GREEN.—Mean temp. 4°·3 below the average. Duration of sunshine 12·7 hours above the average; only four sunless days. Mean amount of ozone 2·8; range from 7·5 on 28th to 0·5 on several days with N.E. wind.

POLAPIT TAMAR [LAUNCESTON].—A dry cold month with comparatively light winds. Thick fog till noon on 1st. H storms at night on 4th. Distant T on 11th.

MANCHESTER, PLYMOUTH GROVE.—S and sleet on 3rd and 4th, S on 18th and 20th. Dense fog on seven days.

## WALES.

HAVERFORDWEST.—A cold month with small R and very little S. A very heavy gale occurred blowing with the force of a storm between 8 and 10 p.m. on the 4th, and continued on the 5th, a good deal of damage being done. During the remainder of the month it was usually calm. Bright sunshine for 64·3 hours.; six sunless days. Agricultural operations were well advanced.

ABERYSTWITH, GOGERDDAN.—A very changeable month with little sunshine. Two inches of S on the 3rd,

## SCOTLAND.

COLMONELL, CLACHANTON.—Mean temp. 37°·5 or 1°·2 below the average of 26 years. Three inches of snow on the 4th.

TIGHNABRUAICH, CRAIGANDARAICH.—A good winter month. The average max. temp. was 39°·8, min. 31°·7, or about 3° higher than in February, 1900; this may be due to the number of days of unbroken sunshine.

ABERDEEN, CRANFORD.—In the first part of the month S fell from W. and N.W.; in the latter part from N.W. and N.N.W.

S. RONALDSHAY, ROEBERRY.—The first part was cold, rough, and very changeable with S, sleet and R, the latter part bitterly cold. Mean temp. 36°·5, or 3°·5 below the average of 11 years.

## IRELAND.

DARRYNANE ABBEY.—Except May, 1876, with ·44 in., and November, 1879, with ·75 in., this was the driest month ever registered. Up to 24th the weather was bright and very fine. The last few days were showery and gloomy. Sharp frost at night on 4th, 5th and 6th.

BROADFORD, HURDLESTOWN.—A very fine month. A little S on 12th. Dense fog on 20th, 21st and 22nd.

DUBLIN, FITZWILLIAM SQUARE.—Cold, cloudy and rather dull, with a small rainfall distributed over 12 days; of the total R nearly 61 per cent. fell on the first and last days. Like February, 1900, the month was much colder than the preceding January. Mean temp. 39°·2, or 3°·6 below the average. Foggy on four days. The amount of cloud 7·2 was much above the average. High winds were noted on 5 days, reaching the force of a gale on the 4th and 28th. H fell on 13th and 16th, and S or sleet on five days.

LONDONDERRY, CREGGAN RESERVOIR.—S on 3rd, 4th, 5th and 15th.

OMAGH, EDENFEL.—Although there were 11 rainless days and a total fall of ·37 in. under the average, the month was generally damp and raw, with a low mean temp. There was no S or any settled frost, although the temp. on grass fell below 32° on 17 nights.

## "EXTRAORDINARY RAINFALL."

THE following paragraph, which appeared in several evening papers of March 11th, quite deserves its heading:—

"EXTRAORDINARY RAINFALL.

"During the month of February there was a remarkable rainfall in Cumberland. On the top of Helvellyn and also upon Whiteside and Ullscarf, two points of the same range, at an approximate height of 2,000 ft. above sea level, the rainfall during the month was recorded as 3 ft. 5 in., 3 ft. 6 in., and 3 ft. 3 in., respectively. At Dale Head Hall, in the valley, near the shores of Thirlmere, a depth of 3 ft. 3 in. also was recorded, yet upon Armboth Fells, which rise from the side of the lake farthest from Helvellyn to a height of 1,650 ft., the rain gauge registered 9 ft. 2 in. as the depth of rain which had descended in February. The details have given rise to the belief that a series of water-spouts, or of especially heavily charged storm-clouds, burst over the fells and about Wythburn, which did not affect the neighbouring heights."

Probably some weekly paper has by this time converted the feet into inches, as more fitting for rain records, and we may expect to be haunted for years by a spectral "record rainfall" of 110 inches in one month (and that the shortest of the year), at Armboth Fells. The explanation will never, in all probability, succeed in overtaking the error; but it appeared, also on March 11th, in the *Manchester Courier*, and runs thus:—

"THE THIRLMERE RAINFALL.

"The details of the rainfall at Thirlmere during February were given erroneously in a paragraph in our issue of Saturday. By an unfortunate inadvertence feet and inches were named as the measurements, instead of inches and tenths of inches, which were the quantities recorded by the various rain gauges referred to."

*Errata in "Met. Mag." February, 1901.*

Page 14, fourth column of table, in heading, for "1880-9," read "1890-9."
Page 8, line 28, for "9th," read "8th."

SYMONS'S

# METEOROLOGICAL MAGAZINE.

No. CCCCXXIII.] APRIL, 1901. VOL. XXXVI.

## THE BLOOD-RAIN PLANT AT CAMDEN SQUARE.

BY a curious coincidence, while the red rains of African dust are exciting attention and alarm in the south of Italy, the head quarters of the British Rainfall Organization have been invaded by the microscopic water-plant which was responsible for many of the "rains of blood" recorded in history. Speaking accurately, the coincidence is less curious than it appears, for it was the report of the occurrence of red rain in Italy that led us to look more critically into the phenomenon at Camden Square, which had been noticed before, although not investigated. It has nothing in common with the red sand-rains of the Continent except the colour.

About the beginning of March the water in the large evaporation-tank (6 feet square and 2 feet deep) assumed a chocolate colour, which might have been due to the accumulation of ordinary London dust, and attracted little attention; but when the last ice disappeared from the surface, and the long spell of cloudy weather gave place to sunshine, the red colour of the water was intensified to a rich deep crimson, offering a most effective contrast to the green of the surrounding grass. On stirring the water the presence of clouds of a deep red floating substance became apparent, and a glass dipped into the thickest part of one of these clouds and held up to the light was seen to be full of minute bright red points just visible to the eye. Believing that these were due to some sort of living organism, we reported the matter to the Botanical Department of the British Museum, and on April 3rd Mr. V. H. Blackman kindly visited Camden Square and took away specimens of the water. On subjecting them to microscopical examination, he at once found that the red colour was due to the presence of swarms of a minute moving water-plant—in technical language a motile alga—now called *Sphaerella pluvialis*, but formerly known as *Haematococcus pluvialis*, literally "the blood-plant of rain." It is closely allied to the better known *Sphaerella nivalis*, the microscopic plant which gives its colour to red snow. This organism is usually found in small pools, where it makes its home; its occurrence in rain is a

rarity, and the showers coloured red from its presence are probably produced by the same process as the familiar showers of frogs and fish.

The tank at Camden Square has not caught any red rain: the various raingauges emptied daily, weekly and monthly all contained water of the usual dusky tint of London rain without a trace of redness, and there is no reason to suppose that any red rain has fallen recently in this country; but if a little whirlwind were to pass over the tank, spots very like blood would be found where the drops fell along its subsequent track.

If any of our readers who are interested in microscopic work would care to examine this organism, the name of which is so closely linked with rain, we shall be happy to forward specimens of the water containing it.

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# Correspondence.

## WIND AND WAVES.

*To the Editor of Symons's Meteorological Magazine.*

In reference to a report in the newspapers of March 1st of the ss. "Teutonic" having encountered a huge tidal wave on February 24th in the Atlantic, and being momentarily submerged, I venture to surmise it might have been what is called an *acuminative wave.*

This is believed to be induced by two storm swells meeting each other at an onset perpendicularly, or nearly so, and producing a wave of almost double the height of each of the swells combining to produce it. The trough, in consequence, will be nearly double the depth of the storm trough of either separate wave. There have been some violent storms reported lately in the Atlantic, which have probably created these storm swells, which have encountered each other from different directions in the open ocean.

The term Tidal Wave would seem to be inapplicable, as the occurrence is far removed from any shore lines likely to cause concentration of sea rollers.

W. G. BLACK, F.R.Met.Soc.

*Edinburgh, March 4th, 1901.*

[The term "Tidal Wave" is as dear to the journalist as its inspiring congener the "Electric Fluid," and is to be taken in a literary rather than a literal sense. In course of time it will become a curiosity of literature and vanish. We hope to publish next month a short article on storm waves by Mr. Vaughan Cornish.

ED. *S.M.M.*]

## CLIMATE OF PEMBA.

We are indebted to Mr. T. P. Newman, of Haslemere, for what we believe to be the first tables of the climate of Pemba ever published. Pemba is one of the most out-of-the-world places on the coast of Africa, forming, together with the larger island of Zanzibar, that portion of the British East Africa Protectorate still nominally under the rule of the Sultan of Zanzibar. It lies near the equator; the position of Banani being approximately 5° 15′ S., 39° 43′ E., and its altitude apparently less than 50 feet above sea-level.

Mr. Newman accompanies the tables by the following remarks :—

Mr. Theodore Burtt, a missionary of the Society of Friends, engaged in teaching the emancipated slaves to earn a living on his clove plantations at Banani on the little island of Pemba, sends the records of temperature and rainfall given below. He writes, under date of 29th January, 1901 :—

"The past year has been showery, with more cloud, though the rainfall was less, as we have not had such violent storms as in May, 1899.

"On one day about last Christmas-time the black bulb thermometer (Hicks') stood at 172° in the sun, and to-day it shows 175°. I am trying to do a little botanical work, but the specimens will not dry. Two months ago I hung a creeper on my office wall in a dry airy place; just now it is sending out long roots, hoping to find the earth somewhere, but it will not dry or die."

The two rainy seasons are well marked—the greater in March, April and May, and the less in November, December and January. No other meteorological record is kept on Pemba.

*Meteorological Observations at Banani, Island of Pemba.*

| 1899. | Mean Max. | Mean Min. | Absolute Max. | Absolute Min. | Rainy Days. | Rainfall. |
|---|---|---|---|---|---|---|
| | ° | ° | ° | ° | | in. |
| January | 85·3 | 72·6 | 91·0 | 70·0 | 5 | 1·53 |
| February | 86·5 | 73·4 | 90·0 | 72·0 | 1 | ·01 |
| March | 86·3 | 72·6 | 91·5 | 69·5 | 16 | 12·36 |
| April | 84·0 | 72·7 | 87·5 | 67·0 | 19 | 16·09 |
| May | 77·2 | 68·5 | 82·0 | 68·0 | 26 | 58·16 |
| June | 78·1 | 67·4 | 81·0 | 66·0 | 22 | 4·77 |
| July | 77·9 | 66·8 | 80·0 | 65·0 | 21 | 3·70 |
| August | 79·9 | 67·0 | 80·5 | 66·0 | 11 | ·88 |
| September | 82·3 | 67·8 | 85·0 | 66·0 | 3 | ·29 |
| October | 85·3 | 69·2 | 88·0 | 67·5 | 1 | ·02 |
| November | 86·6 | 71·6 | 90·5 | 69·5 | 8 | 3·03 |
| December | 90·3 | 73·0 | 92·0 | 70·0 | 16 | 4·40 |
| Year | 83·3 | 70·2 | 92·0 | 65·0 | 149 | 105·24 |

*Meteorological Observations at Banani, Island of Pemba.*

| 1900. | Mean Max. | Mean Min. | Absolute. | | Rainy Days. | Rainfall. |
|---|---|---|---|---|---|---|
| | | | Max. | Min. | | |
| | ° | ° | ° | ° | | in. |
| January | 86·8 | 73·2 | 94·0 | 70·0 | 14 | 8·20 |
| February | 89·2 | 73·3 | 95·0 | 70·0 | 8 | 4·13 |
| March | 86·7 | 73·5 | 94·0 | 70·0 | 16 | 9·12 |
| April | 85·1 | 73·4 | 89·0 | 70·5 | 17 | 14·44 |
| May | 80·9 | 72·0 | 84·0 | 70·0 | 22 | 24·77 |
| June | 80·2 | 70·1 | 83·0 | 68·0 | 13 | 2·33 |
| July | 79·2 | 68·7 | 80·0 | 67·0 | 11 | 1·06 |
| August | 79·4 | 68·0 | 81·0 | 66·0 | 8 | 1·08 |
| September | 82·0 | 69·0 | 85·0 | 68·0 | 4 | 1·21 |
| October | 83·5 | 70·5 | 87·0 | 69·0 | 11 | 2·51 |
| November | 84·5 | 71·6 | 88·0 | 66·0 | 12 | 5·93 |
| December | 84·7 | 72·6 | 90·0 | 71·0 | 24 | 15·57 |
| Year | 83·5 | 71·3 | 95·0 | 66·0 | 160 | 90·35 |

## THE SCOTTISH METEOROLOGICAL SOCIETY.

THE half-yearly general meeting of this Society was held in Edinburgh, on March 21st, when the report of the Council on the year's work was read. The principal work carried on in the office of the Society was the discussion of the storms recorded by the lighthouse-keepers round the coast, during the last twenty years, and the tabulating of the hourly readings at Ben Nevis and Fort William observatories. Dr. Buchan and Mr. Omond will be mainly occupied for the greater part of the present year in the study of the records of high-level observatories in Europe, in comparison with those of Ben Nevis, and in relation to weather changes.

Dr. A. Buchan, F.R.S., read a paper on the Storms of Scotland from 1881 to 1900, as recorded at the lighthouses. The curve of the frequency of storms was shown to follow the sun, December having a maximum, and June a minimum, of storms, while the equinoxes were periods of great change. A discussion followed the paper, in which Dr. Cargill G. Knott, and Mr. H. M. Cadell took part.

Mr. R. T. Omond read a paper on the Utilisation of the High Level Meteorological Observations of Europe, referring to the fact that the number of high level stations is being considerably increased, and that efforts are now being made to construct isobaric charts for various levels, for comparison with those at sea-level. He laid stress on the importance of establishing a high-level observatory in Norway or Sweden, most of those at present at work being situated in the centre or south of Europe. He believed that the next advance in weather forecasting would be made by connecting the sequence of meteorological changes at high levels with those occurring at the surface of the ground.

## REVIEWS AND BOOKS RECEIVED.

*Lehrbuch der Meteorologie von* DR. JULIUS HANN. *Lieferungen*, 1, 2, 3, Leipzig, C. H. Tauchnitz. 1901. Size 10 × 7. Pp. 240. Plates.

WE merely wish, at present, to congratulate Dr. Hann on the appearance of the first three parts of his great treatise on Meteorology, a work which all meteorologists will welcome as the latest authoritative treatise on the science. When the book is complete we shall give our readers a summary of its contents. Meanwhile we promise ourselves much pleasure and profit in the study of Dr. Hann's conclusions.

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*The Distribution of Rainfall over the Land*, by ANDREW J. HERBERTSON, Ph.D., F.R.S.E. With thirteen maps and a plate. London. John Murray, 1901. Size, 9½ × 6, pp. 70. Price 5s.

THE Royal Geographical Society has published, as a special memoir, this collection of monthly rainfall maps of the land of the globe, with descriptive text. Dr. Herbertson has been bold in attacking a problem the importance of which cannot be questioned, but the available data for which are so sparse and unequal as to deter most meteorologists who might have contemplated it from going further. That the difficulties of the case presented themselves to the author, we cannot doubt, but we regret that he did not give them even more prominence in the discussion than he has done. There was a day when anything that appeared in a printed book appealed to mankind as almost necessarily true. That time has passed, but there still lingers a similar superstition with regard to maps. The smoothly-spread tints on Mr. Bartholomew's beautiful maps which illustrate the memoir, certainly do not in themselves suggest that the information they have to convey varies from point to point between reasonable accuracy and pure guess-work. But with this caution established firmly in his mind, the student will find much that is full of interest and inspiration in the maps. Viewed qualitatively as a picture of the probable distribution of precipitation over the land in time and space, it would be difficult to over-estimate their value. They form a first approximation which supplies a basis for later workers to build upon. The usual system of augmentation, correction, and, it may be, refutation, will result in this case as it has resulted in others in the ultimate production of maps which will present a much closer approach to quantitative accuracy than is now possible.

In describing the conditions which are expressed cartographically on the maps, Dr. Herbertson treats not of countries or continents, but of zones, which he draws according to the dominating systems of winds. He treats the Earth's surface as divisible into (1) the Northern Storm Wind system, (2) the Southern Storm Wind system, and (3) the Steady Wind system of low latitudes, including the region of the trade winds and the equatorial belt of calms. For each

of these areas he discusses the climate of the month, and points out the peculiarities of rainfall which it presents.

In referring to the area of maximum precipitation sometimes occurring on the leeward side of a barrier of high land, Dr. Herbertson hardly succeeds in making it plain that this is an effect common amongst hills rather than mountains. Where the mountain barrier is high and snow-clad, we doubt if the maximum precipitation is ever found on the leeward slope. In the case of hills even as high as those of the English Lake District, it no doubt very frequently does so.

The data used for compiling the maps are referred to at considerable length. *British Rainfall* forms a somewhat conspicuous omission, but the data for the British Islands were drawn indirectly from that source.

We consider that Dr. Herbertson has rendered a marked service to climatology by the publication of this memoir.

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*The Eclipse Cyclone and the Diurnal Cyclones, by* H. HELM CLAYTON. *Being Vol.* **43**. *Pt. I. of the Annals of the Astronomical Observatory of Harvard College.* Cambridge, Mass. 1901. Size $11\frac{1}{2} \times 9\frac{1}{2}$. Pp. 34. Diagrams.

THIS important paper is one of the special studies carried out at the Blue Hill Meteorological Observatory, under the direction of Mr. A. L. Rotch. It is the completest discussion yet made as to the meteorological effects of a solar eclipse. Not only was the fall and recovery of temperature recorded at many places, but the barometric movements and the winds were also observed over a wide area. As the result Mr. Clayton is convinced that a cold-air cyclone is developed by the fall of temperature during the eclipse, that this cyclone is developed and dissipated with remarkable rapidity, and that it does not drift with the atmosphere, but follows its originating cause over the Earth's surface at the rate of 2000 miles an hour. Mr. Clayton then applies these data to the diurnal heating and cooling of the Earth, which, he believes, produce a warm-air cyclone during the day, and a cold-air cyclone during the night. This theory would account fully for the puzzling phenomenon of the double daily maximum and minimum of atmospheric pressure.

This fascinating theory will, we hope, be fully discussed; but meanwhile we confess to some difficulty in grasping the idea of a cold-air cyclone, especially since Mr. Clayton says on p. 15, "Ferrel maintains, from theoretical considerations, that cyclones necessarily have an inner area of low pressure, surrounded by a ring of high pressure . . . ," and lower down on the same page he quotes Ferrel's words: "The centre of a cyclone with a cold centre may, or may not, have a minimum pressure, according to circumstances." And the diagrams of wind round the eclipse centre seem to show a circulation outwards from the centre in the same direction as in an

ordinary anti-cyclone. It is probably merely a question of terminology, and the "moving anti-cyclones" of Australia may be the "cold-air cyclones" of America.

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*Hourly Means of the Readings obtained from the Self-recording Instruments at the five Observatories under the Meteorological Council*, 1897. *Published by the authority of* THE METEOROLOGICAL COUNCIL. London. Printed for His Majesty's Stationery Office. 1901. Size 12 × 10, pp. xii.+240.

THIS volume contains the hourly and daily means for five-day periods and for the months and the year, of pressure, temperature (wet and dry bulb), wind and rain, with duration of sunshine, for Valencia, Falmouth, Kew, Fort William and Aberdeen.

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*Lui Stefan C. Hepites. Manifestatiune cu ocasiunea Jumătăteĭ de veac a vîrsteĭ sale* 5/17 *Februarie*, 1851—5/18 *Februarie*, 1901. Bucuresci, F. Göbl Fii, 1901. Size 12 × 9. Pp. 58.

THIS interesting tribute to the labours of Professor Hepites contains the text of the various letters of congratulation addressed to him on his fiftieth birthday, together with a portrait. It is a remarkable piece of typography, an art in which the Rumanians excel.

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Meteorological Notes and Remarks upon the Weather during the year 1900, with its general effects upon vegetation, by JAMES WHITTON, Superintendent of Parks, Glasgow. Glasgow. Printed by Robert Anderson. 1901. Size $8\frac{1}{2} \times 7\frac{1}{2}$. Pp. 20.

Meteorologisch Jaarboek voor 1898. Uitgegeven door het Koninklijk Nederlandsch Meteorologisch Institut. 50te Jaargang. Utrecht. J. van Boekhoven, 1901. Size $8\frac{1}{2} \times 11$. Pp. 390+xxxii.

The annual report of the Weather Department of Holland.

Buletinul Lunar al Observatiunilor Meteorologice din Romania. Publicat de STEFAN C. HEPITES. Anul IX., 1900. Bucuresci, Eminescu. 1901. Size $12\frac{1}{2} \times 9\frac{1}{2}$. Pp. 168.

The annual report of the Weather Department of Rumania.

The Circulation of the Surface Waters of the North Atlantic Ocean, by H. N. DICKSON, Lecturer in Physical Geography in the University of Oxford. Reprint from the *Philosophical Transactions of the Royal Society of London. Series* A., *Vol.* **196**, pp. 61-203. Plates. London. Published for the Royal Society, 1901. Size 12 × 9. Price 10s. *To be reviewed.*

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## ADDITIONS TO TABLES FOR 1900.

ON account of the late date at which the monthly returns of observers are sometimes received, the Magazine occasionally has to go to press with gaps in the Climatological and Rainfall Tables, which detract from their permanent value.

The following are the omissions during 1900 which the receipt of the annual returns enables us to supply. The month cited is that of the observation; the blank will be found in the Magazine for the following month.

## RAINFALL AND TEMPERATURE AT 50 STATIONS, 1900.

| Div. | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1880-9. | Greatest Fall in 24 hours. Dpth | Date | Days on which ·01 or more fell. | TEMPERATURE Max. Deg. | Max. Date. | Min. Deg. | Min. Date. | No. of Nights below 32°. In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | inches | inches. | in. | | | | | | | | |
| | FEBRUARY. | | | | | | | | | | | |
| XX. | Broadford (Hurdlestown) | 3·31 | ... | ·60 | 8 | 18 | ... | ... | ... | ... | ... | ... |
| | MARCH. | | | | | | | | | | | |
| XII. | Cargen [Dumfries] | ·20 | —3·10 | ·12 | 27 | 2 | 54·0 | 11 | 19·0 | 18 | 18 | ... |
| | MAY. | | | | | | | | | | | |
| III. | Hitchin | ·99 | — ·96 | ·23 | 9 | 10 | 70·0 | 27 | 31·0 | 10 | 1 | ... |
| XIX. | Dunrobin | 1·85 | — ·33 | ·38 | 6 | 12 | 64·0 | 16 | 36·0 | 11 | ... | ... |
| | JUNE. | | | | | | | | | | | |
| VI. | Worcester (Diglis Lock). | 1·93 | — ·50 | ·51 | 12 | 17 | ... | ... | ... | ... | ... | ... |
| XIV. | Colmonell | 1·38 | ... | ·62 | 24 | 12 | 86·0 | 3 | 38·0 | 1 | ... | ... |
| | JULY. | | | | | | | | | | | |
| XVIII. | Glencarron Lodge | 5·64 | ... | ·98 | 5 | 28 | 67·1 | 15 | 40·0 | 31 | ... | ... |
| XX. | Broadford (Hurdlestown) | 2·13 | ... | ·44 | 19 | 17 | ... | ... | ... | .. | ... | ... |
| | AUGUST. | | | | | | | | | | | |
| XIX. | Dunrobin | 3·15 | + ·75 | 1·54 | 22 | 9 | 72·0 | 12 | 44·0 | 5 | ... | ... |
| | SEPTEMBER. | | | | | | | | | | | |
| XX. | Broadford (Hurdlestown) | 1·41 | ... | ·30 | 29 | 14 | ... | ... | ... | ... | ... | ... |
| XVI. | Loch Leven Sluices | 3·40 | + ·61 | 1·10 | 27 | 9 | ... | ... | ... | ... | ... | .. |
| | OCTOBER. | | | | | | | | | | | |
| XX. | Broadford (Hurdlestown) | 5·35 | ... | ·59 | 8 | 22 | ... | ... | ... | ... | ... | ... |
| | NOVEMBER. | | | | | | | | | | | |
| XVII. | Braemar | 3·34 | —1·24 | ·72 | 15 | 21 | 56·8 | 30 | 24·9 | 19 | 11 | 21 |
| XXII. | Clifden (Kylemore) | 6·40 | ... | ·96 | 14 | 22 | ... | ... | ... | ... | ... | ... |
| | DECEMBER. | | | | | | | | | | | |
| XV. | Mull (Quinish) | 11·33 | +3·76 | 1·25 | 18 | 27 | ... | ... | ... | ... | ... | ... |

## SUPPLEMENTARY TABLE OF RAINFALL, 1900.

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | JANUARY. | in. | | JUNE. | in. |
| II. | Alton, Ashdell | 3·86 | XI. | Lake Vyrnwy | 3·18 |
| VII. | Market Overton | 4·09 | XXII. | Collooney, Markree Obs. | 5·24 |
| XII. | Stoneykirk, Ardwell House | 3·63 | | JULY. | |
| XV. | Islay | 7·84 | XII. | New Galloway, Glenlee | 3·82 |
| XVIII. | S. Uist, Askernish | 7·88 | XIX. | Durness | 3·09 |
| XX. | Limerick, Kilcornan | 3·60 | XXIII. | Enniskillen, Model School. | 3·08 |
| XXIII. | Belturbet, Redhills | 2·70 | | AUGUST. | |
| | FEBRUARY. | | V. | Salisbury, Alderbury | 2·79 |
| IX. | Scalby, Silverdale | 5·51 | VI. | Wolverhampton, Tettenhall | 2·86 |
| XVIII. | Fearn, Lower Pitkerrie | ·85 | X. | Keswick, The Bank | 6·83 |
| ,, | S. Uist, Askernish | 2·70 | XIII. | N. Esk Res. [Penicuick] | 4·00 |
| XXII. | Crossmolina, Enniscoe | 3·75 | XX. | Limerick, Kilcornan | 3·30 |
| | MARCH. | | XXI. | Gorey, Courtown House | 4·52 |
| VII. | Market Overton | ·79 | XXIII. | Enniskillen, Model School. | 4·61 |
| | APRIL. | | | SEPTEMBER. | |
| XX. | Limerick, Kilcornan | 1·21 | II. | Dorking, Abinger Hall | ·96 |
| XXIII. | Enniskillen, Model School. | 2·67 | XXIII. | Enniskillen, Model School. | 2·29 |
| | MAY. | | | OCTOBER. | |
| XVI. | Blair Atholl | 3·22 | XXIII. | Enniskillen, Model School. | 6·00 |
| XVIII. | Aviemore, Alvie Manse | 2·38 | | NOVEMBER. | |
| XX. | Ballingarry, Hazelfort | 2·12 | XXIII. | Enniskillen, Model School. | 5·93 |
| ,, | Limerick, Kilcornan | ·90 | | | |
| XXIII. | Enniskillen, Model School. | 2·61 | | | |
| ,, | Belfast, Springfield | 3·10 | | | |

## ROYAL METEOROLOGICAL SOCIETY.

THE Monthly Meeting of this Society was held on March 20th, at the Institution of Civil Engineers, Westminster, Mr. W. H. Dines, B.A., the President, being in the chair.

The following Fellows were elected:—Mr. R. Anderson, Señor P. P. d'Andrade, Mr. E. B. Atkinson, Rev. J. Bufton, Mr. J. Davies, Mr. G. G. Dixon, Mr. P. Harbord, and Mr. A. E. M. Rolland.

The March meetings of the Society are generally of a popular or social character. Formerly, an Exhibition of Meteorological Instruments was held on the occasion, but of late years there has been either a Lecture or a Demonstration. This year, at the request of the Council, Dr. H. R. Mill, F.R.S.E., gave a lantern Lecture on "Climate and the effects of Climate."

The lecturer said that dealing as meteorologists do with air—a substance invisible and almost intangible—the discovery of the existence of which was a feat of human reason almost equal to that of the planetary nature of the Earth, it is inevitable that there is little to take the eye. Observations were made mainly by means of instruments, and whether the figures handled represented pressure, temperature, humidity, wind-force, rainfall, or any other element of meteorology, they themselves were as uninteresting, and perhaps not so stimulating to the untrained imagination, as the entries in a merchant's ledger. But when account was taken not of the phenomena of pure meteorology but of the effects they produce, the

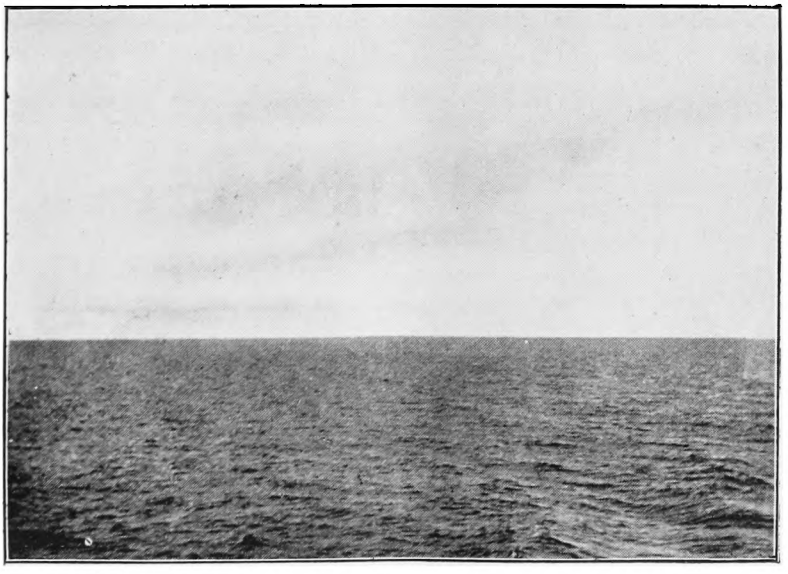

*Fig.* 1.—SMOKE SIMULATING CLOUD.

meteorologist entered on a part of his science of great general interest, and it was from that side that the subject would be treated.

Climatology was as much a branch of geography as of meteorology, in fact more, because it deals, in the first place, with the distribution of atmospheric conditions over the Earth's surface, which is a geographical question in itself; and because, in the second place, all the varieties of climate that give individuality to different countries are produced by the disturbing and controlling influence of the forms of the land. Visible effects could be photographed, and therefore the lecture would be illustrated by showing on the screen photographs which were taken by the lecturer on various holidays in many countries, reinforced by others obtained from friends. Perhaps it

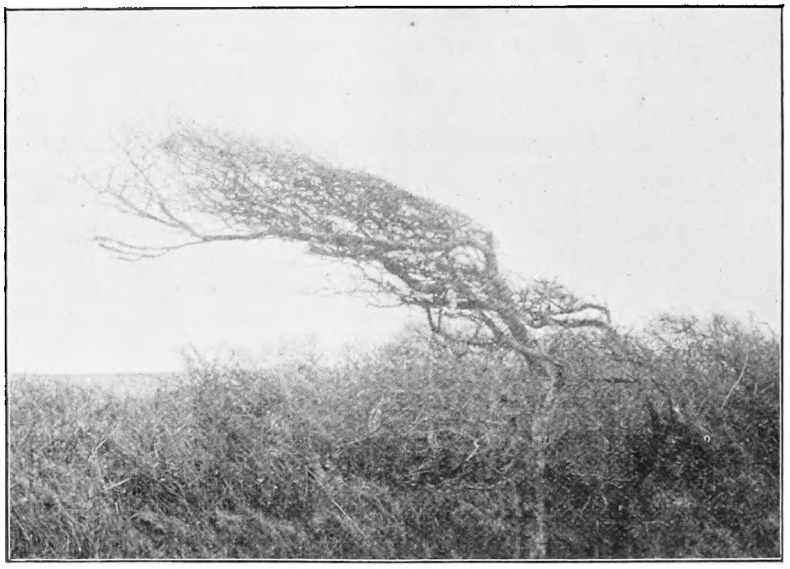

*Fig.* 2—TREE BENT BY PREVAILING WIND.

would be more correct to say that the series of seventy photographs suggested the subject of the lecture, which was an illustration addressed to the ear of what they conveyed to the eye.

In selecting typical climatic photographs care must be taken not to be misled by appearances of an origin different from what might be supposed. A photograph was shown (Fig. 1) which could hardly be distinguished from a typical stratus cloud, yet it consisted merely of wreaths of steamer smoke on a dead-calm cloudless summer day. Another phenomenon apparently meteorological, was the fine rainbow over Niagara Falls, the photograph of which was also taken on a cloudless day, although a raised umbrella in the foreground showed how the fine spray from the cataract simulated rain.

Climate might be defined as the normal or average condition of meteorological phenomena at a given place, in which case Weather

would have to be defined as the temporary disturbance of climate which actually occurred. On the other hand, Weather might be considered first, and defined as the condition of the atmosphere at any moment with regard to wind, warmth, cloud, electricity and precipitation; in that case Climate might fairly be called the average weather of a place. The latter was the practical way of approaching the question, the former the theoretical.

After a brief sketch of the climatic belts of the Earth and of the influence of land-forms on local climates, the lecturer pointed out the difference between the effects of climate and weather. As an example of the former he showed a photograph of a tree permanently bent from the perpendicular by the force of the prevailing wind

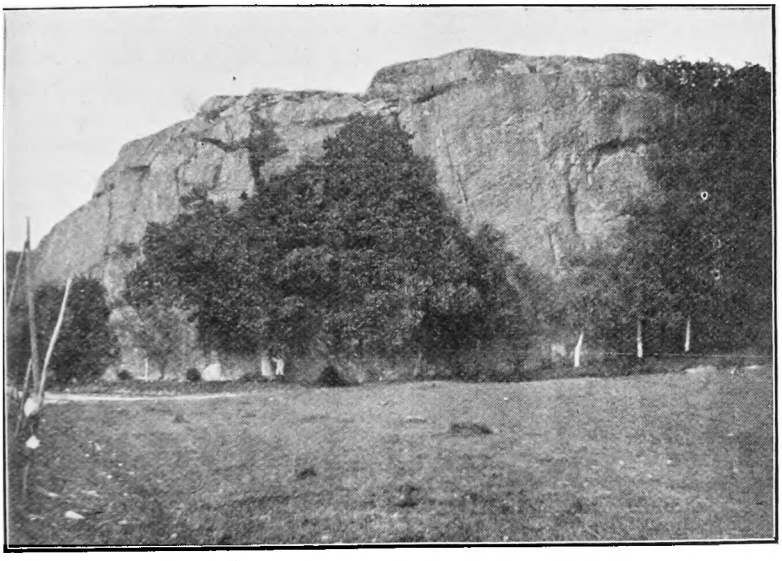

*Fig.* 3.—Trees on windward side of Cliff.

(Fig. 2)*, and demonstrating even to a passing traveller, the direction and force of the prevailing wind, a very important element of climate. Another photograph, taken by the lecturer in western Sweden (Fig. 3), showed how on a moorland, treeless on account of the sweep of the wind, large trees had established themselves on the windward face of the cliff, where the moving air was stopped and compelled to rise to get over the obstacle. The stems were flattened against the rock, and moulded to its surface. As an example of the effect of weather, a picture was shown of a forest where the trees had been uprooted and thrown down by a violent gale.

Similar effects on vegetation, and on the surface of the land, were illustrated for other elements of climate; and were followed by an account of the effects on human beings.

* This photograph was kindly taken for the occasion by Dr. A. Hardwick, of Newquay.

Among the most interesting effects of these were the adaptations of industrial processes, or dwellings, in order to take advantage of climatic conditions, or to mitigate their unpleasant features. Such, for instance, were the arcaded footways of southern towns, where shade was the first desideratum, the temporary roofs placed over the lemon gardens in northern Italy on a threatening of frost; the covered bridges of Tyrol, constructed to prevent the accumulation of snow on the wooden roadway; and the huge water-pipes which disfigured the finest buildings in St. Petersburg, but were required to carry off the great volume of water resulting from the sudden melting of the winter's snow on the roofs in spring. Special attention was given to the devices adopted by farmers in drying hay and other crops, in wet countries,—the stakes, fashioned like hat-stands, on which the hay was hung in northern Tyrol (Fig. 4); the vast frames, resembling the supports for wires on a telephone exchange, used for the same purpose in southern Tyrol, and the hurdles, arranged like fences, across the direction of the prevailing wind in Norway. A photograph of the last-mentioned device, taken in British Columbia, showed how similar methods might be employed in similar climates, even when the countries were widely separated. In every part of the world the climate depended on the position of a place in latitude, its distance from the ocean, and, above all, on the configuration of the land; and the climate in turn affected the life of plants and animals, and the habits and industries of mankind.

On the motion of Dr. C. Theodore Williams, seconded by Mr. Baldwin Latham, a vote of thanks was given to Dr. Mill.

*Fig.* 4.—Hay-drying in Northern Tyrol.

## METEOROLOGICAL NEWS AND NOTES.

THE REV. JOHN M. BACON describes in *Knowledge* for March his experience of the thunderstorm of July 27th, 1900, as observed from a balloon. He ascended from Newbury at 5.45 p.m., the weather at the time being clear, and at an elevation of 700 feet the balloon was being carried by the wind due west at 40 miles an hour, while a thunderstorm came up from the west travelling exactly in the opposite direction, but with a speed that was not determined. The temperature of the air fell suddenly, and a stinging shower of hail was felt simultaneously with the complete envelopment of the balloon in a thunder-cloud in which vivid flashes of lightning appeared, followed by short, sharp detonations of thunder without any of the reverberation which adds so much to the effect of a thunder peal when heard on the surface of the ground. The balloon was not struck, and no harm befel the aëronaut.

DR. J. VAN BEBBER describes in a recent number of *Das Wetter* the reorganization of the weather telegraphy system in Germany, in consequence of which direct messages are sent to the German Naval Observatory at Hamburg every morning at 8 a.m., Central European Time, from a large number of German, British and other European stations, for the preparation of the German weather forecasts. So successfully has this system worked that the distinguished German meteorologist is anxious to introduce a general Weather Service for Europe based on that of the United States, which has to deal with an approximately equal area. In the United States the circuit-system of weather telegraphy is employed, by means of which a telegram containing information from one terminal forecasting station to another is read as it passes through each of the intermediate telegraph offices, from which information may be at once conveyed to the nearest intermediate forecasting centres. But in Europe it is pointed out that a different method of telegraphy is employed, which does not admit of the transcription of passing messages, so that the circuit-system could not be adopted without great waste of time. Dr. van Bebber therefore proposes to introduce a radial system of weather telegraphy for Europe, and offers to receive at Hamburg all the observations for forecasts from every country in Europe, and after discussion to disseminate the results to all the various centres of publication. We presume that the proposal is not to make all the local forecasts at Hamburg, but to send in one telegram to each of the national Weather Offices a complete statement of the data, from which these offices will construct their own charts and forecasts. The proposal was discussed at the International Meteorological Congress at Paris last year, but without convincing the other delegates of the practicability or desirability of this somewhat sweeping reconstruction.

THE DEPERDITOMETER is a new instrument, or rather it will be a new instrument if the suggestion put forth in the *Bulletin Mensuel*

*de l'Observatoire Carlier* for January last is ever realized, for comparing climates according to their effect upon human beings. It is proposed to fill a porous cell, covered with animal membrane, with distilled water maintained at a temperature of 98°·6, the normal temperature of the body, by means of an automatic regulator controlling a gas jet. The amount of heat abstracted from the cell will be measured by determining the quantity of gas burned in order to maintain the normal temperature. If this ingenious idea can be carried out, it will give readings which combine the effect of temperature and humidity; but there is a flaw in the argument of the anonymous inventor, because the porous cell becomes a wet-bulb thermometer and will lose most heat when the air is driest, whereas it is well known that the sensation of cold in the human subject is most felt when the air is laden with moisture.

MR. H. H. KIMBALL, of the U.S. Weather Bureau, gives in the *Monthly Weather Review* for November, 1900 (published January 19th), an important paper on Rainfall from convectional currents. The maximum falls in short periods recorded in the United States are given as at the rate of 2·55 in. per hour for 60 minutes, 7·08 in. per hour for 10 minutes, and 9·00 in. per hour for 5 minutes. The origin of this prodigious amount of water in the atmosphere over any given place is the problem considered. After discussing the rate of reduction of temperature by the expansion of an ascending current of air, Mr. Kimball came to the conclusion that a continual current of air ascending at the rate of 12 or 13 miles an hour would account for the heaviest local rains which have been observed.

PARTICULARS of the remarkable falls of red rain in Sicily and over a great part of Italy and Austria have now been received, and there is no room for doubt that they were simply due to desert sand from the Sahara, raised high into the air, carried northward by the wind, and deposited with or without rain. In a letter to *Nature* of March 28th, Professor J. W. Judd describes the composition of some of the dust, which consisted mainly of particles of quartz and other minerals with an admixture of frustules of fresh-water diatoms. The specimens were sent by Professor A. W. Rücker, who happened to be in Sicily at the time, and observed the phenomenon on March 10th and again on March 20th. On the latter occasion he made a rough measurement which showed that on the marble-topped tables on the terrace of his hotel the fall of dust was at the rate of $5\frac{1}{2}$ tons per square mile. Mr. Silva White, writing to the *Scottish Geographical Magazine* for April, describes the phenomenon of March 10th in the island of Capri. It reminded him of the sand storms he had experienced in the Egyptian desert and the Sudan, only on this occasion the sand-clouds were high overhead, and it was only when the temperature fell at night, that sand and rain came down together, covering the whole island with a light deposit.

MR. J. Y. BUCHANAN, F.R.S., is announced to give a course of three lectures at the Royal Institution, on Climate, its Causes and its Effects, commencing on April 20th.

THE "DISCOVERY," the first ship ever built in this country exclusively for exploration and scientific investigation, was successfully launched at Dundee on March 21st, for the British National Antarctic Expedition; and the similar vessel of the German Antarctic Expedition, the "*Gauss*," was launched at Kiel a few days later. No science is so sure of important results arising from these expeditions as is meteorology, for many indications point to the unknown Antarctic area as that within which the most important climatological discoveries are likely to be made. The equipment of both expeditions for meteorological observations will be exceptionally complete.

MR. ALEXANDER G. MCADIE, of the U.S. Weather Bureau, is to be congratulated on the exquisite photographs of mountain fogs which illustrate his interesting article on "Fog Studies on Mount Tamalpais," in the November number of the *Monthly Weather Review*. The view of fog waves is particularly striking on account of its marvellous resemblance to the waves of a stormy sea.

THE MONTHLY WEATHER REVIEW, the official organ of the United States Weather Bureau, is the largest serial publication devoted to meteorology, and under the distinguished editorship of Professor Cleveland Abbe, it has become much more than a record of the weather of the United States. The last number we have received, that for December, 1900 (published on February 19th), illustrates the attention now being paid in America to theoretical questions bearing on the dynamics of the atmosphere. A translation is given of a second mathematical paper by Professor Bjerknes on "The circulatory movements in the atmosphere," followed by an original supplementary treatise on "Line integrals in the atmosphere," by Professor F. H. Bigelow, in which he shows the importance of the higher mathematical methods in discussing masses of data from which rules for practical weather-forecasting may be deduced. While these papers are only to be studied by the mathematician, the ordinary reader will find a very sane discussion of the unpractical and useless speculations as to whether there are people in Mars, and the Editor's Notes are interesting and of wide range. In a note on Arctic and Antarctic Meteorological Observers, however, he greatly overestimates the number of expeditions which are likely to be exploring the polar seas this year.

IN ONE of the letters of congratulation to Prof. S. C. Hepites on his fiftieth birthday, the Rumanian compositor transposed two letters of a German word, changing "fruchtbaren Forscher" into "furchtbaren Forscher." The result was that the head of the Rumanian Weather Service was hailed as a "frightful" instead of a "fruitful" investigator.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, OCTOBER, 1900.

| STATIONS. (*Those in italics are South of the Equator.*) | Absolute. | | | | Average. | | | | Absolute. | | Total Rain. | | Aver. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum. | | Minimum. | | | | | | | | | | |
| | Temp. | Date. | Temp. | Date. | Max. | Min. | Dew Point. | Humidity. | Max. in Sun. | Min. on Grass. | Depth. | Days. | Cloud. |
| | ° | | ° | | ° | ° | ° | 0-100 | ° | ° | inches | | |
| London, Camden Square | 73·8 | 8 | 34·2 | 16 | 59·3 | 44·4 | 44·7 | 78 | 111·2 | 26·7 | 1·86 | 15 | 5·4 |
| Malta | 91·3 | 23 | 60·3 | 31 | 81·7 | 67·3 | 64·9 | 78 | 139·4 | 51·2 | ·60 | 1 | 2·8 |
| *Cape of Good Hope* | 82·1 | 4 | 42·6 | 7 | 67·2 | 51·9 | 52·0 | 74 | ... | ... | 2·56 | 9 | 4·5 |
| *Mauritius* | 79·7 | 13 | 60·9 | 22 | 77·6 | 65·8 | 61·3 | 72 | 146·7 | 54·0 | 1·59 | 15 | 5·6 |
| Calcutta | 92·4 | 13 | 66·0 | 31 | 88·5 | 74·4 | 71·9 | 74 | 147·8 | 60·5 | ·82 | 4 | 4·4 |
| Bombay | 92·9 | 25 | 72·5 | 22 | 88·4 | 76·0 | 72·8 | 74 | 144·5 | 62·4 | ·00 | 0 | 2·1 |
| Colombo, Ceylon | 92·2 | 8 | 72·6 | 29 | 89·1 | 75·4 | 74·3 | 82 | 151·0 | 70·5 | 9·47 | 17 | 5·2 |
| *Melbourne* | 86·1 | 17 | 38·1 | 6 | 66·4 | 47·5 | 45·2 | 70 | 144·0 | 33·0 | 1·28 | 11 | 5·8 |
| *Adelaide* | 91·5 | 26 | 40·8 | 13 | 73·5 | 52·5 | 46·2 | 96 | 156·3 | 36·1 | ·65 | 7 | 4·8 |
| *Sydney* | 97·3 | 20 | 45·4 | 14 | 74·6 | 54·9 | 47·9 | 57 | 145·0 | 40·0 | ·59 | 9 | 3·5 |
| *Wellington* | 66·5 | 3 | 39·0 | 1 | 60·2 | 49·8 | 45·0 | 71 | 125·0 | 30·0 | 4·40 | 19 | 5·0 |
| *Auckland* | 67·5 | 16 | 46·0 | 1 | 63·4 | 52·8 | 47·0 | 67 | 140·0 | 43·0 | 5·08 | 22 | 7·1 |
| Jamaica, Halfway Tree | 90·0 | 18 | 68·0 | 25 | 86·8 | 71·1 | 70·9 | 81 | ... | ... | 2·09 | 10 | 3·7 |
| Trinidad | 98·0 | 8 | 70·0 | *a* | 89·2 | 72·8 | 73·8 | 79 | 165·0 | 56·0 | 6·53 | 16 | ... |
| Grenada | 91·5 | 4 | 70·0 | 17 | 85·6 | 74·9 | 72·9 | 73 | 155·0 | ... | 5·23 | 21 | 4·3 |
| Toronto | 83·0 | 6 | 25·9 | 17 | 66·0 | 46·7 | 51·9 | 83 | 97·6 | 20·0 | 2·12 | 8 | 5·5 |
| Fredericton New Brunswick, | 74·8 | 4 | 18·4 | 20 | 58·8 | 39·0 | 40·3 | 72 | ... | ... | 10·62 | 12 | 6·1 |
| Winnipeg, Manitoba | 68·5 | 19 | 23·0 | 24 | 56·8 | 35·3 | ... | 82 | ... | ... | ·94 | 10 | 5·1 |
| Victoria, British Columbia | 64·0 | 8 | 38·2 | 6 | 55·1 | 45·2 | .. | ... | ... | ... | 2·68 | 18 | 7·4 |

*a*—on 7 days.

### REMARKS.

MALTA.—Mean temp. of air 72°·8, or 3°·4 above average. Mean hourly velocity of wind 8·1 miles, or 0·8 below average. Mean temp. of sea 76°·3. TSS on 8th and 9th. J. F. DOBSON.

*Mauritius.*—Mean temp. of air 0°·4, and of dew point 0°·5, and rainfall ·01 in. below, their respective averages. Mean hourly velocity of wind 10·5 miles, or 0·6 mile below average; extremes, 25·0 on 17th and 1·7 on 15th; prevailing direction E.S.E. T. F. CLAXTON.

COLOMBO, CEYLON.—Mean temp. of air 1°·2 above, of dew point 1°·4 above, and rainfall 5·05 in. below, their respective averages. Mean hourly velocity of wind 6·2 miles; prevailing direction S.W. to N.W. TSS on 4 days; L was seen on 7 days. H. O. BARNARD.

*Adelaide.*—Mean temp. of air 1°·0 above average. Rainfall very deficient, 1·13 in. below average. The whole country was suffering from a dry spell. C. TODD, F.R.S.

*Sydney.*—Mean temp. of air 1°·3 above, humidity 11·0 per cent. below, and rainfall 2·21 in. below, their respective averages. H. C. RUSSELL, F.R.S.

*Wellington.*—Mean temp. of air 1°·4 above, and rainfall ·03 in. above, their respective averages. Showery and unsettled weather generally; prevailing N.W. wind and frequent storms. T on 22nd; fog on 24th. Earthquake on 16th at 10.50 p.m., very slight, E. and W.; and on 21st at 9.32 p.m., very slight. R. B. GORE.

*Auckland.*—Mean temp. of air slightly above, and rainfall 1·75 in. above, their respective averages. Very stormy and disagreeable throughout the month. T. F. CHEESEMAN.

TRINIDAD.—Rainfall ·14 in. below the 30 years' average. J. H. HART.

FREDERICTON, NEW BRUNSWICK.—On 10th and 11th 7·04 in. of rain fell. R. F. STUPART.

# SUPPLEMENTARY TABLE OF RAINFALL, MARCH, 1901.

| Div | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| I. | Uxbridge, Harefield Pk.. | 1·65 | XI. | Castle Malgwyn ..... | 4·94 |
| II. | Dorking, Abinger Hall . | 2·35 | ,, | Builth, Abergwesyn Vic. | 7·81 |
| ,, | Birchington, BeresfordLge. | 1·82 | ,, | Rhayader, Nantgwillt ... | 6·98 |
| ,, | Hailsham ..... | 2·34 | ,, | Lake Vyrnwy ..... | 6·36 |
| ,, | Crowborough..... | 2·19 | ,, | Corwen, Rhug ..... | 4·76 |
| ,, | Ryde, Thornbrough ..... | ... | ,, | Criccieth, Talarvor ..... | 2·72 |
| ,, | Emsworth, Redlands ... | 2·56 | ,, | I. of Anglesey, Lligwy.. | 3·54 |
| ,, | Alton, Ashdell ..... | 2·85 | ,, | I. of Man, Douglas ..... | 2·66 |
| ,, | Newbury, Welford Park | 1·94 | XII. | Stoneykirk, ArdwellHo. | 2·68 |
| III. | Oxford, Magdalen Coll.. | 1·41 | ,, | New Galloway, Glenlee | 2·48 |
| ,, | Banbury, Bloxham ..... | 2·04 | ,, | Moniaive, MaxweltonHo. | 2·49 |
| ,, | Pitsford, Sedgebrook ... | 2·10 | ,, | Lilliesleaf, Riddell ..... | 1·80 |
| ,, | Huntingdon, Brampton. | 2·45 | XIII. | N. Esk Res. [Penicuick] | 2·90 |
| ,, | Wisbech, Bank House... | 1·90 | XIV. | Glasgow, Queen's Park.. | 2·20 |
| IV. | Southend ..... ..... | 1.82 | XV. | Inveraray, Newtown ... | 4·07 |
| ,, | Colchester, Lexden ..... | 1·54 | ,, | Ballachulish, Ardsheal... | 3·26 |
| ,, | Saffron Waldon, Newport | 2·46 | ,, | Islay, Eallabus..... | 2·83 |
| ,, | Rendlesham Hall ..... | 1·91 | XVI. | Dollar..... | 2·38 |
| ,, | Swaffham ..... | 1·70 | ,, | Balquhidder, Stronvar... | 5·26 |
| V. | Salisbury, Alderbury ... | 1·87 | ,, | Coupar Angus Station... | 2·09 |
| ,, | Bishop's Cannings ..... | 2·34 | ,, | Blair Atholl ... ..... | 2·16 |
| ,, | Blandford, Whatcombe . | 2·35 | XVII. | Keith H.R.S..... | 2·50 |
| ,, | Ashburton, Druid House | 5·00 | ,, | Forres H.R.S. ... ..... | 1·63 |
| ,, | Okehampton, Oaklands. | 5·08 | XVIII. | Fearn, Lower Pitkerrie.. | 1·49 |
| ,, | Hartland Abbey ..... | 2·48 | ,, | S. Uist, Askernish ..... | ... |
| ,, | Lynton, Glenthorne ... | ... | ,, | Invergarry..... | 1·64 |
| ,, | Probus, Lamellyn ..... | 3·21 | ,, | Aviemore, Alvie Manse. | 1·09 |
| ,, | Wellington, The Avenue | 3·20 | ,, | Loch Ness, Drumnadrochit | 3·40 |
| ,, | North Cadbury Rectory | 2·28 | XIX. | Invershin ..... | 3·58 |
| ,, | Clifton, Pembroke Road | 2·94 | ,, | Durness..... | 3·04 |
| VI. | Ross, The Graig ..... | 2·19 | ,, | Watten H.R.S..... | 1·87 |
| ,, | Wem, Clive Vicarage ... | 2·36 | XX. | Dunmanway, Coolkelure | 6·82 |
| ,, | Wolverhampton, Tettenhall | 2·08 | ,, | Cork, Wellesley Terrace | 3·30 |
| ,, | Cheadle, The Heath Ho. | 2·46 | ,, | Killarney, District Asyl. | 4·84 |
| ,, | Coventry, Priory Row... | 1·86 | ,, | Caher, Duneske ..... | 2·86 |
| VII. | Market Overton ..... | 1·70 | ,, | Ballingarry, Hazelfort... | 1·98 |
| ,, | Grantham, Stainby ..... | 1·13 | ,, | Limerick, Kilcornan ... | ... |
| ,, | Horncastle, Bucknall ... | ·92 | ,, | Miltown Malbay ..... | 3·34 |
| ,, | Worksop, Hodsck Priory | 1·90 | XXI. | Gorey, Courtown House | 1·79 |
| VIII. | Neston, Hinderton ..... | 1·42 | ,, | Moynalty, Westland ... | 3·40 |
| ,, | Southport, Hesketh Park | 2·66 | ,, | Athlone, Twyford ..... | 3·51 |
| ,, | Chatburn, Middlewood. | 3·31 | ,, | Mullingar, Belvedere ... | 3·48 |
| ,, | Duddon Val., Seathwaite Vic. | 5·19 | XXII. | Woodlawn ..... | 3·29 |
| IX. | Melmerby, Baldersby ... | 2·48 | ,, | Crossmolina, Enniscoe .. | 4·17 |
| ,, | Scalby, Silverdale ..... | 2·97 | ,, | Collooney, Markree Obs. | 3·65 |
| ,, | Ingleby Greenhow Vic.. | 2·72 | XXIII. | Enniskillen, Model Sch. | 3·29 |
| ,, | Middleton, Mickleton ... | 2·12 | ,, | Warrenpoint..... | 2·96 |
| X. | Haltwhistle, Unthank H. | ... | ,, | Miltown, Banbridge..... | 2·15 |
| ,, | Bamburgh ..... | 1·85 | ,, | Belfast, Springfield ..... | 3·26 |
| ,, | Keswick, The Bank ..... | ... | ,, | Bushmills, Dundarave.. | 2·46 |
| XI. | Llanfrechfa Grange ..... | 3·14 | ,, | Stewartstown ..... | 2·91 |
| ,, | Treherbert, Tyn-y-waun | 5·92 | ,, | Killybegs ..... | 5·46 |
| ,, | Llandovery ..... | 4·51 | ,, | Horn Head ..... | 2·93 |

# MARCH, 1901.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1890-9. | Greatest Fall in 24 hours. Dpth | Greatest Fall in 24 hours. Date | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Max. Date | Min. Deg. | Min. Date. | No. of Nights below 32°. In shade. | No. of Nights below 32°. On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches. | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | 2·14 | + ·68 | ·60 | 30 | 16 | 55·2 | 4, 5 | 23·2 | 29 | 9 | 18 |
| II. | | Tenterden ..... | 1·87 | + ·18 | .45 | 7 | 17 | 53·0 | 1 | 24·0 | 26*e* | 5 | 13 |
| ,, | | Hartley Wintney ..... | 1·86 | + ·30 | ·37 | 2 | 16 | 55·0 | 1*b* | 23·0 | 28 | 11 | 17 |
| III. | | Hitchin ..... | 2·65 | + 1·21 | ·49 | 30 | 18 | 53·0 | 5 | 23·0 | 26 | 17 | ... |
| ,, | | Winslow (Addington) ..... | 1·96 | + ·44 | ·44 | 19 | 14 | 55·0 | 5*c* | 20·0 | 27*a* | 14 | 20 |
| IV. | | Bury St. Edmunds (Westley) | 1·61 | — ·02 | ·30 | 7 | 18 | 55·0 | 5 | 21·0 | 27 | ... | ... |
| ,, | | Norwich (Brundall) ..... | 1·98 | ... | ·30 | 27 | 21 | 56·1 | 5 | 25·5 | 29 | 9 | 17 |
| V. | | Winterbourne Steepleton ... | 2·65 | ... | ·61 | 20 | 18 | 55·3 | 12 | 20·8 | 29 | 11 | 14 |
| ,, | | Torquay (Cary Green) ... ..... | 4·75 | ... | 2·31 | 20 | 20 | 54·3 | 12 | 25·5 | 28 | 5 | 10 |
| ,, | | Polapit Tamar [Launceston].. | 3·88 | + 1·60 | ·78 | 20 | 17 | 55·0 | 13 | 20·3 | 29 | 14 | 17 |
| VI. | | Stroud (Upfield) ..... | 2·51 | + ·83 | ·48 | 19 | 15 | 54·0 | 5 | 25·0 | 25*f* | 10 | ... |
| ,, | | Church Stretton (Woolstaston) | 4·08 | + 2·31 | 1·31 | 30 | 18 | 55·0 | 12 | 20·5 | 26 | 12 | 22 |
| ,, | | Worcester (Diglis Lock) ..... | 2·39 | + 1·05 | ·42 | 5 | 15 | ... | ... | ... | ... | ... | ... |
| VII. | | Boston ..... | 1·50 | + ·31 | ·45 | 19 | 15 | 49·0 | 31 | 22·0 | 26 | 19 | ... |
| ,, | | Hesley Hall [Tickhill]..... | 1·41 | + ·01 | ·43 | 29 | 18 | 53·0 | 12 | 20·0 | 29 | 12 | ... |
| ,, | | Derby (Midland Railway)..... | 1·92 | + ·50 | ·35 | 29 | 18 | 55·0 | 12 | 21·0 | 29 | 9 | ... |
| VIII. | | Manchester (Plymouth Grove) | 2·15 | + ·08 | ·45 | 4 | 12 | 60·0 | 13 | 21·0 | 28 | 9 | 12 |
| IX. | | Wetherby (Ribston Hall) ... | 1·85 | + ·22 | ·65 | 29 | 18 | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) ..... | 5·63 | + ·51 | 1·33 | 29 | 18 | ... | ... | ... | ... | ... | ... |
| ,, | | Hull (Pearson Park)..... ..... | 1·71 | + ·05 | ·34 | 29 | 18 | 53·0 | 12*b* | 21·0 | 26 | 14 | 23 |
| X. | | Newcastle (Town Moor) ..... | 1·51 | — ·43 | ·40 | 16 | 19 | ... | ... | ... | ... | ... | ... |
| ,, | | Borrowdale (Seathwaite)..... | 8·71 | + 1·95 | 2·55 | 4 | 14 | 55·5 | 13 | 20·2 | 29 | 11 | ... |
| XI. | WALES. | Cardiff (Ely)..... | 2·10 | — ·46 | ·34 | 29 | 12 | ... | ... | ... | ... | ... | ... |
| ,, | | Haverfordwest ..... | 3·26 | + ·52 | ·83 | 29 | 15 | 54·5 | 13 | 22·0 | 29 | 9 | 20 |
| ,, | | Aberystwith (Gogerddan) ... | 3·66 | + ·82 | ·80 | 30 | 14 | 58·0 | 12*d* | 16·0 | 25 | 14 | ... |
| ,, | | Llandudno..... | 2·61 | + ·67 | 1·05 | 29 | 16 | 56·0 | 13 | 27·5 | 29 | 5 | ... |
| XII. | SCOTLAND. | Cargen [Dumfries] ..... | 2·40 | — ·65 | ·76 | 30 | 8 | 55·0 | 13 | 16·0 | 29 | 11 | ... |
| XIII. | | Edinburgh (Royal Observatory) | 1·52 | ... | ·25 | 5 | 17 | 54·8 | 12 | 22·3 | 29 | 6 | 11 |
| XIV. | | Colmonell ..... | 1·60 | — 1·64 | ·38 | 2*a* | 10 | 55·0 | 12 | 18·0 | 25 | ... | ... |
| XV. | | Tighnabruaich ..... | 3·35 | ... | ·80 | 2 | 11 | 50·0 | 12*d* | 22·0 | 27 | 14 | ... |
| ,, | | Mull (Quinish)..... | 3·01 | — 1·16 | 1·28 | 5 | 17 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Leven Sluices ..... | 2·30 | — ·28 | ·69 | 31 | 10 | ... | ... | ... | ... | ... | ... |
| ,, | | Dundee (Eastern Necropolis) | 1·35 | — ·63 | ·30 | 2*a* | 14 | 58·3 | 10*c* | 18·8 | 29 | 9 | ... |
| XVII. | | Braemar ..... .. | 3·27 | + ·95 | ·58 | 1 | 21 | 50·1 | 10 | 1·0 | 29 | 23 | 28 |
| ,, | | Aberdeen (Cranford) ... ..... | 2·21 | + ·01 | ·38 | 1 | 21 | 63·0 | 10 | 10·0 | 28 | 21 | ... |
| ,, | | Cawdor (Budgate) ..... | 2·23 | — ·01 | ·43 | 6 | 17 | ... | ... | ... | ... | ... | ... |
| XVIII | | Strathconan [Beauly] ..... | 4·63 | + ·41 | 1·00 | 7 | 8 | .. | ... | ... | ... | ... | ... |
| ,, | | Glencarron Lodge..... | 6·38 | — ·56 | 1·86 | 4 | 21 | 55·2 | 13 | 12·0 | 29 | 9 | ... |
| XIX. | | Dunrobin ..... | 2·24 | — ·20 | ·44 | 6 | 16 | 54·0 | 13 | 18·0 | 29 | 7 | ... |
| ,, | | S. Ronaldshay (Roeberry) ... | 1·98 | — 71 | ·79 | 30 | 26 | 52·0 | 13 | 21·0 | 24*g* | 9 | ... |
| XX. | IRELAND. | Darrynane Abbey..... | 2·22 | — ·90 | ·69 | 1 | 18 | ... | ... | ... | ... | ... | ... |
| ,, | | Waterford (Brook Lodge) ... | 2·78 | + ·26 | 1·05 | 29 | 13 | 55·5 | 10 | 21·0 | 29 | 9 | ... |
| ,, | | Broadford (Hurdlestown) ... | 2·93 | + ·73 | ·72 | 1 | 19 | 68·0 | 7 | 24·0 | 25 | 11 | ... |
| XXI. | | Carlow (Browne's Hill) ..... | 1·98 | — ·23 | ·41 | 29 | 14 | ... | ... | ... | ... | ... | ... |
| ,, | | Dublin (Fitz William Square) | 1·78 | — ·04 | ·33 | 5 | 17 | 54·6 | 12 | 26·0 | 26 | 7 | 11 |
| XXII. | | Ballinasloe ..... ..... | 3·25 | + ·83 | ·78 | 1 | 18 | 60·0 | 3 | 21·0 | 24 | 14 | ... |
| ,, | | Clifden (Kylemore) ..... .. | 4·90 | — ·29 | ·94 | 26 | 14 | ... | ... | ... | ... | ... | ... |
| XXIII | | Seaforde..... | 2·81 | + ·40 | 1·09 | 29 | 12 | 54·0 | 11 | 23·0 | 28 | 14 | 17 |
| ,, | | Londonderry (Creggan Res.). | 3·67 | + ·98 | ·54 | 31 | 18 | ... | ... | ... | ... | ... | ... |
| ,, | | Omagh (Edenfel) ..... | 3·85 | + 1·27 | ·90 | 29 | 18 | 51·0 | 4*c* | 23·0 | 25*f* | 16 | 23 |

+ Shows that the fall was above the average ; — that it was below it.

*a*—and 29. *b*—and 31. *c*—and 12. *d*—and 13. *e*—and 28, 29. *f*—and 28. *g*—and 26.

# METEOROLOGICAL NOTES ON MARCH, 1901.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

LONDON, CAMDEN SQUARE.—A singularly disagreeable month, on account of the prevalence of cold wind, frequent showers, including snow, sleet and hail, and rapid alternations of strong sunshine and heavy cloud. The mean temp. of air was 39°·9. or 2°·2 below the average of 40 years, the mean max. 3°·1, and mean min. 1°·5 below their respective averages; yet the month was not an extreme one in any instrumental readings; during the last 43 years there were eight Marches with a mean temp. equally low, or lower, eight with a lower mean max, and nine with a lower mean min.

TENTERDEN.—A remarkably dull month, with only 62 hours of sunshine, but though the days were cold, the night temp. was higher than in 1899 and 1900. The first week was wet and the fourth week very cold.

HARTLEY WINTNEY.—An intensely cold month; after the first wet week the cold increased until the end, with bitter, biting N.E. and E. winds; slight S showers from 18th to 27th. The last three days were wet, with S.W. gales. Ozone on 22 days, with a mean of 6·2. The chiff-chaff was seen on the 6th.

WINSLOW, ADDINGTON.—A cold month, and often very stormy. Intense frost from 26th to 29th, grass min. at or below 20° on four days. Mean temp. of month 38°. Much S on 19th, and again on 24th and 25th. T on 30th and 31st. Thick fog on 12th.

BURY ST. EDMUNDS, WESTLEY.—An unusually cold month, with 21 days of N. wind. Vegetation very backward. T on 1st, 28th and 31st. S from 24th to 27th.

NORWICH, BRUNDALL.—A very unkindly month, although the mean temp. was 0°·8 higher than that of March, 1899. TS with S on 28th. T on 1st; S on 24th, 25th, 27th and 28th; H on 1st, 3rd, 18th and 19th.

WINTERBOURNE STEEPLETON.—The weather was squally and disagreeable, and between 22nd and 29th very cold, the mean temp. of these eight days being 34°·0. That of the whole month was 39°·3. The first week was warm, with a mean of 43°·3. H on 2nd, 3rd and 6th; S on seven days.

TORQUAY, CARY GREEN.—R 1·91 in. above the average. Mean temp. 3°·1 below the average, and duration of sunshine 22 hours below the average, with four sunless days. Mean amount of ozone 5·0, the highest being 7·5, and the lowest 1·0. So far as can be traced the R of the 20th (2·31 in.) was the heaviest ever recorded at Torquay.

POLAPIT TAMAR [LAUNCESTON].—A wet, cold month, very stormy during the first week. The last week showed a remarkable quantity of S. T and L on 1st and 2nd; T on 6th; H on 3rd and 5th.

STROUD, UPFIELD.—T and L in S.W. and S.E. on 2nd. S on 19th, 25th and 26th.

ARNCLIFFE VICARAGE.—The 29th was one of the wildest days, with S, experienced for many years.

## WALES.

HAVERFORDWEST.—A wet, cold month, with the first eight days stormy. From 8th to 18th no R fell, and four other days were rainless. S fell on five days, and the temp. was generally low. Lowest grass min. 14°·1 on the 26th. Duration of sunshine 82·2 hours, with six sunless days. Primroses, daffodils and other spring flowers were in bloom, but vegetation generally was backward.

ABERYSTWITH, GOGERDDAN.—Very cold, with N. and N.E. wind, nearly all the month. A fall of S on 20th, and on 27th and 28th, about 2 in. falling on each occasion.

## SCOTLAND.

CARGEN [DUMFRIES].—Vegetation was generally very backward. Farm work was hindered by severe frost at the end of the month. S five inches deep on 30th.

CLACHANTON, COLMONELL.—Mean temp. 39°·8, or 0°·6 below the average. About 3 in. of S on 29th.

TIGHNABRUAICH, CRAIGANDARAICH.—There was much sunshine, and the average max. shade temp. was 44°·1. At night the temp. was low, the average min. being 32°·3.

ABERDEEN, CRANFORD.—S every day from 24th, with N. and N.W. wind. Strong gale on the night of 30th and morning of 31st.

S. RONALDSHAY, ROEBERRY.—Very cold upon the whole. The last 10 days were very severe, especially 26th, when there was a blizzard. Winds mainly N. and N.E.

## IRELAND.

DARRYNANE ABBEY.—On the whole a dry month; the middle part very cold, with frost on several nights. Strong N.E. gale on 25th. H on 4th.

WATERFORD, BROOK LODGE.—A very harsh month. A little S on several days. H on 1st, 5th, 6th and 30th.

BROADFORD, HURDLESTOWN.—A favourable month on the whole. S on 26th, 27th and 28th.

DUBLIN, FITZWILLIAM SQUARE.—A rather cold month, but not so cold as March, 1900. Bright sunshine 132½ hours. Northerly winds predominated, except at the beginning, when there were strong S.W. to W. winds. Mean temp. 41°·9, or 1°·2 below the average. Fog on 3 days; gales on 5; S or sleet on 8 days, and H on 8 days.

OMAGH, EDENFEL.—The month commenced with stormy, boisterous and unsettled weather, and cold, saturating rains, 2·16 in. falling in the first week. From 8th to 23rd a fine dry cold period followed, drying the land for farming purposes. The last week was by far the severest of the winter, or of any winter since 1895; heavy S squalls, and keen night frosts prevailed without intermission, reducing the mean temp. of the month to 2°·4 below the average, and that of the last week to 8°·7 below the average of 30 years. Vegetation was dormant, and the sowing of seed was impossible.

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## THE "EXTRAORDINARY RAINFALL."

With reference to our fear expressed in this Magazine for March that the correction of the absurd story as to a rainfall of 9 feet 2 inches on Armboth Fells in February would never overtake the error, we note with some amusement that the editor of the well-known Guide-books to the Lake District, Mr. J. B. Baddeley, in writing to *The Standard* of April 9th on the exceptional sunniness of the previous fortnight at Windermere, remarks :—"Of course the Lake District has a well-earned reputation for rainfall. The amount that fell on the west side of Thirlmere during February was so prodigious that I tremble to record it, for fear of being accused of belonging to the angling fraternity. Suffice it to say, that it was measured by feet, not inches, and that Manchester had no fear of a water famine. But the Lake District does not do things by halves."

SYMONS'S

METEOROLOGICAL MAGAZINE.

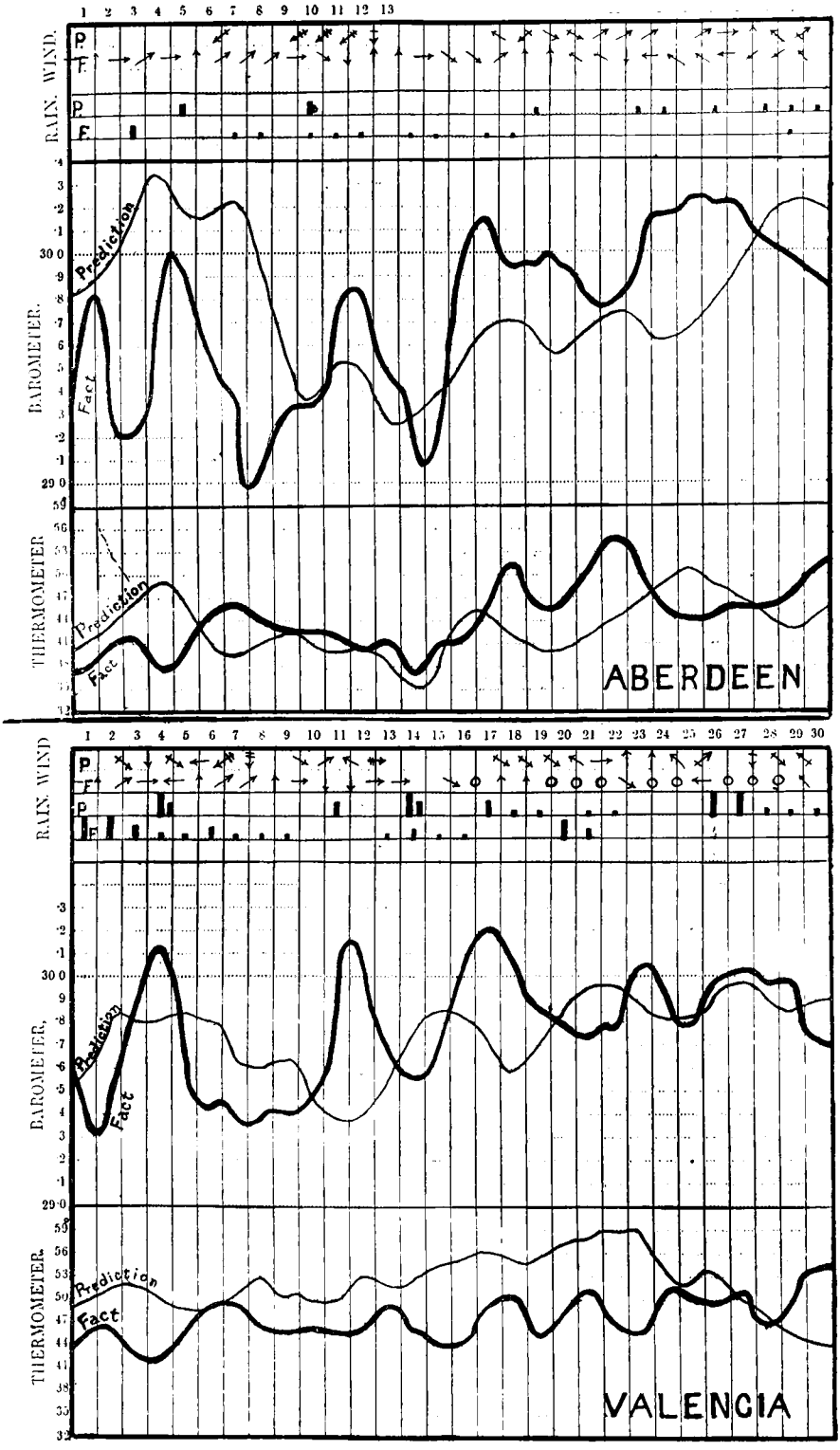
No. CCCCXXIV.] MAY, 1901. VOL. XXXVI.

## DEMCHINSKY'S WEATHER FORECASTS FOR APRIL.

BY THE EDITOR.

WE do not propose to discuss the theory of the influence of the moon on the weather put forward by M. Demchinsky in his polyglot journal *Climat*, but we recognise that it is a theory and not a mere empirical speculation like those of most upholders of lunar influence. We are interested, however, in testing the validity of M. Demchinsky's claim that his theory enables him to predict the weather for every locality for any period in advance, and we are grateful to him for supplying so liberally the evidence on which his theory can be brought to trial.

We have accordingly selected out of the seventy-four curves of the probable course of barometer and thermometer for April, published in Nos. 1 and 2 of *Climat*, those for Aberdeen and Valencia, and these are reproduced in the accompanying diagrams in a thin black line. The top row of squares in each diagram indicates the predicted direction of the wind by the direction of the little arrow, the top of the diagram being taken as the north; and the force of the wind is shown by the bars across the arrow. A little lower the predicted rainfall is indicated by a vertical black line, the length of which is proportional to the amount of fall, though not on any definite scale. On the same diagrams we have shown in the same way the actual facts of the weather of April taken day by day from the *Daily Weather Report* of the Meteorological Office. As we do not know whether the middle of the day in the Russian curves is taken as the line or the space between two lines, we cannot be sure that the prediction and the fact are exactly brought together—in other words, the curve of fact may require to be shifted as a whole half a division to the right or half a division to the left, and so we cannot look for any agreement closer than a whole day on either side of a given point. The winds are shown for 8 a.m. each day on the left hand side of the division devoted to the day, the rainfall is that measured at 8 a.m. on the day under which it stands. The barometer curve is drawn from two points daily, of which that corresponding to 8 a.m. is at the left hand line of the day-division, that at 6 p.m. in the middle of the division. The temperature is the mean of the




DEMCHINSKY'S FORECASTS FOR APRIL, 1901, COMPARED WITH THE FACTS.

maximum and minimum read at 8 a.m. and referred to the middle of the previous division. Thus the temperature under the figure 2 is the mean of the maximum on the afternoon of the 2nd, and the minimum on the night between the 2nd and 3rd.

M. Demchinsky asks that it should be borne in mind when examining the results that these are the first predictions of the kind, that his theory is in an early stage of development, and that he does not profess to give the actual values of temperature and pressure on particular days, but merely the time and direction of the changes of these values.

Before proceeding to confront the theory with the facts, we wish to make two points perfectly clear. First, that we will not take the trouble of reading or discussing any papers on the theory of the prediction of weather, or of the action of the moon, or of sunspots, or of planets, or any other bodies external to the atmosphere unless they are the work of persons of scientific training. And second, that we do not accept any theory of external influence on the atmosphere other than that of the radiant energy of the sun, and we shall require very positive proof before our opinion will change.

Comparing the barometer curves for Aberdeen, we notice at once that during the first fortnight there is a general resemblance between the prediction and the fact so far as direction of change is concerned; but the minimum on the 3rd was not foreseen; that on the 8th was at least two days too soon, and that on the fifteenth two days too late to satisfy the predictor. From the 19th to the end of the month the curves are so exactly contradictory as to excite surprise; but it is plain that any forecasts of weather founded on the predicted curve must have been entirely falsified. The most striking feature is the occurrence in the two curves of the isolated maximum on the 12th, but, as we shall see, this coincidence is not supported by other facts. As regards temperature, the periods from the 1st to the 3rd and from the 10th to the 22nd show the two curves in agreement; but from the 3rd to the 9th and from the 22nd to the 30th they are absolutely in contradiction. The frost predicted for the 20th did not occur, though that predicted for the 14th did.

Turning to the Valencia diagram we see a general correspondence between prediction and fact from the 2nd to the 9th, and a quite remarkable coincidence from the 24th to the 30th. However, for the long period from the 10th to the 23rd there is entire and nearly perfect discordance, the absolute inversion of the curves between the 10th and 13th, when those for Aberdeen showed the closest accord, being particularly striking. The predicted temperature changes were fairly verified except between the 6th and 8th, and between the 24th and 26th; but the Valencia forecast of temperature fits the facts at Aberdeen a great deal better than those at its own place. The warm spell predicted between the 18th and 24th for Valencia corresponded to the great rise of temperature at Aberdeen, where, however, a cool spell had been predicted.

No shifting of the curves to right or left would improve matters for the lunar theory, for if some additional agreements might be secured, this could only be done by sacrificing others.

The predictions of wind and rain show no relation to the 8 a.m. winds and the actual fall which occurred; and practically the forecasts as a whole appear to us to be valueless.

We would not willingly throw cold water on any effort, however quixotic it may at first appear, to reduce the turbulent disorder of the atmosphere to definite laws; and we acknowledge the possibility that amongst the seventy diagrams which we have not tested some may possibly be found of a more encouraging character. But we feel that it would have been safer and better if M. Demchinsky had devoted a few more years to testing and checking his forecasts before bringing them before the world.

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## ON THE OCCURRENCE OF WAVES OF EXCEPTIONAL SIZE.

By Vaughan Cornish, F.R.G.S.

We can calculate the velocity of surface waves of any given length, and the depth to which they disturb the water; we know that, in deep water, the rate of progression of a group of waves is one half the speed of the individual wave, and that the swell has the form of a trochoid. This, I think, is about the extent of our precise knowledge of the waves produced by wind on water; except in the matter of a few general properties shared by them with other waves, such *e.g.*, that there is no destructive interference between waves of small amplitude. It is desirable that more observations of sea waves should be recorded, both of normal waves and of those exceptional and almost solitary ones which merit the description of "tidal" in so far as they somewhat resemble the tide wave in the visible form of a "bore." Such waves, although rare relatively to the vast number of ordinary waves which a seaman meets in his voyages, are not so infrequent but that a careful record of observations would soon give a large number of instances for comparative study. The superposition of waves of different series, chasing one another and running more or less in the same general direction, is the normal condition of affairs in the open sea. This ordinarily causes the heights of wave crests to vary in the ratio of 1 to 2 and even 1 to 3 in one or two wave-lengths, and must occasionally give rise to a wave many times higher than those ordinarily met with. Such a billow has moreover no mere momentary existence for, the superimposed waves travelling with not very different speeds in the same general direction, the combination wave grows gradually and diminishes gradually. Passengers, whose attention is usually not given to the waves until the ship receives a shock, frequently suppose the great waves to come singly, but seamen generally say they come in triplets, three big waves one after

another. That, at any rate, is the version I usually get from men who have navigated ships on ocean voyages. As far as my personal experience goes I should say that the greater waves generally come either in a triplet or some other very short series. During the winter just passed I have crossed the North Atlantic twice, westbound in December from Liverpool to Boston, when we met with very heavy weather with head winds, and eastbound in March from New York to Southampton, when we had following winds and, on one day, a really heavy swell after the subsidence of a moderate gale. In the first voyage I measured one or two waves which attained a height of 40 feet or upwards during gales of wind, although the average height of the waves was probably 20 feet or less. During the return voyage some of the swells on the day referred to (March 13th, position at noon 48° 31′ N., 21° 40′ W.) attained 30 feet or upwards. The observations on this occasion were interesting from our present point of view. I took up a station where, with an eye elevation of about 67 feet, I had a clear view over the whole ship (except for the smoke stacks) and a horizon at 8 miles. The light was remarkably good for seeing waves, the visibility of which depends mainly upon the distribution of sunlight and shadow. Under these unusually favourable conditions for observation I was deeply impressed with the strictly normal character of the arrangement of the agitated sea in broad stretches of comparatively low flat waves with intervening narrow bands, consisting of about three great billows. The ridges of these could often be traced through a lateral extention of a mile or more. Sir G. G. Stokes has pointed out in a different connection that wind has more power to further disturb the water where the waves are high than where they are low. Thus the differences of roughness and smoothness originating in the interference of different sets of waves are increased by the wind.

I have pointed out that the great waves originating in this way can never come singly. There is, however, another case to be considered, viz., that of a sudden local disturbance such as the slipping of a submerged sandbank, or on a smaller scale the overturning of an iceberg. But even if a single wave were thus created at the place of disturbance it cannot remain single when travelling in deep water, but, as the theory of waves clearly shows, a group of waves arises in which the largest are near the centre.

May I ask for particulars of any exceptional waves which may be noticed from time to time by your readers, or for any measurements of waves? The available records are scanty, not because the observations are few but because they have not been collected.

*72, Princes Square, London, W.*

[In connection with the influence of wind in the formation of waves at sea, we have pleasure in drawing the attention of our readers to a series of illustrated articles by Mr. Cornish now appearing in *Knowledge*.—ED. *S.M.M.*]

## ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on April 17th, at the Institution of Civil Engineers, Great George Street, Westminster, Mr. W. H. Dines, B.A., the President, in the chair.

The following gentlemen were elected Fellows :—Mr. D. B. Campbell, Mr. M. Immisch, Mr. O. C. Immisch, and Mr. R. J. Robson.

A letter was read from the Home Secretary conveying the thanks of His Majesty the King "for the Loyal and Dutiful Address of the President, Council and Fellows of the Royal Meteorological Society, expressing their sympathy with His Majesty and the Royal Family on the occasion of the lamented death of Her late Majesty Queen Victoria."

Mr. W. Marriott read a paper on "The Special Characteristics of the Weather of March, 1901." From the 1st to the 13th the weather was comparatively mild, the temperature being a little above the average. The winds were mostly from the south-west or west, and strong in force, and thunderstorms were of frequent occurrence. From the 14th to the 29th these conditions were completely reversed, causing low temperatures and keen north-easterly winds. The last two days of the month were much warmer, although still slightly below the average. The contrast between the first two periods was shown in a very striking manner by means of isobaric and isothermal charts. From the 25th to the 29th the cold was most intense, the temperature being very low, and the wind particulary keen and dry. The temperature during this period was more than 10° below the average. From the *Weekly Weather Report* it appears that for the week ending March 30th, the temperature over Scotland was 10° below the average, over the greater part of England and Wales 9°, and over Ireland 8°.

The great dryness of the air will be seen from the low relative humidity recorded at the Royal Observatory, Greenwich —viz., 26th, 52 per cent.; 27th, 54 per cent.; 28th, 67 per cent.; and 29th, 63 per cent. It appears that a relative humidity as low as 52 per cent. for the day in the month of March has only been recorded once before during the last 54 years—viz., on March 1st, 1886; and no two consecutive days have had such low relative humidities in March as the 26th and 27th of the present year.

From an examination of the U.S. *Pilot Chart* it appears that a number of depressions passed across the Atlantic in a north-easterly direction during the month of March, and that their path was considerably to the west and north-west of the British Isles. This confirms the reports in the newspapers of the boisterous character of the weather over the North Atlantic. The only depression shown on the chart which passed across the British Isles travelled in an unusual direction, from north to south, the centre being over the north of Scotland on the 7th, near Paris on the 8th, and over the

Gulf of Genoa on the 9th. It was apparently this depression which caused the red rain of African sand in the south of Italy.

On the 20th a snow storm occurred over the south of England, being heaviest in the southern portion of Devon and Cornwall. At Torquay the melted snow yielded 2·31 in., and at Buckfastleigh 2·06 in. On the 29th a snow storm of great severity occurred over the northern part of England and Wales. At Llanerchymedd, in Anglesea, the melted snow measured 2·35 in., while over practically the whole of the north of Wales and the north-west of England the amount was over one inch.

Although the death rate was below the average, there was, as a result of the bitterly cold weather, a considerable increase in the deaths due to diseases of the respiratory organs. Vegetation also was at a standstill.

Mr. A. J. Hands made some remarks on several cases of damage by lightning during the month of March.

Mr. H. Southall said that the blackthorn was extremely late this year. It was on the point of appearing during the first week of March, but did not actually come out till April 14th.

Mr. H. N. Dickson spoke on the influence of the temperature of the surface water of the ocean upon the distribution of atmospheric pressure. He thought that it might perhaps be possible to form an opinion of the character of coming winters in western Europe from the records of the temperature of the surface water of the North Atlantic during the previous summer.

The President, Mr. F. J. Brodie, and Mr. C. Harding also took part in the discussion, and Mr. W. Marriott replied.

A paper by Mr. R. Strachan on "Vapour Tension in relation to Wind," was read by the Secretary.

## METEOROLOGICAL NEWS AND NOTES.

Mr. H. H. Clayton's paper on the Eclipse Cyclone has been made the subject of a critical discussion in *Science* for April 12th by Mr. Frank H. Bigelow, who gives a very clear account of Ferrel's theory of a cyclone with a cold centre, and illustrates the description by means of effective diagrams. Mr. Bigelow recognises that (as we pointed out in our notice of Mr. Clayton's paper in the April number of this Magazine) the circulation of air round the centre of the eclipse shadow is anticylonic in direction; and he shows that our surmise as to a cold-air cyclone being another name for a moving anticyclone is erroneous, because the phenomenon due to the eclipse is not a cold-air cyclone at all. He says—"The Weather Bureau observations at sixty-five stations confirm the Clayton distribution of pressure, but the conclusion is also unavoidable that we are not dealing with a cold-center cyclonic circulation." The accuracy of the theory of semi-diurnal cyclones is also questioned, and Mr. Clayton is supplied with an opportunity for defending his thesis and still further elucidating a question of great theoretical interest.

MR. J. Y. BUCHANAN, F.R.S., delivered a course of three lectures on "Climate, its Causes and Effects," at the Royal Institution, on Saturdays April 20th, 27th, and May 7th. The first lecture dealt comprehensively with the amount of heat received from the Sun, its measurement by means of calorimeters, and its distribution in latitude and season over the globe. The second lecture concerned types of climate, grouped as the equatorial or jungle climate, the tropical or desert climate, the polar or frigid climate, and the temperate or composite climate. The modifying influences of land and sea, and of elevation above sea-level were then considered; and the third lecture dealt in greater detail with the climate of the polar regions and lofty mountains.

DR. SYMES THOMPSON gave a course of four lectures on the "Climate of Algiers," at Gresham College, commencing on April 16th. He treated the subject in much detail, mainly from the points of view of medicine and hygiene.

"THE CAMBRIAN NATURAL OBSERVER," a quarterly record of natural phenomena in Wales, gives in a recent number an article on "Natural Science in the Principality," in the course of which a suggestion is made that we would like to see brought before every municipality in the United Kingdom, omitting, where necessary, the sentence on the Welsh language:—"Our municipal authorities might copy the example of Germany. There, in Berlin and perhaps other towns, are street pillars with meteorological and such like instruments, with forecasts, and notes on current phenomena, so that pedestrians find themselves insensibly interested. Why should there not be something of the kind outside every town hall and parish room in Wales? The information might, if necessary, be given in Welsh, a vehicle which has been used too little in the dissemination of science."

UNIFORMITY in the units used for scientific work has received much more attention on the Continent than in English-speaking countries, and we observe from the supplement to *Petermanns Mitteilungen* that the centigrade thermometer is the only form to be permitted henceforth in German schools. The Réaumur scale, against the continued use of which this rule has been made, has never been used to any extent in scientific work, but it has obtained a hold of the public in Germany and Russia similar to that of the Fahrenheit scale amongst English-speaking people.

MONSIEUR A. ANGOT publishes in the March number of the *Annuaire* of the French Meteorological Society a table of the average monthly frequency of rain in Paris for the twenty-eight years 1873—1900. The observations are for the Parc Saint-Maur, and the following is the average number of days on which any rain whatever was recorded:—

| Jan. | Feb. | Mar. | Apr. | May. | Jun. | Jul. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 13·8 | 13·0 | 13·0 | 12·5 | 12·7 | 13·2 | 12·9 | 12·2 | 12·0 | 15·1 | 15·5 | 15·8 |

The average number of rainy days in the year was just under 162; but the number of days on which the fall was ·40 in. or over was only 22. It will be noticed that August and September are the months with fewest rainy days in Paris, while October, November and December have most.

THE SECOND INTERNATIONAL CONFERENCE for the Physical and Biological Study of the North Sea met at Christiania from May 6th to 11th, the delegates interested mainly in the physical work were Professor Mohn, Professor Krümmel, Professor Otto Pettersson, Mr. Ekman, Mr. Knudsen and Dr. H. R. Mill.

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## FORTY YEARS' METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE.

Lat. 51° 32′ 40″ N., Long. 0° 8′ 0″ W., Altitude 111 ft.

DURING 1898 and 1899 Mr. Symons published in this Magazine every month a table of the forty years' observations for the month of the same name during forty consecutive years. The tables in 1898 dealt with the average monthly means or totals and the highest and lowest readings in each month of all the instruments observed. The monthly tables in 1899 gave the actual means and extremes for each year of the forty for rainfall, temperature and cloud. A third set of tables was designed to give the monthly and annual values of each of the meteorological elements, and so make the series complete as far as practicable.

It is at once a duty and a privilege to complete the series, and so make fully available the finest record of the climate of London ever made, a record the value of which is enhanced by the fact that it forms an epitome of the life-work of one man. The additional tables include—

(1) The Mean and Extreme Annual Values for each of the forty years.
(2) Monthly and annual Barometric Pressure.
(3) Monthly and annual Mean Temperature.
(4) Monthly and annual Extreme Temperatures in Shade.
(5) Monthly and annual Maximum Sun Temperatures.
(6) Monthly and annual Minimum Grass Temperatures.
(7) Monthly and annual Rainfall.
(8) Monthly and annual amount of Cloud.

It is to be noted that, as the first table shows, the values refer to the forty years commencing with January 1st, 1858, except—

| | | |
|---|---|---|
| Grass Minimum (38 years), | from January | 1st, 1860. |
| Solar Radiation, black bulb (28 years) | .. | 1870. |
| Temp. of Soil at 1 foot (27 years) | ,, | 1871. |
| Solar Radiation, bright bulb (20 years) | ,, | 1878. |

## ANNUAL MEANS

| Years. | BAROMETER. | | | SHADE TEMPERATURE. | | | | |
|---|---|---|---|---|---|---|---|---|
| | Mean. | Extremes. | | Means. | | | Extremes. | |
| | | Highest. | Lowest. | 9am & 9pm | Max. | Min. | Max. | Min. |
| | in. | in. | in. | ° | ° | ° | ° | ° |
| 1858... | 29·885 | 30·560 | 28·888 | 49·3 | 58·8 | 42·0 | 92·6 | 20·1 |
| 9... | ·820 | ·683 | ·535 | 50·7 | 59·4 | 43·4 | 91·9 | 14·4 |
| 60... | ·875 | ·624 | ·722 | 47·3 | 55·2 | 41·1 | 76·1 | 6·7 |
| 1... | ·973 | ·689 | ·983 | 49·3 | 59·0 | 42·1 | 89·5 | 14·3 |
| 2... | ·950 | ·689 | 29·041 | 49·8 | 57·6 | 43·2 | 81·1 | 18·1 |
| 3... | ·991 | ·693 | 28·931 | 50·4 | 59·4 | 43·0 | 85·0 | 24·5 |
| 4... | ·971 | ·690 | ·783 | 48·9 | 58·3 | 41·5 | 89·4 | 15·1 |
| 65... | ·967 | ·782 | ·626 | 50·1 | 60·2 | 43·4 | 88·2 | 15·4 |
| 6... | ·899 | ·663 | ·802 | 50·1 | 58·9 | 43·5 | 87·2 | 22·5 |
| 7... | ·981 | ·788 | ·736 | 49·5 | 57·4 | 42·7 | 88·2 | 6·7 |
| 8... | ·969 | ·653 | ·805 | 52·1 | 61·1 | 43·9 | 93·3 | 23·4 |
| 9... | ·971 | ·589 | 29·054 | 50·0 | 58·9 | 42·8 | 91·0 | 20·8 |
| 70 . | ·987 | ·628 | 28·907 | 48·9 | 58·6 | 41·9 | 91·2 | 14·0 |
| 1... | ·966 | ·520 | ·888 | 48·7 | 57·8 | 42·0 | 82·2 | 19·7 |
| 2 .. | ·811 | ·473 | ·616 | 51·1 | 59·9 | 43·9 | 92·3 | 26·1 |
| 3... | ·959 | ·790 | ·476 | 49·0 | 58·1 | 42·4 | 90·1 | 22·9 |
| 4... | ·987 | ·735 | ·630 | 49·6 | 58·8 | 42·5 | 90·8 | 18·4 |
| 75... | ·990 | ·660 | ·666 | 49·6 | 58·1 | 43·0 | 86·1 | 20·7 |
| 6... | ·891 | ·662 | ·398 | 50·1 | 58·9 | 43·6 | 92·6 | 18·9 |
| 7... | ·895 | ·683 | ·733 | 49·8 | 58·5 | 43·1 | 87·1 | 23·5 |
| 8... | ·925 | ·671 | 29·006 | 49·5 | 58·1 | 43·3 | 86·5 | 18·7 |
| 9... | ·945 | ·784 | 28·838 | 46·3 | 54·1 | 40·6 | 80·2 | 16·1 |
| 80... | ·982 | ·653 | ·760 | 49·1 | 58·3 | 43·0 | 88·3 | 19·2 |
| 1... | ·951 | ·650 | ·937 | 48·7 | 57·4 | 42·0 | 94·6 | 11·8 |
| 2... | ·942 | ·950 | ·970 | 49·7 | 58·3 | 43·1 | 77·8 | 24·5 |
| 3... | ·978 | ·854 | ·902 | 49·3 | 58·2 | 42·7 | 85·6 | 22·4 |
| 4 . | 30·011 | ·680 | ·610 | 50·7 | 59·3 | 43·6 | 86·9 | 25·3 |
| 85... | 29·950 | ·607 | ·941 | 48·4 | 57·1 | 42·0 | 90·4 | 22·3 |
| 6.. | ·922 | ·751 | ·323 | 48·4 | 57·1 | 42·4 | 87·5 | 19·4 |
| 7 .. | 30·031 | ·747 | ·812 | 47·6 | 56·5 | 41·0 | 88·8 | 14·5 |
| 8... | 29·968 | ·736 | ·824 | 47·5 | 55·5 | 41·9 | 84·7 | 19·1 |
| 9... | ·982 | ·733 | 29·007 | 48·6 | 56·8 | 42·7 | 84·5 | 19·2 |
| 90... | ·977 | ·693 | 28·712 | 48·4 | 56·9 | 42·1 | 78·2 | 14·9 |
| 1... | ·978 | ·728 | ·533 | 48·2 | 56·6 | 41·9 | 84·3 | 16·8 |
| 2... | ·963 | ·589 | 29·170 | 48·0 | 56·7 | 41·2 | 84·7 | 16·7 |
| 3... | 30·004 | ·755 | 28·761 | 50·6 | 60·6 | 43·2 | 90·7 | 15·4 |
| 4... | 29·978 | ·645 | ·911 | 49·7 | 58·1 | 43·2 | 88·2 | 13·1 |
| 95... | ·933 | ·613 | ·912 | 48·7 | 57·9 | 41·8 | 86·2 | 7·3 |
| 6... | 30·031 | ·934 | ·668 | 50·0 | 58·5 | 43·3 | 88·7 | 23·2 |
| 1897... | 29·984 | ·741 | ·746 | 50·0 | 58·3 | 43·7 | 88·4 | 23·4 |
| Mean ... | 29·954 | 30·694 | 28·789 | 49·3 | 58·1 | 42·6 | 87·3 | 18·2 |
| Highest | 30·031 | 30·950 | 29·170 | 52·1 | 61·1 | 43·9 | 94·6 | 26·1 |
| Lowest. | 29·811 | 30·473 | 28·323 | 46·3 | 54·1 | 40·6 | 76·1 | 6·7 |

CAMDEN SQUARE FOR 40 YEARS, 1858–97.

## AND EXTREMES.

| SUN MAX. | | GRASS MIN. | | RAINFALL. | | | CLOUD | Years. |
|---|---|---|---|---|---|---|---|---|
| Mean. | Highest. | Mean. | Lowest. | Total. | Max. Fall. | Rainy Days. | Mean. | |
| ° | ° | ° | ° | in. | in. | | | |
| ... | ... | ... | ... | 18·77 | ·94 | 106 | 5·4 | ...1858 |
| ... | ... | ... | ... | 28·21 | 1·66 | 167 | 5·8 | ... 9 |
| ... | ... | 38·0 | 1·8 | 32·24 | 1·10 | 204 | 6·3 | ... 60 |
| ... | ... | 37·9 | 8·5 | 22·27 | 1·42 | 151 | 5·8 | ... 1 |
| ... | ... | 39·6 | 13·3 | 27·59 | ·94 | 173 | 6·5 | ... 2 |
| ... | ... | 38·9 | 17·8 | 21·59 | 1·55 | 132 | 5·8 | ... 3 |
| ... | ... | 38·1 | 8·8 | 16·93 | 1·01 | 110 | 6·1 | ... 4 |
| ... | ... | 39·5 | 10·8 | 29·48 | 1·12 | 164 | 5·3 | ... 65 |
| ... | ... | 37·8 | 9·3 | 31·60 | 1·33 | 192 | 5·7 | ... 6 |
| ... | ... | 38·2 | 0·5 | 26·29 | 1·82 | 153 | 6·3 | ... 7 |
| ... | ... | 40·8 | 20·5 | 23·40 | ·93 | 142 | 6·1 | ... 8 |
| ... | ... | 39·4 | 17·2 | 25·42 | 1·03 | 147 | 6·4 | ... 9 |
| 90·3 | 136·8 | (38·1) | 10·4 | 21·32 | ·95 | 139 | 5·8 | ... 70 |
| 88·0 | 131·0 | 39·9 | 17·5 | 25·02 | 1·23 | 158 | 6·0 | ... 1 |
| 91·0 | 132·9 | 41·1 | 22·8 | 33·86 | 1·05 | 204 | 5·8 | ... 2 |
| 88·8 | 135·2 | 39·2 | 19·4 | 22·67 | 1·04 | 160 | 6·3 | ... 3 |
| 89·0 | 134·0 | 40·2 | 15·8 | 18·82 | ·99 | 164 | 6·0 | ... 4 |
| 86·6 | 131·3 | 40·6 | 20·6 | 28·44 | 1·29 | 185 | 6·4 | ... 75 |
| 89·0 | 134·2 | 40·0 | 17·8 | 26·16 | 1·61 | 173 | 6·2 | ... 6 |
| 89·8 | 133·9 | 39·6 | 22·7 | 28·17 | ·87 | 195 | 6·0 | .. 7 |
| 88·6 | 135·2 | 40·0 | 12·2 | 34·08 | 3·28 | 172 | 6·5 | ... 8 |
| 82·9 | 131·9 | 37·6 | 7·8 | 33·82 | 1·49 | 181 | 6·9 | ... 9 |
| 89·8 | 133·7 | 39·3 | 13·7 | 30·28 | 1·33 | 158 | 6·5 | .. 80 |
| 88·9 | 137·7 | 37·9 | 0·6 | 27·92 | 1·08 | 152 | 6·4 | ... 1 |
| 88·3 | 130·0 | 39·5 | 19·4 | 27·14 | 1·08 | 165 | 6·5 | ... 2 |
| 86·5 | 127·6 | 38·9 | 19·3 | 24·40 | 1·43 | 164 | 6·1 | ... 3 |
| 84·6 | 125·4 | 39·6 | 21·4 | 20·35 | 1·47 | 150 | 6·1 | ... 4 |
| 83·0 | 129·3 | 37·1 | 15·4 | 26·64 | 1·48 | 165 | 6·1 | ... 85 |
| 84·0 | 133·4 | 37·5 | 8·3 | 27·01 | 1·82 | 176 | 5·8 | ... 6 |
| 84·6 | 133·4 | 37·1 | 11·0 | 19·21 | 1·44 | 140 | 6·0 | ... 7 |
| 82·6 | 127·6 | 37·7 | 16·1 | 27·73 | 1·39 | 173 | 6·7 | ... 8 |
| 83·4 | 126·3 | 38·8 | 13·5 | 23·84 | 1·08 | 169 | 6·5 | ... 9 |
| 85·4 | 126·9 | 38·2 | 5·5 | 21·23 | 1·67 | 161 | 6·2 | .. 90 |
| 85·1 | 127·1 | 37·5 | 12·5 | 28·15 | 1·44 | 178 | 6·2 | ... 1 |
| 85·5 | 130·2 | 36·5 | 12·1 | 22·60 | 1·71 | 158 | 5·7 | ... 2 |
| 89·4 | 134·3 | 39·2 | 10·0 | 19·80 | 1·15 | 148 | 5·2 | ... 3 |
| 86·2 | 128·2 | 38·9 | 14·3 | 27·94 | 1·35 | 185 | 6·2 | ... 4 |
| 86·3 | 135·3 | 37·8 | 5·0 | 21·47 | 1·24 | 137 | 5·6 | ... 95 |
| 86·2 | 135·9 | 38·0 | 19·1 | 23·52 | ·75 | 159 | 6·2 | ... 6 |
| 86·3 | 132·6 | 39·0 | 16·6 | 22·86 | ·83 | 164 | 6·3 | ...1897 |
| 86·8 | 131·8 | 38·8 | 13·4 | 25·46 | 1·31 | 162 | 6·1 | Mean. |
| 91·0 | 137·7 | 41·1 | 22·8 | 34·08 | 3·28 | 204 | 6·9 | Highest |
| 82·6 | 125·4 | 36·5 | 0·5 | 16·93 | ·75 | 106 | 5·2 | Lowest. |

NOTE.—The mean grass minimum for June, 1870, is wanting; in calculating the mean for the year 1870, the average value for June for the other 37 years was adopted.

## REVIEWS AND BOOKS RECEIVED.

*Researches on the past and present history of the Earth's Atmosphere, including the latest discoveries and their practical applications.* By DR. THOMAS LAMB PHIPSON. London: C. Griffin & Co., Ltd. 1901. Size, 7½ × 5. pp. xii. + 194. Price 2s. 6d.

THE formal and somewhat severe title of this book does not prepare one for the pleasantly written notes and reminiscences which make up its contents. Throughout a long life Dr. Phipson has observed much, read a good deal, and made diligent use of Captain Cuttle's invaluable advice, "When found, make a note of." The various chapters are neither systematic nor exhaustive, and they are not quite up to date; but they are crowded with so many facts and inferences, some curious, some puzzling, many almost forgotten, but all interesting, that we have no inclination to carping criticism. Dr. Phipson appears to be one of those fortunate men who find in the pursuit of science an inexhaustible store-house of pleasure, and the portion of his attention bestowed on the phenomena of the atmosphere has resulted in the compilation of a very readable little volume.

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*Sounding the Ocean of Air: being Six Lectures delivered before the Lowell Institute of Boston in December*, 1898, *by* A. LAWRENCE ROTCH, S.B., A.M. London: Society for Promoting Christian Knowledge. 1900. Size, 7 × 5. Pp. viii.+184. *Illustrations.*

THE Romance of Science Series, of which this forms a volume, has seldom dealt with a more fascinating advance in science than the investigation of the physical conditions of the free air. Although the form of abstracts of lectures is not one which lends itself to conspicuous literary excellence, and although several of the illustrations (some of which are called "plates," though all are printed in the text) are rough, this little volume gains steadily on the interest of the reader as he proceeds. The first three chapters deal with comparatively familiar matters—the history of atmospheric research, clouds and balloons; but the last three are full of novelty. They describe the new system of unmanned balloons (*ballons-sondes*) for the exploration of great altitudes in the atmosphere by means of self-recording instruments, and the still newer developments of the kite as a scientific instrument. Flying machines, being still in the future so far as practical results are concerned, are not treated at length.

The *ballon-sonde* "Cirrus" in an ascent made in Germany in 1895 rose to the height of 72,000 feet or 13¼ miles, if the recorded barometric minimum of 1·50 in. of mercury is to be trusted; but as to this, Mr. Rotch appears not to be quite satisfied. The highest ascent recently made by an aeronaut was that by Dr. Berson in 1894 to 30,000 feet, where he found it possible by inhaling oxygen to make observations in spite of the extreme rarity of the air.

Most interest attaches to the experiments with kites, to their results, and the history of the development of the boy's toy into a valuable piece of scientific apparatus. The matter has been so recently referred to in this Magazine that it will suffice to recall the reader's attention to the numbers for September and October last (Vol. 35, pp. 120, 132). By the use of the Hargrave's box kite and steel wire, Mr. Rotch states that he found it possible to send self-recording instruments to altitudes of 12,000 feet, or more than $2\frac{1}{4}$ miles above sea-level; and since the book was written these heights have been exceeded. The advantages of kites over unmanned balloons are their great cheapness, the steadiness with which they may be kept for many hours in one position near any desired level, and the ideal exposure of the instruments they carry to the influence of the free air, for the kites always face the full force of whatever wind may be blowing.

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*Annuaire de l'Observatoire Royal de Belgique.* 1899, *Soixante-sixième Année, Supplement.* Bruxelles, 1900. Size 6 × 4; pp. 200. Diagrams.

*Observatoire Royal de Belgique. Annuaire Météorologique pour* 1901. *Publié par les soins de* A. LANCASTER. Bruxelles, 1901. Size 6 × 4; pp. 576. Maps and diagrams.

WITH the new century the Brussels Observatory has taken a step in advance, and in place of having the meteorological annual as a supplement to the astronomical, it is now published as a separate volume. The object of the new annual is to publish papers of interest to the general public, together with data of permanent value for professional and amateur meteorologists, and for those who follow the many practical pursuits in which a knowledge of weather or climate is necessary.

A table of contents has, unfortunately, been omitted, and there is no index, two serious bars to the utility of any work of reference. The volume contains a calendar, in which, for every day in the year, are entered the mean and extreme temperatures for 60 years, with notes as to the natural phenomena characteristic of the season. A sketch of the history of Meteorology in Belgium, by M. A. Vincent, covers the period from the earliest times to 1769. Then follow nearly 100 pages of annual and monthly values of meteorological data since 1833, a paper by M. Lancaster, on Earthquakes in Belgium, 50 pages of meteorological tables, two old meteorological diaries, one ranging from 1779 to 1810, the other from 1807 to 1830, some other memoirs, and finally a detailed account of the climate of Belgium in 1899.

It forms altogether a most useful and interesting year book, and we could wish that our own Meteorological Council might some day see its way to add to the many advantages it has secured in our meteorological service by compiling a similar compact and popular work in the English language.

*Hints to Travellers, Scientific and General. Edited for the Council of the Royal Geographical Society, by* JOHN COLES. *Eighth edition. Revised and enlarged.* London, The Royal Geographical Society, 1901. 2 vols., size 7 × 5. Pp., vol. i., 436; vol. ii., 266. Maps and illustrations. Price 15s.

THIS very useful work is thoroughly practical. It aims at supplying all the information a traveller can require in fixing his position, and mapping the country, including tables of all the necessary constants, and an extensive table of logarithms, which is a marvel of compactness and clearness. The second volume contains an article of 50 pages on Meteorology and Climate, by Dr. H. R. Mill, accompanied by a series of climatological maps. The object of the article is to supply the traveller with the information necessary to allow him to make full use of the meteorological instruments he carries, and to obtain evidences of the climate of the region he is passing through by noticing the effects produced on the land, vegetation, &c. The other general articles deal with photography, geology (including a special section on glacier observations), natural history, anthropology, industry and commerce, and an extremely valuable chapter (the longest in the book) on Medical Hints, by Dr. W. H. Crosse. This naturally deals mainly with tropical countries, where explorers are subject to the attacks of innumerable diseases, due to microbes; nothing is said of climatic diseases against which explorers in the polar regions should be on their guard, for the same reason that the section on Snakes in Ireland is a blank in works on Natural History.

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*Meteorological Service of the Dominion of Canada. Cloud Observations during* 1896 *and* 1897 *at Toronto.* Ottawa: Government Printing Bureau, 1901. Size, 12½ × 9. Pp. 28.

CLOUD observations were commenced at Toronto in 1896 at two stations nearly a mile apart, and the altitude of particular clouds was determined by simultaneous angular measurements with theodolites. The highest cloud measured was cirrus, on one occasion, at 39,400 ft.; the greatest velocity of cloud movement, also for cirrus, seems to have been 135 miles per hour.

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On Solar Changes of Temperature and Variations in Rainfall in the Region surrounding the Indian Ocean, by Sir Norman Lockyer, K.C.B., F.R.S., and W. J. S. Lockyer, M.A., Ph.D. Reprint from *Proc. R.S.* **67** (1900), 409-431.

This was noticed in the Magazine last year, Vol. **35**, p. 165.

Stonyhurst College Observatory. Results of Meteorological and Magnetical Observations, with Report and Notes of the Director, Rev. W. Sidgreaves, S.J., F.R.A.S. 1900. Clitheroe 1901. Size 7½ × 5. Pp. vii. + 78.

Annual Report of Meteorological Observations for the year 1900, in the Borough of Hastings, by H. COLBORNE, M.R.C.S., Borough Meteorologist. St. Leonards, 1901. Size 9½ × 6. Pp. 16. *Plate.*

Die phänologischen Beobachtungen der Jahre 1864 bis 1897 und die Ernteerträge im Königreich Sachsen in ihrer Abhängigkeit von den Witterungsverhältnissen. Bearbeitet von Dr. GROHMANN. (Amtliche Publikation des Königl. sächsischen meteorologischen Institutes). Chemnitz 1901. Size $12\frac{3}{4} \times 10$. Pp. 88.

The phenological observations in the kingdom of Saxony for the years 1864-97, and the relation between harvests and weather.

Ergebnisse der Beobachtungen an den Stationen II. und III. Ordnung im Jahre 1900, zugleich Deutsches Meteorologisches Jahrbuch für 1900. Berlin, A. Asher & Co. 1901. Size 13 × 10. Pp. 62.

Deutsches Meteorologisches Jahrbuch für 1899. Beobachtungs-System der Deutschen Seewarte. Jahrgang XXII. Hamburg, 1900. Size 13 × 9½. Pp. 198.

Charts illustrating the Weather of the North Atlantic Ocean in the Winter of 1898-9. Published by the authority of THE METEOROLOGICAL COUNCIL. London. Printed for Her Majesty's Stationery Office. 1901. Size 13 × 17. Pp. 9, +10 plates. Price 6s. 6d. *To be reviewed.*

# Correspondence.

## SOLAR HALO, AND FINE WEATHER.

*To the Editor of Symons's Meteorological Magazine.*

On Thursday, April 18th, I went out at 9.10 a.m., *i.e.*, at 9 a.m. local time, to take my daily estimate of wind and cloud, and saw in the N.W. what at first I took to be a long thin wisp of cirrus on a background of hazy sky. Its uniformity of breadth attracted my attention, and it proved to be a large continuous horizontal circle of white light passing round the sky and through the Sun. I then found that round the Sun itself there was a very fairly defined circle also of white light, cutting the first-named circle of course at two points. On the horizontal circle, *not* (it appeared to me, as well as I could observe against the dazzling glare of the Sun) *at* the points of intersection, but just outside them, were two patches of rainbow coloured light. This condition lasted for about twenty minutes, when the large circle slowly faded away. Not so the solar halo, which became brighter and brighter, and at 9.50 was quite conspicuous and strongly coloured. After 10 it also faded. A thin veil of cirrus covered the whole sky all the time.

A somewhat similar phenomenon which I saw here in 1897 preceded the famous Essex storm of June 24th; but on this occasion since April 18th the weather has continued uniformly brilliant, at least in this district.

H. A. BOYS, F.R.Met.Soc.

*North Cadbury Rectory (30 m. S. of Bath),*
*April 27, 1901.*

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, NOVEMBER, 1900.

| STATIONS. (*Those in italics are South of the Equator.*) | Absolute. Maximum. Temp. | Absolute. Maximum. Date. | Absolute. Minimum. Temp. | Absolute. Minimum. Date. | Average. Max. | Average. Min. | Average. Dew Point. | Average. Humidity. | Absolute. Max. in Sun. | Absolute. Min. on Grass. | Total Rain. Depth. | Total Rain. Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0-100 | ° | ° | inches | | |
| London, Camden Square | 62·0 | 1 | 28·3 | 11 | 51·2 | 41·5 | 42·8 | 88 | 88·9 | 22·3 | 1·90 | 18 | 7·4 |
| Malta | 77·4 | 5 | 51·7 | 28 | 71·1 | 59·0 | 57·4 | 83 | 131·1 | 49·0 | 3·64 | 13 | 3·5 |
| *Cape of Good Hope* | 83·3 | 2 | 44·9 | 4 | 72·2 | 53·3 | 52·8 | 66 | ... | ... | ·84 | 10 | 4·1 |
| *Mauritius* | 83·1 | 23 | 62·7 | 2 | 80·3 | 68·4 | 62·9 | 69 | 146·2 | 52·2 | 1·31 | 13 | 5·7 |
| Calcutta | 88·9 | 3 | 57·1 | 30 | 84·1 | 63·6 | 62·2 | 68 | 143·1 | 52·0 | ·00 | 0 | 1·6 |
| Bombay | 92·3 | 4 | 72·3 | 11 | 87·8 | 74·5 | 69·6 | 69 | 141·5 | 61·6 | ·00 | 0 | 1·1 |
| Colombo, Ceylon | 91·2 | 5 | 73·0 | 12 | 88·4 | 74·3 | 71·7 | 80 | 157·0 | 70·0 | 9·25 | 19 | 5·5 |
| *Melbourne* | 97·5 | 25 | 40·4 | 7 | 69·4 | 50·4 | 47·5 | 68 | 155·0 | 33·3 | 1·04 | 7 | 5·4 |
| *Adelaide* | 105·6 | 24 | 47·8 | 2, 4 | 82·1 | 55·6 | 47·7 | 47 | 159·0 | 40·1 | ·57 | 4 | 3·1 |
| *Sydney* | 94·2 | 1 | 54·5 | 20 | 73·6 | 60·1 | 56·4 | 71 | 151·3 | 49·0 | 8·14 | 18 | 6·6 |
| *Wellington* | 70·0 | 23*a* | 40·0 | 1 | 62·5 | 49·0 | 44·7 | 67 | 126·0 | 29·0 | 1·83 | 14 | 4·1 |
| *Auckland* | 71·5 | 10 | 45·5 | 15 | 65·8 | 53·1 | 46·9 | 67 | 141·0 | 42·0 | 1·98 | 14 | 5·6 |
| Jamaica, Halfway Tree | 92·0 | 19 | 68·0 | 24 | 87·2 | 70·5 | 69·1 | 79 | ... | ... | ·78 | 5 | 3·4 |
| Trinidad | 91·0 | 26 | 68·0 | 14*b* | 87·0 | 70·0 | 73·6 | 85 | 161·0 | 47·0 | 5·41 | 18 | ... |
| Grenada | 88·0 | 4 | 72·0 | 16 | 84·4 | 74·6 | 73·5 | 77 | 150·5 | ... | 4·44 | 23 | 4·3 |
| Toronto | 64·8 | 1 | 14·1 | 16 | 44·8 | 32·5 | 34·0 | 81 | 82·2 | 6·0 | 3·90 | 16 | 7·4 |
| Fredericton, New Brunswick | 67·8 | 2 | 2·5 | 29 | 42·4 | 24·9 | 26·5 | 72 | ... | ... | 5·60 | 13 | 6·8 |
| Winnipeg, Manitoba | 51·0 | 1 | —19·5 | 23 | 24·9 | 7·0 | ... | 79 | ... | ... | ·84 | 8 | 6·5 |
| Victoria, British Columbia | 57·0 | 2 | 19·8 | 21 | 48·6 | 38·5 | | ... | ... | ... | 2·32 | 13 | 6·1 |

*a*—and 25th. *b*—and 19th.

REMARKS.

MALTA.—Mean temp. of air 63°·7 or 1°·5 above the average. Mean hourly velocity of wind 10·3 miles or 1·0 above average. Mean temp. of sea 70°·9. TSS on 7 days; L on 4 days. J. F. DOBSON.

*Mauritius.*—Mean temp. of air 0°·3, of dew point 1°·3, and rainfall ·48 in., below their respective averages. Mean hourly velocity of wind 10·0 miles, or 0·6 below average; extremes, 22·2 on 27th and 0·0 on 2nd and 4th; prevailing direction E.S.E. to E. by N. T. F. CLAXTON.

COLOMBO, CEYLON.—Mean temp. of air 0°·3 above, of dew point 0°·6 below, and rainfall 3·41 in. below, their respective averages. Mean hourly velocity of wind 6·5 miles; prevailing direction N. and N.E. TSS occurred on 14 days; L was seen on 7th and 20th. W. C. S. INGLES.

*Adelaide.*—Mean temp. of air 1°·8 above the average. Dry and hot month; rain ·44 in. below the average of 43 years. Sunshine 66 hours above the average. C. TODD, F.R.S.

*Sydney.*—Mean temp. of air 0°·1 above, humidity 1°·8 below, and rainfall 4·91 in. above, their respective averages. H. C. RUSSELL, F.R.S.

*Wellington.*—Mean temp. of air 0°·8 below, and rainfall 2·34 in. below, their respective averages. Very small total rainfall; the latter part of the month was very fine. Prevailing wind N.W., frequently strong. R. B. GORE.

*Auckland.*—Mean temp. about 1°·2 under the average of the previous 32 years. On the whole a fine though cool month. Rainfall barely half the average. T. F. CHEESEMAN.

TRINIDAD.—Rain 1·45 in. below the 30 years' average. J. H. HART.

TORONTO.—First snow on 10th, and last TS on 21st. R. F. STUPART.

# SUPPLEMENTARY TABLE OF RAINFALL, APRIL, 1901.

| Div | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| I. | Uxbridge, Harefield Pk.. | 2 39 | XI. | Castle Malgwyn ..... | 4·01 |
| II. | Dorking, Abinger Hall . | 2·19 | ,, | Builth, Abergwesyn Vic. | 6 16 |
| ,, | Birchington, BeresfordLge. | ... | ,, | Rhayader, Nantgwillt... | 5·59 |
| ,, | Hailsham ..... | 2·25 | ,, | Lake Vyrnwy ..... | 3 88 |
| ,, | Crowborough..... | 3·27 | ,, | Corwen, Rhug ..... | 3·45 |
| ,, | Ryde, Thornbrough ..... | ... | ,, | Criccieth, Talarvor ..... | 2·77 |
| ,, | Emsworth, Redlands ... | 2·76 | ,, | I. of Anglesey, Lligwy.. | 1 85 |
| ,, | Alton, Ashdell ..... | 2·57 | ,, | Douglas, Woodville..... | 2·94 |
| ,, | Newbury, Welford Park | 2·63 | XII. | Stoneykirk, Ardwell Ho. | 2·83 |
| III. | Oxford, Magdalen Coll.. | 1·95 | ,, | New Galloway, Glenlee | 5·64 |
| ,, | Banbury, Bloxham ..... | 2·64 | ,, | Moniaive, Maxwelton Ho. | 4·54 |
| ,, | Pitsford, Sedgebrook ... | 2·71 | ,, | Lilliesleaf, Riddell ..... | 2·55 |
| ,, | Huntingdon, Brampton. | 2·56 | XIII. | N. Esk Res. [Penicuick] | 2·10 |
| ,, | Wisbech, Bank House... | 1·92 | XIV. | Glasgow, Queen's Park.. | 3·20 |
| IV. | Southend ..... ..... | 1·42 | XV. | Inveraray, Newtown ... | 5·35 |
| ,, | Colchester, Lexden ..... | 1·66 | ,, | Ballachulish, Ardsheal... | 5·56 |
| ,, | Saffron Waldon, Newport | 1·88 | ,, | Islay, Eallabus..... ... | 3·96 |
| ,, | Rendlesham Hall ..... | 1·76 | XVI. | Dollar..... | 2·18 |
| ,, | Swaffham ..... | 2·26 | ,, | Balquhidder, Stronvar... | 6·18 |
| V. | Salisbury, Alderbury ... | 2·42 | ,, | Coupar Angus Station... | 2·62 |
| ,, | Bishop's Cannings ..... | 2·42 | ,, | Blair Atholl ... ..... | 2·03 |
| ,, | Blandford, Whatcombe . | 3·10 | XVII. | Keith H.R.S..... | 1·71 |
| ,, | Ashburton, Druid House | 4·53 | ,, | Forres H.R.S. ... ..... | 1·39 |
| ,, | Okehampton, Oaklands. | 4·31 | XVIII. | Fearn, Lower Pitkerrie.. | 1·02 |
| ,, | Hartland Abbey ..... | 3·66 | ,, | S. Uist, Askernish ..... | 3·56 |
| ,, | Lynton, Glenthorne ... | ... | ,, | Invergarry..... | 1·43 |
| ,, | Probus, Lamellyn ..... | 4·08 | ,, | Aviemore, Alvie Manse. | 1·69 |
| ,, | Wellington, The Avenue | 3·12 | ,, | Loch Ness, Drumnadrochit | 1·09 |
| ,, | North Cadbury Rectory | 2·45 | XIX. | Invershin ..... | 1·77 |
| ,, | Clifton, Pembroke Road | 3·30 | ,, | Durness..... | ... |
| VI. | Ross, The Graig ..... | 2·67 | ,, | Watten H.R.S..... | 2·64 |
| ,, | Wem, Clive Vicarage ... | 1·84 | XX. | Dunmanway, Coolkelure | 8·65 |
| ,, | Wolverhampton, Tettenhall | 1·62 | ,, | Cork, Wellesley Terrace | 4·07 |
| ,, | Cheadle, The Heath Ho. | 1·84 | ,, | Killarney, District Asyl. | 4·81 |
| ,, | Coventry, Priory Row .. | 2·16 | ,, | Caher, Duneske ..... | 2 32 |
| VII. | Market Overton ..... | 1·78 | ,, | Ballingarry, Hazelfort... | 2·21 |
| ,, | Grantham, Stainby ..... | 1·61 | ,, | Limerick, Kilcornan ... | ... |
| ,, | Horncastle, Bucknall ... | 1·37 | ,, | Miltown Malbay ..... | 3 32 |
| ,, | Worksop, Hodsck Priory | 1·26 | XXI. | Gorey, Courtown House | 2 64 |
| VIII. | Neston, Hinderton ..... | 2·18 | ,, | Moynalty, Westland ... | 2·14 |
| ,, | Southport, Hesketh Park | 1·78 | ,, | Athlone, Twyford ..... | 2·67 |
| ,, | Chatburn, Middlewood. | 2·52 | ,, | Mullingar, Belvedere ... | 2·24 |
| ,, | Duddon Val., Seathwaite Vic. | 5·15 | XXII. | Woodlawn ..... | 2·91 |
| IX. | Melmerby, Baldersby ... | 2·05 | ,, | Crossmolina, Enniscoe .. | 5·40 |
| ,, | Scalby, Silverdale ..... | 2·15 | ,, | Collooney, Markree Obs. | 3·38 |
| ,, | Ingleby Greenhow Vic.. | 1·77 | XXIII. | Enniskillen, Model Sch. | 3·20 |
| ,, | Middleton, Mickleton ... | 1·46 | ,, | Warrenpoint..... | 2·91 |
| X. | Haltwhistle, Unthank H. | ... | ,, | Miltown, Banbridge..... | 2·10 |
| ,, | Bamburgh ..... | 1·19 | ,, | Belfast, Springfield ..... | 2·87 |
| ,, | Keswick, The Bank..... | 3·54 | ,, | Bushmills, Dundarave.. | 2·58 |
| XI. | Llanfrechfa Grange ..... | 4·88 | ,, | Stewartstown ..... | 3·07 |
| ,, | Treherbert, Tyn-y-waun | 9·24 | ,, | Killybegs ..... | 4·74 |
| ,, | Llandovery ..... | 3·96 | ,, | Horn Head ..... | 2·37 |

# APRIL, 1901.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1890-9. | Greatest Fall in 24 hours. Dpth | Greatest Fall in 24 hours. Date | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Max. Date | Min. Deg. | Min. Date. | No. of Nights below 32°. In shade. | No. of Nights below 32°. On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches. | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | 2·15 | + ·63 | ·62 | 3 | 14 | 76·8 | 23 | 28·1 | 2 | 2 | 15 |
| II. | | Tenterden ... | 2·06 | + ·29 | ·70 | 3 | 17 | 71·5 | 23 | 31·5 | 2 | 1 | 10 |
| ,, | | Hartley Wintney ... | 1·93 | + ·29 | ·64 | 3 | 15 | 75·0 | 23 | 28·0 | 28*d* | 4 | 9 |
| III. | | Hitchin ... | 2·41 | + ·89 | ·62 | 3 | 16 | 74·0 | 22 | 31·0 | 1, 28 | 4 | ... |
| ,, | | Winslow (Addington) ... | 2·23 | + ·67 | ·54 | 3 | 16 | 73·0 | 22*a* | 29·0 | 29 | 5 | 13 |
| IV. | | Bury St. Edmunds (Westley) | 2·39 | + ·86 | ·69 | 3 | 13 | 74·0 | 22 | 28·0 | 3 | ... | ... |
| ,, | | Norwich (Brundall) ... | 2·26 | ... | ·56 | 3 | 16 | 72·0 | 22 | 29·0 | 6 | 2 | 15 |
| V. | | Winterbourne Steepleton ... | 3·27 | ... | ·72 | 3 | 17 | 69·8 | 24 | 27·0 | 2 | 3 | 12 |
| ,, | | Torquay (Cary Green) ... ... | 4·58 | ... | ·98 | 3 | 17 | 65·2 | 24 | 35·1 | 1 | 0 | 3 |
| ,, | | Polapit Tamar [Launceston].. | 3·77 | + 1·61 | ·63 | 3 | 17 | 72·8 | 24 | 30·3 | 17 | 6 | 8 |
| VI. | | Stroud (Upfield) ... | 2·62 | + ·78 | ·57 | 3 | 16 | 72·0 | 24 | 30·0 | 1 | 1 | ... |
| ,, | | Church Stretton (Woolstaston) | 2·97 | + 1·09 | ·57 | 8 | 15 | 72·5 | 23 | 32·0 | 13 | 1 | 14 |
| ,, | | Worcester (Diglis Lock) ... | 2·42 | + ·99 | ·58 | 3 | 16 | ... | ... | ... | ... | ... | ... |
| VII. | | Boston ... | 1·40 | + ·02 | ·40 | 3 | 13 | 80·0 | 22 | 29·0 | 2 | 6 | ... |
| ,, | | Hesley Hall [Tickhill]... | 1·17 | — ·17 | ·27 | 15 | 12 | 79·0 | 22 | 30·0 | 2 | 3 | ... |
| ,, | | Derby (Midland Railway)... | 1·76 | + ·21 | ·36 | 3 | 16 | 78·0 | 21*b* | 29·0 | 2 | 3 | ... |
| VIII. | | Manchester (Plymouth Grove) | 2·11 | + ·44 | ·47 | 8 | 14 | 76·0 | 21*c* | 31·0 | 16 | 2 | 5 |
| IX. | | Wetherby (Ribston Hall) ... | 2·57 | + ·83 | ·59 | 30 | 16 | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) ... | 4·67 | + 1·31 | ·94 | 2 | 18 | ... | ... | ... | ... | ... | ... |
| ,, | | Hull (Pearson Park). ... ... | ·98 | — ·61 | ·24 | 8 | 13 | 77·0 | 22 | 30·0 | 2 | 5 | 14 |
| X. | | Newcastle (Town Moor) ... | ·91 | — ·75 | ·22 | 27 | 16 | ... | ... | ... | ... | ... | ... |
| ,, | | Borrowdale (Seathwaite)... | 7·37 | + 1·03 | 2·68 | 2 | 17 | 72·0 | 24 | 29·3 | 17 | 3 | ... |
| XI. | WALES. | Cardiff (Ely)... | 4·54 | + 2·36 | ·90 | 3 | 16 | ... | ... | ... | ... | ... | ... |
| ,, | | Haverfordwest ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Aberystwith (Gogerddan) ... | 3·07 | + ·50 | ·41 | 8 | 14 | 78·0 | 24 | 25·0 | 16*e* | 7 | ... |
| ,, | | Llandudno... | 1·68 | — ·10 | ·38 | 2 | 15 | 71·0 | 20 | 34·0 | 1 | 0 | ... |
| XII. | | Cargen [Dumfries] ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| XIII. | | Edinburgh (Royal Observatory) | 1·38 | ... | ·45 | 8 | 12 | 68·0 | 22 | 31·5 | 6 | 4 | 7 |
| XIV. | | Colmonell ... | 4·39 | + 2·22 | 2·11 | 2 | 14 | 76·0 | 24 | 28·0 | 16 | ... | ... |
| XV. | | Tighnabruaich ... | 5·09 | ... | 1·76 | 2 | 16 | 61·0 | 29 | 30·0 | 3*f* | 8 | ... |
| ,, | | Mull (Quinish)... | 4·44 | + 1·65 | ·62 | 12 | 21 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Leven Sluices ... | 2·75 | + ·76 | ·54 | 9 | 14 | ... | ... | ... | ... | ... | ... |
| ,, | | Dundee (Eastern Necropolis) | 2·30 | + ·76 | 1·15 | 2 | 15 | 70·6 | 22 | 28·0 | 2 | 8 | ... |
| XVII. | | Braemar ... .. | 2·06 | — ·03 | ·73 | 2 | 18 | 65·0 | 22 | 23·2 | 16 | 14 | 21 |
| ,, | | Aberdeen (Cranford) ... ... | 2·35 | + ·51 | ·65 | 2 | 20 | 64·0 | 22 | 25·0 | 5 | 13 | ... |
| ,, | | Cawdor (Budgate) ... | 1·52 | — ·05 | ·41 | 11 | 15 | ... | ... | ... | ... | ... | ... |
| XVIII | | Strathconan [Beauly] ... | 1·70 | — 1·35 | ·75 | 2 | 7 | .. | ... | ... | ... | ... | ... |
| ,, | | Glencarron Lodge... | 4·62 | — ·04 | ·56 | 14 | 20 | 64·8 | 24 | 28·0 | 4, 5 | 7 | ... |
| XIX. | | Dunrobin ... | 2·04 | + ·27 | ·46 | 10 | 14 | 61·0 | 22 | 30·0 | 2 | 5 | ... |
| ,, | | S. Ronaldshay (Roeberry) ... | 2·51 | + ·59 | ·36 | 14 | 18 | 62·0 | 22 | 29·0 | 1, 9 | 5 | ... |
| XX. | | Darrynane Abbey... | 3·65 | + ·15 | ·51 | 2 | 21 | ... | ... | ... | ... | ... | ... |
| ,, | | Waterford (Brook Lodge) ... | 2·66 | + ·04 | ·50 | 2, 5 | 14 | 63·0 | 24 | 29·0 | 29 | 4 | ... |
| ,, | | Broadford (Hurdlestown) ... | 2·58 | + ·50 | ·65 | 2 | 21 | ... | ... | ... | ... | ... | ... |
| XXI. | | Carlow (Browne's Hill) ... | 2·37 | + ·08 | ·44 | 2 | 15 | ... | ... | ... | ... | ... | ... |
| ,, | | Dublin (Fitz William Square) | ·86 | — 1·11 | ·15 | 15 | 12 | 65·2 | 21 | 34·7 | 17 | 0 | 3 |
| XXII. | | Ballinasloe ... ... | 3·41 | + 1·12 | 1·13 | 2 | 18 | 75·0 | 25 | 29·0 | 12*h* | 8 | ... |
| ,, | | Clifden (Kylemore) ... ... | 5·69 | + ·42 | 1·46 | 1 | 16 | ... | ... | ... | ... | ... | ... |
| XXIII | | Seaforde... | 2·51 | + ·08 | 1·04 | 2 | 15 | 67·0 | 21 | 30·0 | 1, 16 | 3 | 13 |
| ,, | | Londonderry (Creggan Res.). | 3·00 | + ·54 | ·63 | 2 | 24 | ... | ... | .... | ... | ... | ... |
| ,, | | Omagh (Edenfel) ... | 3·71 | + 1·35 | 1·07 | 2 | 19 | 68·0 | 21 | 30·0 | 16*g* | 6 | 13 |

+ Shows that the fall was above the average ; — that it was below it.

*a*—and 23. *b*—and 22. *c*—and 24. *d*—and 29. *e*—and 27. *f*—and 4, 10, 16. *g*—and 28. *h*—and 17.

# METEOROLOGICAL NOTES ON APRIL, 1901.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

LONDON, CAMDEN SQUARE.—Unsettled and showery till the 17th, but unusually warm during the week ending 25th. The last fortnight was fine and dry. H on 15th and 27th; great darkness at 11.30 a m. on 11th. The mean temp. of the month was 49°·1, or 1°·0 above the average.

TENTERDEN.—The first half was persistently wet, with a good deal of wind. Very warm from 19th to 25th, with brilliant sunshine; then cold, with E. wind. The well rose from 6 ft. to 8 ft. 10 in., the maximum occurring on the 19th. T on 1st, and slight TS on 15th. Duration of sunshine 204·5 hours.

HARTLEY WINTNEY.—R fell every day from 1st to 16th, with light S.W. winds; afterwards, to the end, it was very dry, with N. and N.E. winds, and much sunshine. Ozone on 17 days, with a mean of 4·8. All vegetation was exceedingly backward. Swallows were seen on 5th; the nightingale was heard on 11th, and the cuckoo on 13th.

WINSLOW, ADDINGTON.—Very unsettled until the 16th, afterwards fine until the end, particularly from the 17th to 26th. H on 1st, 15th, 16th and 27th. T on 16th.

BURY ST. EDMUNDS, WESTLEY.—All the R fell during the first 16 days, none being measured during the latter fortnight. T on 10th and 15th. Migratory birds came in small numbers at the usual dates.

WINTERBOURNE STEEPLETON.—The early part of the month was both cold and wet, but after the 20th the temp. rose considerably, and for the week ending on the 27th the mean max. temp. was 61°·9, and the mean temp. 49°·7. The relative humidity was low, and the wind being mostly in the N. and E., this, with cold nights, kept back growth, and R was wanted at the end. S on 5th. Fog on 6th and 7th.

TORQUAY, CARY GREEN.—R 2·25 in., mean temp. 0°·1, and duration of sunshine 53·5 hours, above their respective averages. Mean amount of ozone 6·0, the greatest being 8·0 on 3rd, with W. wind, and the least 4·0 on 25th, with E. wind.

POLAPIT TAMAR [LAUNCESTON].—The first fortnight was exceptionally wet, and the total R of thirteen consecutive days was 3·60 in. The second fortnight was remarkably dry. Heavy S on 5th; H on 14th, 15th and 28th. Fog on 24th.

CHURCH STRETTON, WOOLSTASTON.—A cold and wet month, the R of the earlier part making field sowing operations very late.

MANCHESTER, PLYMOUTH GROVE.—Summer weather from 21st to 25th, but very cold E. wind prevailed during the last five days. H storm on 12th. TS on 16th.

HULL, PEARSON PARK.—H and S on 15th and 16th; T on 15th.

## WALES.

ABERYSTWITH, GOGERDDAN.—Bright sunshine nearly every day during the last fortnight.

## SCOTLAND.

COLMONELL, CLACHANTON.—Mean temp. 46°·8, or 1°·7 above the average of 25 years.

TIGHNABRUAICH, CRAIGANDARAICH.—A good spring month, with a full average R. The mean temp. was normal. Prevailing winds, N., N.E. and E. T and L on 24th. The R of 1·76 in. on 2nd was the heaviest in 24 hours during six years.

ABERDEEN, CRANFORD.—Wet and cold, with little sunshine and changeable wind.

S. RONALDSHAY, ROEBERRY.—The first part, till the 17th, was wet and cold, the latter fine and warmer. Mean temp. 43°·4, or 0°·1 below the average of 11 years.

## IRELAND.

DARRYNANE ABBEY.—The first half was wet and cold, the second fairly dry and warm, with some beautiful summerlike days.

WATERFORD, BROOK LODGE.—H showers on several days. Early potatoes were injured by frost on 29th. Swallows were seen on 8th and the cuckoo heard on 23rd.

BROADFORD, HURDLESTOWN.—A very favourable month. S on 1st.

DUBLIN, FITZWILLIAM SQUARE.—Two seasons, summer and winter, may be said to have met in April, 1901. The first half was cold, showery and wintry, the second half dry, sunny, and for a while, distinctly warm. After the 23rd the temp. fell again, but drought lasted till the close. The mean temp. was 48°·6, or 0°·9 above the average. Fog on three days. High winds on twelve days, reaching the force of a gale on four. H on 4th, 15th and 16th, and S or sleet on 1st, 4th and 15th. L on 12th, and T on 15th.

OMAGH, EDENFEL.—The weather, which broke on March 24th, continued with increasing cold, wet and inclemency until well into the third week of this month. In the first eight days there fell the full average R for the whole month, and by the 17th, when the weather improved, 50 per cent. more than the average had fallen, and not more than a fourth of the grain or potatoes had been sown. The remainder of the month was, however, everything that it should be—fresh, dry and warm. The strong sun, with but little frost, stimulated a rapid growth of all vegetation. Swallows appeared on 13th, landrails on 24th, and the cuckoo was heard on May 1st.

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## ERRATA IN TABLES OF CAMDEN SQUARE OBSERVATIONS.

Readers are requested to be good enough to make the following corrections in their copies of the Camden Square tables published in 1898 and 1899.

SERIES 1.—*Vol. XXXIII., p. 37, March*—

| | | |
|---|---|---|
| Col. 1, Mean Bar. | for 29·904 | read *29·903* |
| ,, 5, ,, 9 a.m. Bar. | ,, 29·907 | ,, *29·905* |
| ,, 6, Sol. Rad., black | ,, 91·4 | ,, *91·3* |
| ,, 7, ditto, date | ,, 1882 | ,, *1883* |
| ,, 10, Sol. Rad., black | ,, 128·7 | ,, *112·6* |
| ,, 11, ditto, date | ,, 20th, 1882, | read *25th, 1881* |
| ,, 14, Sol. Rad., black | ,, 104·3 | ,, *103·6* |

*Vol. XXXIII., p. 52, April*—

Col. 15, Bar. mean of lowest, 9 a.m., for 29·381 read *29·356*

*Vol. XXXIII., p. 183, Dec.*—

| | | |
|---|---|---|
| Col. 6, Grass Min. | for 37·4 | read *38·3* |
| ,, 7, ditto date | ,, 1876 | ,, *1868* |

SERIES 2.—*Vol. XXXIV., p. 44, March*—

| | | |
|---|---|---|
| Col. 11, Sun. Max., black, 1882 | for 128·7 | read *108·7* |
| ,, 11, Mean | ,, 104·3 | ,, *103·6* |
| ,, 11, Highest | ,, 128·7 | ,, *112·6* |
| ,, 12, Sun Max., black, mean, 1882 | ,, 91·4 | ,, *90·7* |
| ,, 12, Highest | ,, 91·4 | ,, *91·3* |

SYMONS'S

# METEOROLOGICAL MAGAZINE.

No. CCCCXXV.] JUNE, 1901. VOL. XXXVI.

## THE SYMONS MEMORIAL FUND.

A MEETING of Subscribers to the fund for the foundation of a Gold Medal in memory of the late Mr. G. J. Symons, F.R.S., was held in the rooms of the Royal Meteorological Society on Tuesday, June 11th. The Executive Committee appointed on May 31st, 1900, consisted of Dr. C. Theodore Williams (Treasurer), Mr. F. Campbell Bayard, Mr. R. Bentley, Mr. C. Hawksley, Mr. J. Hopkinson, Professor R. Meldola, F.R.S., Dr. R. H. Scott, F.R.S., Mr. H. Sowerby Wallis and Mr. W. Whitaker, F.R.S. Professor Meldola and Mr. W. Marriott acted as Secretaries. The Report of this Committee stated that the Subscribers numbered 323, and the subscriptions ranged from twenty-five guineas to half-a-crown, the total amount received being £713 14s. 7d. After paying for the dies for the medal and all preliminary expenses, a sufficient sum remained in hand for the first award of the medal, while the balance had been invested so as to yield an annual income of £18. The Committee had adopted the designs of Mr. J. Pinches for the dies of the medal, the obverse bearing a medallion of Mr. Symons, and the reverse the Tower of the Winds at Athens. The Committee recommended that the following conditions be submitted to the Council of the Royal Meteorological Society:—

(1). That the Medal be awarded for distinguished work done in connection with Meteorological Science, irrespective of sex or nationality.

(2). That the Medal be awarded biennially, unless the Council see fit to withhold the award.

Dr. A. Buchan, F.R.S., moved the adoption of the Report, passing a high encomium on the work and on the personality of the late Mr. Symons, and Mr. E. M. Eaton seconded the motion.

Mr. C. Hawksley then proposed that the Treasurer be instructed to transfer the whole of the property of the fund to the Royal Meteorological Society, and after the proposal had been seconded by Mr. Bentley and adopted, Mr. W. H. Dines accepted the trust in the name of the Society. A vote of thanks to the Treasurer, Secretaries and Executive Committee was proposed by Sir Erasmus Ommanney, seconded by Dr. Mill and acknowledged by Dr. Williams.

## INTERNATIONAL INVESTIGATION OF THE SEA AND AIR.

In 1899 an International Conference was held at Stockholm, at which representatives of the countries bordering the Baltic and North Sea drew up a provisional plan for carrying out a systematic study of the seas bordering North-Western Europe, in the interest mainly of the fishing industry. The governments of Denmark, Finland, Germany, Holland, Norway, Russia, Sweden and (with some reservations) the United Kingdom, agreed to take part in the work, and they, together with Belgium, sent delegates to a second Conference, which met in Christiania from May 6th to 11th of this year, as mentioned in our last number, p. 61.

The work of this Conference consisted in the adoption of a programme for the joint investigation, and the suggestion of a scheme of organization to be submitted to the various governments.

From earlier researches it has been established that fish living in the sea are subject to the influence of the currents, salinity and temperature of the water much as animals living in the air are subject to the influence of wind, rainfall and temperature. Just as the climatic influence on the larger land animals is only partly direct and very largely indirect, working through the stronger influence exercised on the sources of food supply, so the oceanic climates act largely by causing variations in the supply of the small floating organisms, known collectively as plankton, which form the food of the useful fishes. It is accordingly proposed to establish a sort of meteorology of the sea, which shall take account of the seasonal and periodic changes in the nature, movements and temperature of the water, and also a sort of agriculture of the sea, which shall study the conditions necessary for successful harvests of food fishes. The delegates sent by the various governments were therefore chosen to represent not only government departments but also practical fisheries, the scientific study of marine life, and what we may term "marine meteorology." The British delegates were Sir Colin Scott Moncrieff (Permanent Under Secretary of State for Scotland), Professor D'Arcy Thompson, of Dundee (a member of the Scottish Fishery Board), Mr. W. Garstang (of the Marine Biological Station at Plymouth), and Dr. H. R. Mill.

The week spent at Christiania was one of continuous hard work, most harmoniously carried out by all the various nationalities; and it is exceedingly satisfactory to reflect that, after full discussion, every resolution proposed was either accepted or rejected unanimously. The programme for the projected work is divided into two categories —the first Hydrographical, or, as it is more usually termed in English, Oceanographical; the second Biological.

The first naturally possesses most interest for meteorologists, and the resolutions adopted are summarised below.

The first paragraph may be quoted in extenso:—"The hydrographical researches shall have for their object the distinction of the

different water strata, according to their geographical distribution, depth, temperature, salinity, gas contents, plankton and currents, in order to find the fundamental principles, not only for the determination of the external life conditions of useful marine animals, but also for weather forecasts for extended periods in the interests of agriculture."

In order to carry out this object, it was decided that observations of the various conditions should be made as far as possible simultaneously along certain determined lines four times in the year, the middle of the period of working being arranged to fall in the first half of February, May, August and November respectively. It is provided that during the cruises of the exploring vessels the temperature of the air shall be observed every two hours by means of Assmann's aspiration thermometer, and pressure by the barometer, self-recording instruments being used for interpolation. Opportunities for carrying on researches with kites in the upper air are to be offered on board the ships to the meteorological offices of the various countries, and all meteorological observations are to be carried out according to the methods adopted by these offices, with which it is the desire of the international organization to co-operate. The results obtained on each trip are to be tabulated and mapped at the earliest possible date, and published in a special bulletin. Rules are laid down for the observation of temperature in the water at various depths, and for the collection and analysis of samples of sea-water. The unit for measuring depth is to be the metre, but the depth may also be given in fathoms; distances are to be given in sea miles, and either the Centigrade or the Fahrenheit thermometer scale may be used, but all observations are to be reduced to Centigrade for publication. The methods of testing thermometers and conducting the various laboratory determinations are duly specified. The concluding paragraph is of special importance as tending towards continuity in the records of surface observations :—"It is desirable to supplement these investigations by making use of regular liners, lightships, &c., and coast-stations for the purpose of taking temperature observations and collecting samples of sea-water and plankton. These observations are to be taken not only in the typical months but also during the intervening periods."

The biological and fishery observations are laid down and classified with no less care and minuteness; but there is not space to touch on them here.

In order to carry out the scheme of work it is necessary that each nation should provide at least one ship suitably equipped for making the researches. The Norwegian vessel, "Michael Sars," is already at work under the able leadership of Dr. Hjort, who describes her equipment in detail in the last two numbers of *Petermanns Mitteilungen*. The Russians have also a special ship ready for use, and the Germans have specially designed a vessel which is being built. It is not yet known what action our Government will take, but we can hardly afford to take a minor part in so important a movement.

The Conference recommends that an International Council, consisting of two Commissioners, with full powers from each of the governments concerned, should control the whole organization, and that they should meet at Copenhagen as soon as possible in order to appoint the permanent officials of the Central Bureau, whose duty it will be to direct the various cruises, to collect and discuss the data, and to publish reports. The Council will also arrange for the institution of an international laboratory, at which the various instruments will be tested and observers instructed in their use. The Central Bureau and Laboratory are to be independent of each other, and probably in different countries, but both under the direction of the Council. The decision as to the site of both places is left to the various governments, to which a confidential report has been made by the Conference. It may, however, be said that on account of the reserve with which our Government approached the matter at first, there is little probability of either Bureau or Laboratory being established in this country, a fact which makes it all the more important that British interests in this international co-operation shall not be suffered to fall into the background. Any arrangement that can be come to must of necessity be a compromise, and subject to some drawbacks; but the prime requisites are friendly co-operation and uniformity of working between the various nationalities, and this we believe that the Conference has secured. The work is proposed to be carried on for five years, and it is hoped that the simultaneous observations may be commenced not later than May, 1902, and earlier if possible.

Amongst the resolutions passed by the Conference, attention was called to the interest which would result from uniting the study of large fresh water lakes with that of the sea, and to the great importance, both for fisheries and weather forecasting, of establishing a telegraph cable to Iceland.

It is impossible to conclude a notice of the Conference, however brief, without acknowledging the great courtesy and hospitality of the King and Government of Norway, and the hearty welcome given to the foreign delegates by Professor Nansen, Professor Mohn, and other Norwegian men of science.

## PROPOSED OBSERVATIONS ON DEW-PONDS.

FOLLOWING on a paper on dew-ponds, read at the Bradford meeting of the British Association by Professor Miall, a scheme of meteorological observations, intended to throw light upon the supply of dew-ponds, has been drawn up by a Leeds Committee, consisting of Mr. F. W. Branson, Dr. J. B. Cohen, Mr. Herbert Ingle, Professor L. C. Miall and Professor W. Stroud.

In order to bring the matter before such of our readers as may have leisure and opportunity for taking part in so interesting a research, we reproduce the programme suggested, and we hope that it may be acted upon in different parts of the country.

1. Observations should be made for at least a week, and longer if possible, at two stations, one being a carefully selected dew-pond, the other a low-lying pond in the same neighbourhood.

2. The observations should be taken day and night at intervals of three hours, and should include the following points:—(*a*) Temperature of air. *(b)* Temperature of surface and bottom of pond, the depth being noted, and being the same in each case. The bulb of the surface-thermometer to be immersed. *(c)* Humidity of air, as measured by wet and dry bulb thermometers. *(d)* Amount of dew, to be measured either by parcels of wool (see Wells on Dew), or in some other way. *(e)* Level of the water of the pond, to be measured by an inclined scale dipping into the water. Mr. Ingle has devised a scale which can be read with great ease and considerable accuracy. *(f)* A tray containing pond-water to be floated on the surface of the pond, and the loss or gain determined morning and evening by weighing the tray and its contents, the outside of the tray being dried. To secure a tranquil area for the floating tray during a breeze a protective ring of wood or coarse wire gauze, not projecting sensibly above the surface, might be arranged to enclose it. A rough landing-stage would be useful for this and other observations. The observations with a floating tray should be repeated on a low-level pond, and a similar tray containing pure water should be exposed at a spot thirty or forty feet away from the dew-pond. All these observations should be simultaneous. *(g)* Cloud, mist, rain, sunshine, direction and force of wind to be noted.

3. The situation, exposure, shape, depth and superficial area of each pond should be noted. Such part of the margin as can act as a collecting ground should be measured.

4. Sheep or cattle should not have access to the ponds during the period of observation. If absolutely necessary, a measured volume of water should be transferred every day to a trough for their use, but this is undesirable.

5. Observations on rainfall are most desirable. They cannot be made during the time appointed for observations (*a*—*g*), which, it is hoped, will be rainless. The best stations for rain gauges would be at the selected dew-pond, at a spot thirty or forty feet away from the dew-pond, and as nearly as possible at the same level, and, lastly, at the low-level pond and at neighbouring stations to windward and leeward during the prevailing winds. It may be necessary, for lack of observers, to employ gauges which will hold the rain of several weeks.

Suggestions as to the organization of an observing party have also been drawn up. As the work is purely voluntary each observer will be expected to pay his own expenses. July or August would probably be the most suitable month for carrying out the observations, and settled weather is considered essential. We should be glad if any reader able and willing to organise an observing party, would communicate on the subject either with the Editor, or directly with Professor Miall, The Yorkshire College, Leeds.

## MEAN TEMPERATURE (SOUTHERN COUNTIES), 1885-1900.

*To the Editor of Symons's Meteorological Magazine.*

The past 16 years, if divided into two periods of 8 years each, show a very remarkable record of temperature. I shall be glad to know whether it agrees with the experience of others. If there is anything of the nature of a cycle in this 8-year alternation, the year 1901 should prove the forerunner of another sequence of cold years. The following means are derived from stations in Sussex, Hants and Surrey, and I give them for what they may be worth :—

| FIRST PERIOD, 1885—1892. | | SECOND PERIOD, 1893—1900. | |
|---|---|---|---|
| Years. | Mean Temp. | Years. | Mean Temp |
| | ° | | ° |
| 1885 ..... | 46·0 | 1893 ..... | 47·7 |
| 1886 ..... | 46·3 | 1894 ..... | 48·0 |
| 1887 ..... | 45·2 | 1895 ..... | 48·0 |
| 1888 ..... | 45·4 | 1896 ..... | 49·9 |
| 1889 ..... | 46·5 | 1897 ..... | 49·7 |
| 1890 ..... | 45·7 | 1898 ..... | 50·0 |
| 1891 ..... | 45·4 | 1899 ..... | 49·2 |
| 1892 ..... | 45·0 | 1900 ..... | 48·8 |
| Mean ... | 45·7 | Mean ... | 48·9 |

Coldest year, 1892, 45°·0. Warmest, 1898, 50°·0.

The means for the months show an increase in the second period in every instance, thus :—

| | MEANS. | | INCREASE. | |
|---|---|---|---|---|
| | 1st Period. | 2nd Period. | 2nd Period. + | Sequences of Heat and Cold of 5 years or more. |
| | ° | ° | ° | |
| Jan. ... | 33·8 | 36·8 | 3·0 ... | Cold '85-'89 and '91-'95. |
| Feb. ... | 35·1 | 37·6 | 2·5 ... | ,, '86-'91. |
| March ... | 37·3 | 41·2 | 3·9 ... | ,, '85-'92. |
| April ... | 43·1 | 47·5 | 4·4 ... | ,, '85-'92. Warm '93-'00. |
| May ... | 50·6 | 52·5 | 1·9 ... | None. |
| June ... | 57·2 | 60·0 | 2·8 ... | ,, |
| July ... | 59·2 | 63·2 | 4·0 ... | Cold '88-'92. Warm '95-'00. |
| Aug. ... | 58·0 | 61·8 | 3·8 ... | ,, '88-'92.* |
| Sept. ... | 54·0 | 56·5 | 2·5 ... | None. |
| Oct. ... | 45·4 | 48·3 | 2·9 ... | ,, |
| Nov. ... | 40·9 | 42·8 | 1·9 ... | ,, |
| Dec. ... | 33·9 | 38·9 | 5 0 ... | Warm '94-'98. |
| | | Mean ... | 3·2 | |

* Warm '95, '97, '98, '99.

April is generally considered to be a variable month, but here we have no less than 8 cold Aprils followed by 8 mild Aprils. It remains to be seen whether this year will break the series. The cold periods for February, March and April are very similar, and, with regard to July and August, are identical; and the warm ones are much the same, with the exception of 1896 and 1900 in August, which gave average temperatures.

The number of months over and under average in the two periods shows the situation in a still more striking manner, thus :—

| FIRST PERIOD. | | | SECOND PERIOD. | | |
|---|---|---|---|---|---|
| | Warm. | Cold. | | Warm. | Cold. |
| 1885 ... | 1 | 8 | 1893 ... | 6 | 3 |
| 1886 ... | 2 | 6 | 1894 ... | 6 | 4 |
| 1887 ... | 1 | 8 | 1895 ... | 9 | 2 |
| 1888 ... | 1 | 9 | 1896 ... | 10 | 1 |
| 1889 ... | 2 | 8 | 1897 ... | 10 | 0 |
| 1890 ... | 1 | 8 | 1898 ... | 8 | 0 |
| 1891 ... | 0 | 7 | 1899 ... | 8 | 1 |
| 1892 ... | 0 | 9 | 1900 ... | 7 | 3 |
| Totals ... | 8 | 63 | Totals ... | 64 | 14 |

Out of the whole 192 months, 43 were of average temperature—viz., 25 in the first period and 18 in the second period.

A. F. PARBURY.

*Chiddingfold, Godalming, Surrey.*

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## TABLES OF MONTHLY RAINFALL AT ACRISE, KENT.

Lat. 51° 8′ 15″ N. Long. 1° 8′ 15″ E.

Gauge 8 in. diameter ; 1 ft. above ground ; 500 ft. O.S.D.

By G. C. WOOLLETT.

TABLE I. shows months of the year in order according to their dryness during the past thirty years, 1871 to 1900, both years inclusive, or 10957 days, out of which rain fell on 5673 days yielding 1124·58 in. of rainfall, inclusive of hail, snow and sleet. The thirty years' average is 37·486 inches.

Table II. shows order of months according to number of days rainfall and the average number of rainy days in the month.

TABLE I.

| | Fall. in. | | Monthly Average. in. |
|---|---|---|---|
| 1. May... | 63·74 | ... | 2·124 |
| 2. April.. | 67·34 | ... | 2·244 |
| 3. June.. | 69·80 | ... | 2·326 |
| 4. March | 75·31 | ... | 2·510 |
| 5. Feb.... | 82·23 | ... | 2·741 |
| 6. July... | 83·02 | ... | 2·767 |
| 7. Aug... | 85·87 | ... | 2·862 |
| 8. Sept... | 97·56 | ... | 3·252 |
| 9. Jan.... | 100·99 | ... | 3·366 |
| 0. Dec.... | 120·56 | ... | 4·018 |
| 11. Nov... | 137·54 | ... | 4·584 |
| 12. Oct.... | 140·62 | ... | 4·687 |
| | 1124·58 | | 37·481 |

TABLE II.

| Month. | Total Days of Rain. | | Average No. of Days in each Month. |
|---|---|---|---|
| 1. June.. | 362 | ... | 12·0 |
| 2. May.. | 378 | ... | 12·6 |
| 3. July.. | 423 | ... | 14·1 |
| 4. Aug... | 438 | ... | 14·6 |
| 5. April. | 439 | ... | 14·6 |
| 6. Sept.. | 455 | ... | 15·1 |
| 7. Mar... | 480 | ... | 16·0 |
| 8. Feb... | 489 | ... | 16·3 |
| 9. Oct... | 524 | ... | 17·4 |
| 10. Jan... | 544 | ... | 18·1 |
| 11. Nov... | 565 | ... | 18·8 |
| 12. Dec... | 576 | ... | 19·2 |

# THE NORWEGIAN RAINFALL SERVICE.

By Professor H. Mohn.

*Director of the Meteorological Institute, Christiania.*

The Norwegian Meteorological Institute, which was established in 1866, had in 1895 one hundred and two stations for measuring atmospheric precipitation. In 1894 the Norwegian Association of Engineers and Architects impressed with the importance of obtaining fuller information regarding the rainfall of the country, approached the government with the object of bringing before the Storthing, or Norwegian Parliament, a proposal for the establishment of 263 new stations for measuring precipitation. The vote was granted, and the whole system was placed under the superintendence of the Meteorological Institute.

The total number of stations now at work in Norway is 438, and most of the observers are paid. The results of the observations are published in a year book entitled "Nedböriagttagelser i Norge" (*i.e.*, Observations of Precipitation in Norway). The contents of this Report for each year include :—

A.—Depth of precipitation for each day, measured at 8 a.m., at 202 stations.

B.—Depth, extent and density of the snow covering the ground at the same stations, as far as they make these observations.

C. Part I.—Total depth of precipitation for each month, and for the year, at all stations, the daily maximum for each month, the number of days with observed precipitation for each month, the number of days with precipitation equal to, or greater, than one-tenth of a millimetre (·004 in.), the number of days with a fall equal to, or greater, than one millimetre (·039 in.), the number of days with snow or sleet, and with hail, mean and maximum depth of snow, and finally the number of days on which snow covered the ground.

C. Part II.—Normal values of depth of precipitation and of depth of snow, mean maxima and minima, and absolute maximum of depth of precipitation in twenty-four hours for each month, and for the year for all the old stations.

D.—Yearly values of the depth of precipitation for each single year, 1867-95, and the normals of the year.

E.—Yearly depths of precipitation for each year in the period from 1896 to the current year, and their means.

F.—Mean monthly and yearly depths of precipitation expressed as per centages of the normal values.

A map is published for each year, showing the distribution of rainfall by isohyetal lines.

Snow and rain are not measured in the same gauge; the rain-gauge is made of painted metal, in one piece, with a spout, by which the water collected can be poured out*, and it is exposed on a stand.

* The pattern is very similar to one of those in use at Greenwich Observatory.—Ed. *S. M. M.*

The snow-gauge is a rectangular metal box, standing about two feet high, in which the snow is collected and melted for measurement.

It is believed that the continuation of this work will be of the greatest value to Norway as an industrial country. The amount of rain is large, and the fallen water must descend from the higher land to the sea, and on its way it supplies an immense store of power, which may be employed in useful mechanical work, a very important consideration in a country which contains no deposits of mineral fuel.

[We are pleased to receive the foregoing communication from the distinguished chief of the government weather service in Norway. We trust that the last paragraph does not imply that any question has arisen as to the wisdom of continuing observations of so vital and practical a nature as those on rainfall. Even if such observations were only established temporarily, they must be continued for at least ten years, and preferably for twenty, or more, before they can become very useful, while of course they should be kept up in perpetuity, so as to trace the fluctuations of rainfall, as well as to establish normal values.—ED. *S.M.M.*].

## ROYAL METEOROLOGICAL SOCIETY.

THE first of the afternoon meetings for the present session was held on Wednesday, May 15th, at the Society's rooms, 70, Victoria Street, Westminster, Mr. W. H. Dines, B A., President, in the chair.

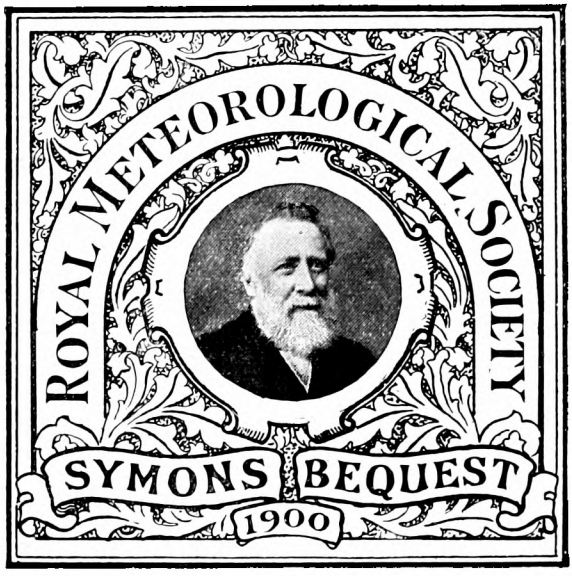
Miss J. Charlesworth was elected a Fellow.

Mr. Rupert T. Smith read a paper entitled "The Periodicity of Cyclonic Winds," which was the result of a discussion of his own observations made in the neighbourhood of Birmingham, during the 26 years 1874-99. He had been accustomed to classify the daily observations of the direction and the force of the wind, under the heads "cyclonic," "anti-cyclonic," and "periodic." The winds were entered as (1) "cyclonic," when the barometric pressure was below 29·8 ins., and the incurving isobars showed that some portion of the circular storm was definitely over the station; (2) "anti-cyclonic," when the barometric pressure was above 30·0 ins., and the weather chart showed the prevalence of anti-cyclonic conditions; and (3) "periodic," when the barometric pressure was about the average for the time of year, and when the weather conditions were doubtful, and so could not be grouped under "cyclonic," or "anti-cyclonic." In this paper the author only dealt with the winds in the first group, viz. "cyclonic." The equinoxes do not appear to be very stormy periods; but from the author's tables it is shown that the greatest frequency and force of cyclonic wind occurs some two weeks before the spring equinox, and some three weeks after the autumn equinox.

The President, Mr. W. Ellis, Mr. R. Inwards, Mr. R. H. Curtis

and Mr. F. J. Brodie, took part in a keen discussion, in the course of which the author's methods were severely criticised. Mr. R. T. Smith replied.

Mr. W. Marriott gave an account of the Bequest by the late Mr. G. J. Symons, F.R.S., to the Royal Meteorological Society. The readers of the *Meteorological Magazine* will remember that Mr. Symons took a great interest in the welfare of the Society, of which he was Secretary for 25 years, and was twice elected President. By his will Mr. Symons bequeathed to the Society his Cross of the Legion of Honour, the gold Albert Medal, awarded to him by the Society of Arts, the Testimonial Album presented to him in 1879 by the Fellows of the Royal Meteorological Society, and the sum of £200, as well as such of his books, pamphlets, maps and photographs as were not already represented in the Society's Library.




Mr. Marriott stated that from Mr. Symons's valuable collection, he had selected for the Society over 5,000 books and pamphlets, and about 900 photographs. Very many of the books were old and rare works, 9 being printed in the 15th century, 128 in the 16th, 214 in the 17th, and 403 in the 18th. By this noble bequest the Society now possesses the most complete and extensive meteorological library in existence. We are happy to be able to present our readers, by the courtesy of the Royal Meteorological Society, with a copy of the design on the special book-plate used for distinguishing the volumes acquired under this bequest.

Mr. Marriott made some reference to the Bibliography compiled by Mr. Symons, which although not included in the bequest, had been purchased by the Society from his executors. This

consists of the titles of all books, pamphlets, papers, and articles bearing on meteorology, of the existence of which Mr. Symons was aware. These titles, together with particulars as to size, date, and place of publication, are entered on cards, either in manuscript, or cuttings from booksellers' catalogues, and other sources. The cards are all placed in boxes, in a strictly alphabetical manner, under the name of the author, and each author's cards are arranged according to date. There are about 60,000 titles. This is a most valuable compilation, and a rich store-house of information on meteorological literature. Mr. Symons greatly prized this Bibliography, to the compilation of which he had devoted many years of his life.

## REVIEWS.

*Charts illustrating the Weather of the North Atlantic Ocean in the Winter of* 1898-9. *Published by the Authority of the Meteorological Council.* London, printed for Her Majesty's Stationery Office, 1901. Size $13 \times 16\frac{1}{2}$; pp. 22 and 60 maps. Price 6s. 6d.

MR. SHAW, Secretary of the Meteorological Council, explains in the preface that the charts which form the basis of this publication were prepared mainly under the superintendence of the late Lieutenant C. W. Baillie, whose death caused some delay in their appearance, and that only the completion of the charts and the compilation of the introduction and notes has devolved upon the present Marine Superintendent, Captain Campbell Hepworth. It is thus obvious that the present officials of the Meteorological Office are not responsible for the system upon which the meteorological data dealt with are charted—a system, which, we should think, could hardly commend itself to the majority of scientific meteorologists.

The object of the work is to investigate the very remarkable weather which prevailed over the North Atlantic, in the winter of 1898-99, and the method adopted was to construct a map showing the distribution of pressure, the direction and force of the wind, and the temperature over the whole area for every day from 18th December, 1898, to 15th February, 1899 inclusive. If temperature were the chief feature to be mapped, it would be reasonable to plot observations made at the same hour of the solar day, say local noon; but temperature is only treated incidentally, no isotherms being shown on the charts. Nevertheless, local noon is selected as the time for plotting the atmospheric pressures and drawing isobars, which thus represent the pressure which existed at each point at a different instant of time. The charts embrace a stretch of longitude from 40° E. to 100° W.; so that the pressure recorded for central Russia was observed more than nine hours before that recorded for western Canada, and the maps, which look like synoptic charts, are consequently very difficult to interpret. They certainly show the

approximate position of the areas of high and low pressure, but they give only an obscure idea of the actual gradients at any given time. Of course every care has been taken to prevent any reader supposing that the maps are what they are not; each being labelled distinctly "local noon," and the fact is referred to in the introduction, but no explanation or justification is given. We think that separate maps should have been drawn for temperature at local noon, and for pressure and winds synchronously at some hour, say Greenwich noon. We consider that the present maps, dealing with both conditions at local noon, are not worth the amount of public money which has been expended upon them. They are certainly not useless, and it is better to have them rather than nothing, for they are extremely interesting, and the notes and introduction are of real value in presenting a clear picture of an unusual and very remarkable succession of storms with an abnormal distribution of air temperature in Europe and America. (See this Magazine for October, 1900, p. 130.)

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*Rainfall of India, ninth year*, 1899. *Published by the various provincial governments, and issued under the authority of the Government of India by the Meteorological Department of the Government of India.* [JOHN ELIOT, *Meteorological Reporter*]. Calcutta, 1900. Size, $13\frac{1}{2} \times 8\frac{1}{2}$. *Not paged.*

THIS ponderous volume is made up of the returns of each day's rainfall for all the stations in each of the provinces of India, and although we cannot give the total number of pages, the size of the book may be guessed from the fact that it weighs about ten pounds.

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*Nautical Meteorological Annual*, 1900. *Published by the Danish Meteorological Institute.* Copenhagen, 1901. Size, $12 \times 9\frac{1}{2}$. Pp. xxviii. + 202. Maps and diagrams.

THIS important annual, which is printed in Danish and English in parallel columns, is of international importance, for it takes account not only of the climate of Denmark, but of the physical conditions of the surface water of the Atlantic Ocean north of 50° N. Monthly charts are given showing the position and movements of the Arctic ice, and another series of monthly charts showing the temperature of the surface water of the ocean for every one-degree square, so far as the records are available. In view of the growing importance assigned by meteorologists to the influence of ocean temperature on climate, the enterprise of the Danish Government in undertaking this work for the benefit of all Europe, is greatly to be praised.

## BOOKS RECEIVED.

Jahrbuch des Norwegischen Meteorologischen Instituts für 1900. Herausgegeben von Dr. H. Mohn. Christiania, 1901. Size 13 × 10. Pp. xii. + 122.

Zanzibar, Annual Report of the Agricultural Department, 1899. Zanzibar, "Gazette" Press, 1900. Size 8 × 6½. Pp. 34.

Annual Report upon the Meteorology of Cheltenham for 1900, by Richard Tyrer, B.A., F.R.Met.Soc. Cheltenham, 1901. Size 9½ × 6. Pp. 8.

1900. Thirty-fifth Annual Report to the Bath Urban Sanitary Authority, by the Medical Officer of Health [Dr. W. H. Symons]. Bath, 1901. Size 9½ × 6. Pp. 60. *Map and Rainfall Diagrams.*

Borough of Southport, Meteorological Department. The Fernley Observatory, Southport. Report and Results of Observations for the year 1900, by Joseph Baxendell, F.R.Met.Soc. Southport, 1901. Size 9½ × 7½. Pp. 28.

Totland Bay, Isle of Wight. Report of Meteorological Observations for the year 1900, with extremes and averages for preceding years, by John Dover, M.A., F.R.Met.Soc. Eastbourne, 1901. Size 9½ × 6. Pp. 16.

Record of Results of Observations in Meteorology and Terrestrial Magnetism made at the Melbourne Observatory and other localities in the Colony of Victoria, Australia, from 1st of January to 30th of June, 1900, under the direction of Pietro Baracchi. Melbourne, 1901. Size 9½ × 6½. Pp. 48.

The Weather, 1884-1900. Resumé of the Beckford Meteorological Observations for the last seventeen years of the Nineteenth Century, by Frederick Slade, Assoc.M.Inst.C.E., F.R.Met.Soc. Evesham, 1901. Size 6½ × 4½. Pp. 18.

The Twelfth Annual Report on the Health and Sanitary Condition of the Town and Urban District of Newquay for 1900, by Arthur Hardwick, M.D. Newquay, 1901. Size 8½ × 5½. Pp. 24.

Bulletin Mensuel de l'Observatoire Météorologique de l'Université d'Upsal. Vol. **32**, année 1900. Par Dr. H. Hildebrand Hildebrandsson. Upsala, 1901. Size 13 × 10. Pp. 74.

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## METEOROLOGICAL NEWS AND NOTES.

MR. H. HELM CLAYTON makes a spirited reply to the criticisms by Prof. Bigelow on his paper on the Eclipse Cyclone noticed in this column last month. He explains in *Science* for May 10th the reason for the method of investigation which he adopted, and vindicates his results; but as a paper on the subject of the Eclipse Cyclone by Mr. Clayton is announced for reading at the next meeting of the Royal Meteorological Society, it is unnecessary to say more on the subject at present.

THE FRENCH ASSOCIATION for the Advancement of Science differs from the British Association in having a section devoted to Meteorology, and the President of this section, the Abbé Maze, Secretary of the French Meteorological Society, has announced that a special subject for consideration at the meeting at Ajaccio in September will be, "Storms, with special reference to their formation and movement."

AN ENGLISH TRANSLATION of Hann's great work on Meteorology, now appearing in parts, is, of course, an impossibility in England, where no publisher would care to undertake the expense of reproducing a scientific classic, and where no public funds are available for such a purpose. Hence we observe with great pleasure a statement in the last number of the American *Monthly Weather Review*:—"If there is a sufficient demand for an English translation, we believe that the Chief of Bureau will be pleased to provide it, although it may include only a portion of the present work."

ADMIRAL DE BRITO CAPELLO having resigned the post of Director of the "Infante D. Luiz" Meteorological and Magnetic Observatory at Lisbon, General A. A. de Pina Vidal, Professor of Physics in the Lisbon Polytechnic School, has been appointed as his successor.

DR. CHARLES DAVISON publishes in *Knowledge* for June an interesting little map showing the points at which the minute guns fired by the fleet at Spithead, on the occasion of the late Queen's funeral on February 1st, were heard. People who tried to hear the guns within 50 miles of the ships, succeeded in doing so in very few instances; but a very great number heard the rhythmic succession of reports between the distances of 60 and 80 miles, while in one case they were heard at a distance of 139 miles. Dr. Davison attributes this curious variation in audibility to the action of the wind, which on the date in question probably distorted the sound-waves so as to throw the rays of sound upwards, over the heads of observers in the immediate neighbourhood, and downwards again at a greater distance.

FREE HARVEST WEATHER FORECASTS are to be issued by the Meteorological Office this year. They will be prepared at 3.30 p.m. daily, and refer to the 24 hours from the midnight following. The only charge to be made is the actual cost of the telegram, which may be paid in advance for any period. An excellent innovation is the provision by the Meteorological Office of forms on which an observer can record the weather experienced, so that the office may be supplied with data for testing the accuracy of the forecasts. The new service will not interfere with the supply of single daily forecasts by telegraph, on payment of the usual small fee.

A CORRESPONDENT writes, with reference to the photograph of a tree subjected to a prevailing wind, on p. 42 of our April number:—"A friend of mine in one of the Eastern Counties, having occasion to change his gardener, was showing a candidate for the vacant post over the scene of his prospective labours, and mentioned that the charge of a small plantation surrounding the garden would be included in the duties. The man, who had never seen the power of the wind so sharply defined before, looked around carefully and replied that he liked the garden, but must decline the job, for he never could undertake to keep the whole of the trees clipped to that one particular angle."

# METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858–97.

## BAROMETRIC PRESSURE.

| Months. | MONTHLY MEANS. | | | MEANS, 9 A.M. AND 9 P.M. | | | | | | EXTREMES, 9 A.M. AND 9 P.M. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | HIGHEST. | | LOWEST. | | HIGHEST. | | | LOWEST. | | |
| | Mean 40 Years. | Highest Month. | Lowest Month. | 9 a.m. | 9 p.m. | 9 a.m. | 9 p.m. | 9 a.m. | 9 p.m. | 9 a.m. | 9 p.m. | Mean of all 9 a. & 9 p | 9 a.m. | 9 p.m. | Mean of all 9 a. & 9 p. |
| | in. | in. | in. | in. | in. | in. | in. | in. | in. | in. | in. | in. | in. | in. | in. |
| Jan. ... | 29·982 | 30·378 | 29·573 | 29·983 | 29·981 | 30·378 | 30·378 | 29·583 | 29·564 | 30·950 | 30·934 | 30·529 | 28·528 | 28·476 | 29·205 |
| Feb. ... | 30·003 | 30·480 | 29·537 | 30·004 | 30·003 | 30·481 | 30·478 | 29·538 | 29·536 | 30·854 | 30·770 | 30·509 | 28·761 | 28·767 | 29·319 |
| March... | 29·903 | 30·202 | 29·574 | 29·905 | 29·901 | 30·208 | 30·197 | 29·561 | 29·587 | 30·788 | 30·782 | 30·452 | 28·693 | 28·676 | 29·215 |
| April ... | 29·931 | 30·180 | 29·658 | 29·932 | 29·931 | 30·184 | 30·182 | 29·664 | 29 652 | 30·722 | 30·677 | 30·367 | 28·911 | 28·885 | 29·376 |
| May ... | 29·978 | 30·236 | 29·784 | 29·979 | 29·978 | 30·244 | 30·228 | 29·781 | 29·787 | 30·643 | 30·650 | 30·372 | 28·980 | 29·083 | 29·499 |
| June ... | 29·995 | 30·216 | 29·782 | 29·995 | 29·994 | 30·221 | 30·211 | 29·773 | 29·792 | 30·600 | 30·590 | 30·321 | 29·312 | 29·173 | 29·563 |
| July ... | 29·961 | 30·193 | 29·767 | 29·963 | 29·959 | 30·197 | 30·189 | 29·766 | 29·769 | 30·469 | 30·450 | 30·293 | 29·210 | 29·247 | 29·550 |
| August. | 29·946 | 30·156 | 29·720 | 29·947 | 29·945 | 30·149 | 30·163 | 29·716 | 29·724 | 30·480 | 30·488 | 30·279 | 29·149 | 29·010 | 29·503 |
| Sept. ... | 29·970 | 30·255 | 29·757 | 29·971 | 29·970 | 30·260 | 30·250 | 29·747 | 29·766 | 30·532 | 30·523 | 30·387 | 28·731 | 28·959 | 29·451 |
| Oct. ... | 29·906 | 30·189 | 29·576 | 29·906 | 29·906 | 30·188 | 30·191 | 29·597 | 29·554 | 30·683 | 30·662 | 30·438 | 28·640 | 28·774 | 29·260 |
| Nov. ... | 29·929 | 30·307 | 29·678 | 29·931 | 29·927 | 30·313 | 30·301 | 29·700 | 29·653 | 30·741 | 30·711 | 30·485 | 28·533 | 28·760 | 29·179 |
| Dec. ... | 29·947 | 30·312 | 29·481 | 29·948 | 29·945 | 30·320 | 30·304 | 29·483 | 29·479 | 30·784 | 30·782 | 30·496 | 28·398 | 28·323 | 29·187 |
| Means.. | 29·954 | 30·259 | 29·657 | 29·956 | 29·953 | 30·262 | 30·256 | 29·659 | 29·655 | 30·687 | 30·668 | 30·411 | 28·821 | 28·844 | 29·359 |
| Highest. | 30·003 | 30·480 | 29·784 | 30·004 | 30·003 | 30·481 | 30·478 | 29·781 | 29·792 | 30·950 | 30·934 | 30·529 | 29·312 | 29·247 | 29·563 |
| Lowest.. | 29·903 | 30·156 | 29·481 | 29·905 | 29·901 | 30·149 | 30·163 | 29·483 | 29·479 | 30·469 | 30·450 | 30·279 | 28·398 | 28·323 | 29·179 |

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, DECEMBER, 1900.

| STATIONS. *(Those in italics are South of the Equator.)* | Absolute. Maximum. Temp. | Date. | Absolute. Minimum. Temp. | Date. | Average. Max. | Min. | Dew Point. | Humidity. | Absolute. Max. in Sun. | Min. on Grass. | Total Rain. Depth. | Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0-100 | ° | ° | inches | | |
| London, Camden Square | 56·5 | 12 | 28·3 | 23 | 50·1 | 40·6 | 41·8 | 87 | 73·1 | 23·4 | 2·55 | 21 | 6·5 |
| Malta | 64·6 | 7 | 45·3 | 16 | 62·6 | 52·2 | 50·6 | 85 | 122·0 | 42·8 | 1·04 | 9 | 2·8 |
| *Cape of Good Hope* | 91·0 | 1 | 49·9 | 26 | 77·1 | 59·7 | 56·3 | 65 | ... | ... | ·67 | 7 | 3·1 |
| *Mauritius* | 87·2 | 29 | 66·4 | 2 | 84·0 | 71·5 | 66·7 | 72 | 152·3 | 60·5 | ·68 | 15 | 5·1 |
| Calcutta | 83·3 | 5 | 54·8 | 10 | 80·1 | 58·1 | 56·9 | 66 | 135·0 | 49·1 | ·05 | 1 | 1·4 |
| Bombay | 90·1 | 18 | 66·2 | 28 | 85·9 | 72·0 | 67·3 | 68 | 139·7 | 57·8 | ·00 | 0 | 2·0 |
| Colombo, Ceylon | 91·7 | 26 | 70·0 | 30 | 85·5 | 73·1 | 72·6 | 82 | 154·0 | 67·0 | 5·20 | 10 | 4·5 |
| *Melbourne* | 104·8 | 30 | 45·6 | 24 | 77·1 | 53·9 | 50·3 | 63 | 161·1 | 36·1 | 1·18 | 7 | 5·8 |
| *Adelaide* | 105·4 | 30 | 48·7 | 14 | 85·5 | 59·5 | 48·7 | 44 | 165·4 | 43·8 | ·39 | 4 | 3·4 |
| *Sydney* | 104·1 | 17 | 58·6 | 12 | 76·7 | 63·5 | 58·7 | 67 | 153·0 | 49·0 | 2·06 | 16 | 5·6 |
| *Wellington* | 78·0 | 19 | 45·0 | 11 | 65·8 | 51·6 | 47·4 | 67 | 133·0 | 34·0 | 4·49 | 13 | 4·6 |
| *Auckland* | 76·0 | 19 | 49·0 | 26 | 68·9 | 55·4 | 50·8 | 67 | 144·0 | 47·0 | 2·33 | 17 | 4·7 |
| Jamaica, Halfway Tree | 90·0 | 15 | 65·0 | 31 | 86·9 | 68·7 | 67·3 | 77 | ... | ... | 1·58 | 5 | 2·5 |
| Trinidad | 90·0 | 1*a* | 66·0 | 12*b* | 83·2 | 77·5 | 72·3 | 83 | 162·0 | 49·0 | 2·61 | 17 | ... |
| Grenada | 87·0 | 3 | 71·0 | 24 | 83·2 | 74·1 | 70·3 | 70 | 151·0 | ... | 6·16 | 24 | 3·2 |
| Toronto | 48·4 | 22 | —1·5 | 14 | 35·5 | 30·0 | 25·0 | 79 | 62·4 | —4·4 | ·83 | 14 | 7·8 |
| Fredericton New Brunswick, | 39·9 | 20 | —15·3 | 16 | 25·5 | 5·6 | 10·0 | 80 | ... | ... | 2·23 | 7 | 5·3 |
| Winnipeg, Manitoba | 36·0 | 21 | —25·6 | 13 | 19·8 | —1·0 | ... | ... | ... | ... | ·67 | 9 | 5·9 |
| Victoria, British Columbia | 55·0 | 18 | 31·2 | 31 | 48·0 | 42·2 | .. | ... | ... | ... | 4·07 | 21 | 8·7 |

*a*—and 3, 7 and 9. *b*—and 26.

### REMARKS.

MALTA.—Mean temp. of air 56°·5 or 0°·2 above the average. Mean hourly velocity of wind 10·3 miles or 0·9 below average. Mean temp. of sea 63°·7. TS on 8th. L on 3rd. H on 2nd. J. F. DOBSON.

*Mauritius.*—Mean temp. of air 0°·1, of dew point 1°·3, and rainfall 4·02 in., below their respective averages. Mean hourly velocity of wind 10·2 miles, or 0·7 below average; extremes, 22·7 on 4th and 0·0 on 2nd; prevailing direction E. by N. T. F. CLAXTON.

COLOMBO, CEYLON.—Mean temp. of air 0°·6 above, of dew point 1°·5 above, and rainfall 1·19 in. below, their respective averages. Mean hourly velocity of wind 7·5 miles; prevailing direction N.E. TSS occurred on three days; L was seen on four days. W. C. S. INGLES.

*Adelaide.*—Mean temp. of air 0°·8 above average. Rainfall ·43 in. below average. C. TODD, F.R.S.

*Sydney.*—Mean temp. of air 0°·2 above, humidity 1·9 below, and rainfall ·49 in. below, their respective averages. H. C. RUSSELL, F.R.S.

*Wellington.*—Mean temp. of air 2°·1 below, and rainfall ·68 in. above, their respective averages. Generally showery, especially towards the end of the month. Prevailing wind N.W., and, on the whole, moderate; cool weather for time of year. H on 25th. R. B. GORE.

*Auckland.*—Mean temp., rainfall and barometric pressure all very close to the average of 32 years. T. F. CHEESEMAN.

TRINIDAD.—Rainfall 2·20 in. below the 30 years' average. J. H. HART.

# SUPPLEMENTARY TABLE OF RAINFALL, MAY, 1901.

| Div | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| I. | Uxbridge, Harefield Pk.. | ·73 | XI. | Castle Malgwyn ..... | ·96 |
| II. | Dorking, Abinger Hall . | ·48 | ,, | Builth, Abergwesyn Vic. | 1·46 |
| ,, | Sheppey, Leysdown ..... | ·80 | ,, | Rhayader, Nantgwillt ... | 1·15 |
| ,, | Hailsham ..... | ·87 | ,, | Lake Vyrnwy ..... | ·95 |
| ,, | Crowborough..... | 1·12 | ,, | Corwen, Rhug ..... | 1·09 |
| ,, | Ryde, Thornbrough ..... | ... | ,, | Criccieth, Talarvor ..... | ·81 |
| ,, | Emsworth, Redlands ... | ·87 | ,, | I. of Anglesey, Lligwy.. | ·90 |
| ,, | Alton, Ashdell ..... | ·66 | ,, | Douglas, Woodville..... | 1·55 |
| ,, | Newbury, Welford Park | 1·26 | XII. | Stoneykirk, Ardwell Ho. | 2·51 |
| III. | Oxford, Magdalen Coll.. | 1·27 | ,, | New Galloway, Glenlee | 1·73 |
| ,, | Banbury, Bloxham ..... | 1·20 | ,, | Moniaive, Maxwelton Ho. | 2·77 |
| ,, | Pitsford, Sedgebrook ... | 1·67 | ,, | Lilliesleaf, Riddell ..... | 2·31 |
| ,, | Huntingdon, Brampton. | ·97 | XIII. | N. Esk Res. [Penicuick] | 1·95 |
| ,, | Wisbech, Bank House... | 1·15 | XIV. | Glasgow, Queen's Park.. | 1·91 |
| IV. | Southend ..... ..... | ·68 | XV. | Inveraray, Newtown ... | 2·03 |
| ,, | Colchester, Lexden ..... | 1·10 | ,, | Ballachulish, Ardsheal... | 1·60 |
| ,, | Saffron Waldon, Newport | 2·27 | ,, | Islay, Eallabus..... ... | 1·69 |
| ,, | Rendlesham Hall ..... | 1·41 | XVI. | Dollar..... | 1·57 |
| ,, | Swaffham ..... | 1·00 | ,, | Balquhidder, Stronvar... | 3·68 |
| V. | Salisbury, Alderbury ... | 1·18 | ,, | Coupar Angus Station... | 2·13 |
| ,, | Bishop's Cannings ..... | 1·80 | ,, | Blair Atholl ... ..... | 1·96 |
| ,, | Blandford, Whatcombe . | 1·23 | XVII. | Keith H.R.S..... | 1·63 |
| ,, | Ashburton, Druid House | 2·36 | ,, | Forres H.R.S. ... ..... | 1·20 |
| ,, | Okehampton, Oaklands. | 1·26 | XVIII. | Fearn, Lower Pitkerrie.. | 1·87 |
| ,, | Hartland Abbey ..... | ·76 | ,, | S. Uist, Askernish ..... | 1·76 |
| ,, | Lynton, Glenthorne ... | ... | ,, | Invergarry..... | ·58 |
| ,, | Probus, Lamellyn ..... | 1·27 | ,, | Aviemore, Alvie Manse. | 1·40 |
| ,, | Wellington, The Avenue | ·76 | ,, | Loch Ness, Drumnadrochit | 1·46 |
| ,, | North Cadbury Rectory | 1·52 | XIX. | Invershin ..... | ·97 |
| ,, | Clifton, Pembroke Road | 1·10 | ,, | Durness ..... | ... |
| VI. | Ross, The Graig ..... | 1·21 | ,, | Watten H.R.S..... | 1·26 |
| ,, | Wem, Clive Vicarage ... | ·67 | XX. | Dunmanway, Coolkelure | 2·58 |
| ,, | Wolverhampton, Tettenhall | 1·17 | ,, | Cork, Wellesley Terrace | 2·07 |
| ,, | Cheadle, The Heath Ho. | ·93 | ,, | Killarney, District Asyl. | 2·32 |
| ,, | Coventry, Priory Row .. | ·87 | ,, | Caher, Duneske ..... | 1·91 |
| VII. | Market Overton ..... | 1·15 | ,, | Ballingarry, Hazelfort... | 1·83 |
| ,, | Grantham, Stainby ..... | 1·09 | ,, | Limerick, Kilcornan ... | ... |
| ,, | Horncastle, Bucknall ... | 1·15 | ,, | Miltown Malbay ..... | 1·84 |
| ,, | Worksop, Hodsck Priory | 1·03 | XXI. | Gorey, Courtown House | 1·08 |
| VIII. | Neston, Hinderton ..... | 1·15 | ,, | Moynalty, Westland ... | 3·97 |
| ,, | Southport, Hesketh Park | ·97 | ,, | Athlone, Twyford ..... | 2·04 |
| ,, | Chatburn, Middlewood. | ·86 | ,, | Mullingar, Belvedere ... | 1·89 |
| ,, | Duddon Val., Seathwaite Vic. | 2·31 | XXII. | Woodlawn ..... | 1·64 |
| IX. | Baldersby ..... | ·96 | ,, | Crossmolina, Enniscoe .. | 2·67 |
| ,, | Scalby, Silverdale ..... | ... | ,, | Collooney, Markree Obs. | 2·43 |
| ,, | Ingleby Greenhow Vic.. | 1·55 | XXIII. | Enniskillen, Model Sch. | 2·47 |
| ,, | Middleton, Mickleton ... | 1·21 | ,, | Warrenpoint..... | 2·79 |
| X. | Haltwhistle, Unthank H. | ... | ,, | Miltown, Banbridge..... | 1·51 |
| ,, | Bamburgh ..... | 2·19 | ,, | Belfast, Springfield ..... | 1·72 |
| ,, | Keswick, The Bank ..... | 1·37 | ,, | Bushmills, Dundarave.. | 2·13 |
| XI. | Llanfrechfa Grange ..... | 1·23 | ,, | Stewartstown ..... | 1·93 |
| ,, | Treherbert, Tyn-y-waun | 2·45 | ,, | Killybegs ..... | 2·41 |
| ,, | Llandovery ..... | ·86 | ,, | Horn Head ..... | 1·65 |

# MAY, 1901.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1890-9. | Greatest Fall in 24 hours. Dpth | Date | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Max. Date | Min. Deg. | Min. Date. | No. of Nights below 32°. In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches. | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | ·85 | — ·71 | ·39 | 7 | 6 | 83·8 | 29 | 36·8 | 18 | 0 | 1 |
| II. | | Tenterden ..... | 1·01 | — ·80 | ·39 | 7 | 5 | 80·0 | 29 | 34·0 | 6 | 0 | 5 |
| ,, | | Hartley Wintney ..... | ·56 | — 1·30 | ·19 | 30 | 9 | 82·0 | 29 | 30·0 | 5 | 1 | 3 |
| III. | | Hitchin ..... ..... | 1·28 | — ·46 | ·47 | 7 | 9 | 79·0 | 29 | 35·0 | 17 | 0 | ... |
| ,, | | Winslow (Addington) ..... | 1·69 | — ·02 | ·54 | 7 | 6 | 81·0 | 29 | 31·0 | 18 | 1 | 3 |
| IV. | | Bury St. Edmunds (Westley) | ·89 | — ·95 | ·32 | 10 | 6 | 79·0 | 29 | 32·0 | 1 | 1 | ... |
| ,, | | Norwich (Brundall) ..... | ·86 | ... | ·39 | 7 | 9 | 76·7 | 28 | 33·4 | 18 | 0 | 11 |
| V. | | Winterbourne Steepleton ... | 1·31 | ... | ·57 | 30 | 6 | 71·3 | 22 | 30·5 | 8 | 1 | 11 |
| ,, | | Torquay (Cary Green) ... ..... | 1·43 | ... | ·69 | 30 | 8 | 66·2 | 14 | 40·0 | 8 | 0 | 0 |
| ,, | | Polapit Tamar [Launceston].. | 1·28 | — ·96 | ·56 | 7 | 7 | 73·2 | 22 | 32·8 | 12 | 0 | ... |
| VI. | | Stroud (Upfield) ..... ... | 1·14 | — ·75 | ·44 | 8 | 6 | 80·0 | 29 | 41·0 | 3*d* | 0 | ... |
| ,, | | Church Stretton (Woolstaston) | 1·02 | — 1·28 | ·26 | 9 | 11 | 76·0 | 29 | 37·0 | 8 | 0 | ... |
| ,, | | Worcester (Diglis Lock) ..... | 1·09 | — ·65 | ·45 | 8 | 9 | ... | ... | ... | ... | ... | ... |
| VII. | | Boston ..... | 1·49 | — ·01 | ·55 | 29 | 5 | 80·0 | 29 | 42·0 | 7 | 0 | ... |
| ,, | | Hesley Hall [Tickhill]..... | ·74 | — ·80 | ·18 | 9 | 9 | 79·0 | 29 | 32·0 | 5*e* | 2 | ... |
| ,, | | Derby (Midland Railway)..... | ·84 | — 1·01 | ·26 | 8*i* | 8 | 81·0 | 29 | 37·0 | 5*f* | 0 | ... |
| VIII. | | Manchester (Plymouth Grove) | 1·10 | — ·99 | ·33 | 29 | 10 | 82·0 | 29 | 38·0 | 16 | 0 | ... |
| IX. | | Wetherby (Ribston Hall) ... | ·67 | — 1·00 | ·20 | 29 | 8 | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) ..... | 1·92 | — 1·47 | ·75 | 29 | 10 | ... | ... | ... | ... | ... | ... |
| ,, | | Hull (Pearson Park). ... ..... | ·91 | — ·90 | ·37 | 29 | 7 | 75·0 | 28 | 31·0 | 15 | ... | 2 |
| X. | | Newcastle (Town Moor) ..... | 2·24 | + ·49 | 1·00 | 26 | 13 | ... | ... | . | ... | ... | ... |
| ,, | | Borrowdale (Seathwaite)..... | 2·77 | — 4·57 | ·92 | 29 | 12 | 74·0 | 24 | 36·3 | 8 | 0 | ... |
| XI. | WALES. | Cardiff (Ely)..... | ·95 | — 1·40 | ·40 | 30 | 8 | ... | ... | ... | ... | ... | ... |
| ,, | | Haverfordwest ..... .... | 1·36 | — ·93 | ·44 | 30 | 6 | 74·8 | 22 | 35·3 | 12 | 0 | 11 |
| ,, | | Aberystwith (Gogerddan) ... | ·40 | — 2·12 | ·15 | 6 | 5 | 78·0 | 14 | 26·0 | 7 | 5 | ... |
| ,, | | Llandudno..... | ·96 | — ·87 | ·21 | 27 | 9 | 69·0 | 21 | 39·0 | 8*g* | 0 | ... |
| XII. | SCOTLAND. | Cargen [Dumfries] ..... | 2·37 | — ·27 | ·82 | 29 | 9 | 75·0 | 21*a* | 35·0 | 14 | 0 | ... |
| XIII. | | Edinburgh (Royal Observatory) | 1·95 | ... | ·52 | 26 | 10 | 68·9 | 21 | 36·2 | 4 | 0 | 4 |
| XIV. | | Colmonell ..... ..... | 2·29 | — ·17 | ·64 | 7 | 8 | 78·0 | 22 | 31·0 | 11 | ... | ... |
| XV. | | Tighnabruaich ..... ..... ..... | 2·36 | ... | ·70 | 29 | 9 | 70·0 | 24 | 34·0 | 11 | 0 | ... |
| ,, | | Mull (Quinish)..... | 1·95 | — 1·20 | ·58 | 31 | 9 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Leven Sluices ..... | 2·45 | + ·16 | ·72 | 30 | 12 | ... | ... | ... | ... | ... | ... |
| ,, | | Dundee (Eastern Necropolis) | 1·70 | — ·06 | ·40 | 29 | 12 | 73·1 | 4 | 36·4 | 4 | 0 | ... |
| XVII. | | Braemar ..... .. | 2·48 | + ·29 | ·68 | 7 | 12 | 69·3 | 21 | 31·0 | 4 | 2 | 13 |
| ,, | | Aberdeen (Cranford) ... ..... | 2·41 | + ·40 | ·70 | 30 | 14 | 65·0 | 1*b* | 30·0 | 15 | 3 | ... |
| ,, | | Cawdor (Budgate) ..... | 1·32 | — ·78 | ·37 | 7 | 12 | ... | ... | ... | ... | ... | ... |
| XVIII | | Strathconan [Beauly] ..... | 1·23 | — 2·09 | ·30 | 7 | 7 | . | ... | ... | ... | ... | ... |
| ,, | | Glencarron Lodge..... | 1·60 | — 3·65 | ·38 | 10 | 11 | 74·9 | 22 | 33·0 | 12 | 0 | ... |
| XIX. | | Dunrobin ..... | 2·17 | + ·24 | ·90 | 30 | 8 | 72·0 | 14 | 37·2 | 4 | 0 | ... |
| ,, | | S. Ronaldshay (Roeberry) ... | 1·66 | — ·40 | ·55 | 30 | 10 | 67·0 | 23 | 34·0 | 16 | 0 | ... |
| XX. | | Darrynane Abbey..... | 1·70 | — ·74 | ·51 | 10 | 11 | ... | ... | ... | ... | ... | ... |
| ,, | | Waterford (Brook Lodge) ... | 1·71 | — ·94 | ·45 | 30 | 9 | 71·0 | 16 | 32·0 | 12 | 1 | ... |
| ,, | | Broadford (Hurdlestown) ... | 1·32 | — ·91 | ·30 | 8 | 11 | 71·0 | 22 | 36·0 | 10*h* | 0 | ... |
| XXI. | IRELAND. | Carlow (Browne's Hill) ..... | .. | ... | ... | ... | ... | ... | ... | . | ... | ... | .. |
| ,, | | Dublin (FitzWilliam Square) | 1·20 | — ·70 | ·25 | 27 | 9 | 66·7 | 31 | 39·1 | 12 | 0 | 0 |
| XXII. | | Ballinasloe ..... ..... | 1·90 | — ·55 | ·37 | 5 | 11 | 78·0 | 21 | 36·0 | 13 | 0 | ... |
| ,, | | Clifden (Kylemore) ..... .. | 2·93 | — 1·69 | ·62 | 30 | 8 | ... | ... | ... | ... | ... | ... |
| XXIII | | Seaforde..... | 1·65 | — ·66 | ·48 | 30 | 9 | 73·0 | 21 | 33·0 | 11 | 0 | 3 |
| ,, | | Londonderry (Creggan Res.). | 1·49 | — 1·15 | ·38 | 6 | 10 | ... | ... | ... | ... | ... | ... |
| ,, | | Omagh (Edenfel) ..... | 1·86 | — ·68 | ·45 | 6 | 12 | 74·0 | 15*c* | 33·0 | 9 | 0 | 1 |

+ Shows that the fall was above the average ; — that it was below it.

*a*—and 24. *b*—and 4, 21, 22. *c*—and 21. *d*—and 5, 10, 11. *e*—and 15. *f*—and 17. *g*—and 12. *h*—and 11. *i*—and 29.

# METEOROLOGICAL NOTES ON MAY, 1901.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

LONDON, CAMDEN SQUARE.—A dry and sunny month, particularly after the 9th. Unsettled from 6th to 9th, with slight TSS and H at times. Mean temp. 54°·9, or 0°·9 above the average. Absolute drought on 19 days, 10th to 28th.

TENTERDEN.—A dry month, except for showers from 6th to 10th, and on 30th. Much E. wind, but not exceptionally strong. Vegetation was backward, but in full beauty at the end, when warmer weather set in with S. wind. Duration of sunshine, 256 hours. Absolute drought 11th to 29th.

HARTLEY WINTNEY.—With the exception of two slight electrical disturbances about the 9th and 29th, the drought which commenced on April 16th continued. There were many cloudless days, and keen E. and N.E. winds throughout. Ozone on 9 days, with a mean of 4·3. Swifts seen on the wing on 5th. May-blossom on 19th.

WINSLOW, ADDINGTON.—Not a drop of R from 9th to 29th, and then just enough to moisten the surface. Absolute drought of 19 days. The temp. was low at night all through the month. Much sunshine, many days being cloudless. Distant T on 8th, 9th and 29th.

BURY ST. EDMUNDS, WESTLEY.—A very dry month. The 23 days of N. and N.E. winds were very injurious to vegetation. T on 5 days.

NORWICH, BRUNDALL.—A very dry month with much brilliant sunshine, but cold on many days. Sharp TSS on 6th. T on 7th, 25th, 26th and 29th: L on 29th.

WINTERBOURNE STEEPLETON.—A dry month, with a good deal of hot sun by day, but cold nights; the mean max. temp. being 62°·5, and the mean min. 40°·8. The wind, until the last week, was almost entirely northerly. Absolute drought of 19 days, 10th to 28th.

POLAPIT TAMAR [LAUNCESTON].—A period without any rain from 11th to 24th; but steady R fell for about seven hours on 30th. Distant T on 8th.

## WALES.

HAVERFORDWEST.—A very fine dry month, with small R and a great deal of bright sunshine. From 11th to 28th no R fell, and there was a remarkable absence of dew. Night temp. was low. The winds were generally moderate, and for the most part from N. or E. Hay crops are very scanty, but corn was generally looking well; R, however, was greatly needed. Hours of bright sunshine 283·9. The foliage of the oak was far in advance of that of the ash. TS on 4th.

ABERYSTWITH, GOGERDDAN.—A trying month, with little R for the season. Winds either N. or N.E. Absolute drought of 19 days, 10th to 28th.

## SCOTLAND.

COLMONELL, CLACHANTON.—Mean temp. 53°·2, or 2°·4 above the average of 25 years. T and L on 3rd and 7th, with heavy H showers on 7th.

TIGHNABRUAICH, CRAIGANDARAICH.—A model month of May, well-balanced in point of moisture, temp. and sunshine. The average max. temp. was 5° above that of May, 1900.

ABERDEEN, CRANFORD.—An exceptionally fine month.

S. RONALDSHAY, ROEBERRY.—A very fine month. Mean temp. 47°·3, or 0°·1 below the average of eleven years.

## IRELAND.

DARRYNANE ABBEY.—Very dry and warm. Strong gales on 30th and 31st.

WATERFORD, BROOK LODGE.—T on 4th, 5th and 8th. Heavy gale from S.W. on 31st. H showers on 7th.

BROADFORD, HURDLESTOWN.—A very favourable month, with an absolute drought of 15 days from 11th to 26th, the first since July, 1898. T on 3rd. H on 8th. Moderate S. gale on 31st.

DUBLIN, FITZWILLIAM SQUARE.—A delightful month; bright, dry and seasonably warm. As usual N.E. and E. winds prevailed, and as the atmosphere was dry the diurnal range of temp. was large. Sunny, warm days were followed by calm, cold nights. Absolute drought prevailed for 15 days from 11th to 25th inclusive. The mean temp. was 53°·6, or 1°·6 above the average. High winds were noted on six days, and attained the force of a gale on 31st. H on 5th and 7th; T and L on 5th, and T on 7th.

BALLINASLOE.—Absolute drought for 15 days from 11th to 25th. This has only occurred on seven occasions in 30 years.

OMAGH, EDENFEL.—May was a pleasant surprise. It is seldom indeed that so sudden a reversal of weather as that which took place on April 17th, from a disagreeable spring, has been so permanent through a month usually fickle. With sufficient R during the first and last weeks the settled summer weather of the remainder of the month resulted in a season of unusual beauty and profusion of foliage and flower. On nine days the temp. reached 70° or above, a record only once approached in 36 years, but the entire absence of the "cold snap" in May was still more remarkable.

# Correspondence.

## LOW RELATIVE HUMIDITIES IN MAY, 1901.

*To the Editor of Symons's Meteorological Magazine.*

PERHAPS the enclosed record of thermometric and hygrometric readings here on 23rd and 24th May, from 3 p.m. to 6 p.m., may be of sufficient interest to find a place in the monthly Magazine. The relative humidity of 25 per cent. at 4 p.m. on the 24th is the lowest I have registered during my nineteen years' observations here.

| May, 1901. | Dry Bulb. | Wet Bulb. | DewPoint. | Relative Humidity. | Wind | | Cloud. |
|---|---|---|---|---|---|---|---|
| | ° | ° | ° | per cent. | | | |
| 23rd— | | | | | | | |
| 3 p.m. | 70·6 | 51·6 | 37·1 | 29 | E.N.E. | 5 to 7 | 0 |
| 3.30 ,, | 69·3 | 49·1 | 33·4 | 27 | | | |
| 4 ,, | 69·3 | 49·7 | 34·5 | 28 | ,, | 4 to 6 | 0 |
| 4.30 ,, | 68·4 | 49·4 | 34·5 | 29 | | | |
| 5 ,, | 67·3 | 49·7 | 35·7 | 31 | ,, | ,, | 0 |
| 6 ,, | 64·1 | 47·3 | 33·4 | 31 | ,, | ,, | 0 |
| 24th— | | | | | | | |
| 3 p.m. | 73·1 | 54·3 | 40·4 | 30 | E. | 4 to 6 | 0 |
| 3.30 ,, | 71·5 | 51·1 | 35·2 | 26 | | | |
| 4 ,, | 71·6 | 49·9 | 33·5 | 25 | ,, | ,, | 0 |
| 4.30 ,, | 71·1 | 50·9 | 35·6 | 28 | | | |
| 5 ,, | 69·4 | 52·4 | 39·2 | 33 | ,, | 3 to 5 | 0 |
| 6 ,, | 65·9 | 49·1 | 35·5 | 32 | ,, | 2 to 4 | 0 |

R. H. BARNES.

*Heatherland House, Parkstone, 6th June, 1901.*

SYMONS'S

METEOROLOGICAL MAGAZINE.

No. CCCCXXVI.] JULY, 1901. VOL. XXXVI.

## Sir Cuthbert Peek.

1855–1901.

BY the death of Sir Cuthbert Peek, Bart., on July 6th, at the age of 46 years, the science of Meteorology has lost a patron and student. Sir Cuthbert will be remembered on account of his establishment, in 1886, of a completely equipped astronomical and meteorological observatory at Rousdon, in Devon, from which an annual report of considerable value has ever since been regularly issued. He was, at the time of his death, a member of the Council of the Royal Meteorological Society, and he had been an observer for the British Rainfall Organization for eighteen years. These services to meteorology are deserving of recognition, and remind us once more of the worthy tradition of British science, that men of wealth and leisure should co-operate on equal terms with the specialist and the humbler amateur in advancing knowledge.

## ON A FALLACY AS TO THE DIURNAL BAROMETER WAVE.

By W. H. DINES, B.A.,

*President of the Royal Meteorological Society.*

THE paper of Mr. Helm Clayton recently read at the Royal Meteorological Society has suggested yet another cause for the puzzling phenomenon of the double daily oscillation of the barometer, and although there seem to be many difficulties in the way of accepting the theory put forward by Mr. Clayton, the idea is decidedly a hopeful one.

Under these circumstances it may be well to call attention to the fallacy of one of the explanations given in sundry books on Meteorology. If a barometer were placed in a sealed vessel, a steam boiler for instance, the changes in level of the mercury would exactly follow the changes in the temperature of the air inside, the percentage changes in the height being exactly equal to the percentage changes in the absolute temperature, i.e., in the temperature

measured from about —460° F. If there were a large opening in the boiler we know that warming the air would not alter the barometric height, corrected of course for temperature. If there were a very small hole, warming would raise the mercury level, and it would continue above its proper value until some of the air had had time to escape, a time that might be considerable if the hole were very small.

The fallacy to which I refer lies in assuming that the inertia of the air can act like a containing vessel with a small hole in it. The inertia of the air does act like a containing vessel, but it is like one with a large and not with a small hole.

Supposing a sudden change of temperature to have occurred in the lower layers of air, or a sudden increase of vapour tension, the result would be not a rise of the barometer lasting for hours or even minutes, but an oscillation with an extremely small period. On the supposition that the air above the warmed strata is rigid throughout the time that would elapse before the barometer fell back to its previous level is easily calculated. It is independent of the magnitude of the supposed change of temperature, and under the most favorable circumstances could not amount to 30 seconds. The air, however, is not rigid but elastic, and this greatly reduces the time.

Anyone unwilling to accept the result of a mathematical calculation may perhaps convince himself of this by experimenting with a column of water 34 ft. long, or even with the mercury column of the barometer itself. The inertia of the superincumbent air is exactly equal to the inertia of the mercury column, the only difference being that if an increased pressure moves both the mercury column and the upper layers of air, the air has farther to go ; and if it were possible for the inertia of the air to cause an increase of pressure to last for hours, the inertia of the mercury column would prevent the barometer from registering the change.

For calm air the barometer gives a perfectly exact measure of the mass of air above it, and no theory of the daily oscillation is tenable that runs counter to this fact.

Warmth reduces the height of the barometer provided there is time for the upper part of the warmed column to roll off, but could a space be enclosed by a wall reaching to the upper limit of the air, no variations of temperature in the enclosed space could effect the barometer in the slightest degree.

A mathematical statement of this question may be added for the convenience of anyone who wishes to go into the matter more fully.

Consider some air confined in a vertical tube of cross section A, and compressed by a piston of the same weight as that of the upper layers of the atmosphere. Let the pressure of the confined air be $p$, then the weight of the piston must be $Ap$.

Now suppose a sudden but small change of pressure ; it is required to find the time that will elapse before the pressure regains the value $p$.

Let $h$ be the height of the column of air in the case of equilibrium, i.e., when $p$ is the pressure, $h+x$ the height, and P the corresponding pressure at any other time.

We have (Case I. for isothermal expansion) $\frac{P}{p} = \frac{h}{h+x}$ ... (a)

(Case II. for adiabatic expansion) $\frac{P}{p} = \left(\frac{h}{h+x}\right)^{1\cdot408}$

Confining our attention to Case I. we have
force moving piston = AP − weight of piston = A $(P-p)$.

From (a) $P-p = -p\frac{x}{h+x} = -p\frac{x}{h}$ if we neglect the square and higher powers of $\frac{x}{h}$

The mass of the piston is $\frac{Ap}{g}$

Hence $$\frac{Ap}{g} \cdot \frac{d^2x}{dt^2} = -A\frac{px}{h}$$

or $$\frac{d^2x}{dt^2} + \frac{g}{h}x = 0.$$

This being the case of harmonic motion, the period is $2\pi\sqrt{\frac{h}{g}}$ and the time we require is $\frac{1}{4}$ of this; namely, $\frac{\pi}{2}\sqrt{\frac{h}{g}}$

For adiabatic expansion the time is $\frac{\pi}{2}\sqrt{\frac{h}{g \times 1\cdot408}}$

It follows that the time is independent of the actual change of pressure, provided only that this be small compared with the original pressure, and also that it varies as the square root of the height of the atmosphere in which the pressure is changed.

Supposing the temperature of the first half mile of air were suddenly changed, we have $h = 2640$ ft. (since $g$ is expressed in ft. $h$ must be also in ft.).

This gives a time of $\frac{\pi}{2}\sqrt{\frac{2640}{32}} = 14$ seconds about.

For adiabatic expansion the time is 20 % less.

---

The question is one that admits of a more rigorous solution. (See *Besant's Hydromechanics*, p. 253, 3rd Edition.) The actual period of the barometric oscillations must be about that required for the passage of a sound wave of a length not greater than $2h$, and could hardly exceed a few seconds.

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## UNPRECEDENTED HEAT IN NEW YORK.

THE heat-wave which overspread a considerable part of the United States from June 28th to July 4th appears from the reports in the daily Press to have produced more serious effects in New York than had ever been experienced before. The maxima recorded do not seem to have exceeded 100° in the shade, but the minima were frequently over 80°, so that little difference of temperature was perceptible indoors between day and night. The humidity also was exceptionally high. The asphalte, with which most of the streets in New York are paved, softened with the heat, and the wheels of heavy vehicles ploughed deep ruts in the roadway. Outdoor work was practically suspended, and it is stated that even the excitement of financial operations proved an inefficient spur to exhausted human

nature, and the Stock Exchanges both in New York and Boston were closed from July 3rd to 8th. It is said that 150,000 people had abandoned New York City, and special permission had been given to open the public parks at night for people to sleep in whose dwellings are uninhabitable on account of the heat. The hospitals were filled to overflowing with cases of heat prostration, and the deaths in the street have been so numerous that many bodies have had to be buried without identification. The *Times* correspondent, telegraphing on July 4th, says that the deaths from heat in Greater New York alone for seven days are estimated variously at from 619 to 740. Another newspaper states that over a thousand horses have dropped dead.

One of the most remarkable features of the heat-wave is a forecast stated to emanate from the Weather Bureau that there was no hope of any improvement in the weather for a month, but this, if issued, was fortunately falsified by the facts.

## ROYAL METEOROLOGICAL SOCIETY.

THE last meeting of the session was held on Wednesday afternoon, June 19th, at the Society's rooms, 70, Victoria Street, Westminster, Mr. W. H. Dines, B.A., President, in the chair.

Mr. J. H. H. Harrison, Mr. H. D. Jassoobhoy, and Dr. R. L. Jones were elected Fellows.

The President stated that the Symons Memorial Fund (see *ante* p. 73) had been transferred to the Society, and that the Council had that day accepted the trust.

A paper by Mr. H. Helm Clayton, of the Blue Hill Observatory, Mass., U.S.A., on "The Eclipse Cyclone, the Diurnal Cyclones, and the Cyclones and Anticyclones of Temperate Latitudes," was read by the Secretary. The author has discussed the meteorological observations made along the path of the total solar eclipse in the United States on May 28th, 1900, and also those made during three previous eclipses in various parts of the world. The meteorological changes due to the eclipse were separated from other changes of greater length, such as the diurnal and the cyclonic, by interpolating a uniform change between the beginning and the end of the eclipse and subtracting this from the observations. The author finds that a cyclone follows in the wake of the eclipse—though the changes are very minute and feeble—the fall of temperature developing a cold air cyclone in an astonishingly short time with all the peculiar circulation of winds and distribution of pressure which constitute such a cyclone. In the author's opinion the results show that a fall of temperature of the air does not act primarily to cause an anticyclone but a cyclone, and the anticyclone is a secondary phenomenon or rather a part of the cyclone. He also says that "the eclipse cyclone has suggested a new theory of the diurnal barometric waves, and also suggested explanations of certain phenomena of ordinary cyclones and anticyclones."

The President said that there can be no doubt that the low pressures at the poles are due to the centrifugal force of the westerly winds that blow more or less in all temperate latitudes, and hence we must accept Ferrel's cold centre cyclone as a possible phenomenon. The whole question as put forward in the paper depended on the reality of the cyclonic circulation produced by the eclipse, and if that were accepted as a fact it had a most important bearing on theoretical meteorology. Mr. Clayton's supposition as to the cause of the double barometric daily oscillation was also very suggestive, but there was one awkward fact against it which he seemed to have overlooked. The double oscillation, opposed to the 24 hour period oscillation, was most marked near the Equator, but owing to the absence of the directive tendency due to the Earth's rotation, these regions were exactly those in which a cyclone could not be set up by the daily temperature variation.

Capt. M. W. C. Hepworth mentioned that in the region of the trade winds, the diurnal range of barometric pressure is more accentuated in strong winds, both in rise and fall, than in light winds.

Prof. G. H. Darwin, Dr. R. H. Scott, Mr. J. Hopkinson, Mr. R. H. Curtis, and Capt. A. Carpenter, R.N., also took part in the discussion.

A paper by Mr. F. Napier Denison, of Victoria, British Columbia, on "The Seismograph as a sensitive Barometer," was read by the Secretary. A Milne seismograph was installed in 1898 at the Meteorological Office, Victoria, B.C.,* and the author has since that time compared its movements with the changes of atmospheric pressure recorded by his aerograph. He finds that when the barometric pressure is high over the Pacific slope from British Columbia south-eastward to California, and the barometer off the Pacific coast is comparatively low, the horizontal pendulum of the seismograph tends to move towards the eastward. This movement appears to be due to a distortion of the Earth's crust, caused by the heavier air over the Pacific slope depressing the underlying land surface below its normal position, while on the other hand, the comparatively light air over the adjacent ocean tends to allow the surface beneath to rise above its normal level. It has been found that when an extensive storm area is approaching from the westward, and often 18 to 24 hours before the local barometer begins to fall, the horizontal pendulum of the seismograph swings steadily to the eastward, completely masking any diurnal fluctuations that might have existed, as the storm area approaches; and in the event of it being followed by an important high area, the pendulum will begin to swing towards the westward before it is possible to ascertain the position of this area on the current Weather Charts.

* It seems rather late to correct a slip made so long ago as 1899 (*S. M. M.*, **34**, 148); but in the interests of accuracy the opportunity may be taken to mention that the Superintendent of the Meteorological Office at Victoria, B.C., was then and is still Mr. E. Baynes Reed.

Prof. G. H. Darwin, F.R.S., said that, while he was not convinced that the author had as yet established his conclusions, he thought that there was a future for work of this kind in meteorology. He had himself estimated about 20 years ago the probable amount of the elastic yielding of the Earth's surface under varying pressures, and had concluded that there were in existence instruments of sufficient delicacy to detect the changes in question.

Dr. H. R. Mill thought that Mr. Denison's site at Victoria, B.C., was not a particularly happy one for the purpose of measuring seismic changes due to differences of atmospheric pressure. There was a rapid increase in the depth of the water off the Pacific coast, and a rapid rise of the land on the east to the plateau west of the Rocky Mountains. Hence there was a want of symmetry on the two sides that would make that portion of the crust imperfectly balanced.

The President, Mr. R. Inwards, Mr. R. H. Curtis, and Mr. J. Hopkinson also joined in the discussion.

A letter was read from Prof. J. Milne, F.R.S., in which he said :— "Not only will a horizontal pendulum respond to barometric change, but it responds to variations in several other meteorological elements. Here at Shide, Isle of Wight, my pendulum swings west before bad weather."

## Correspondence.

### SUN PILLAR.

*To the Editor of Symons's Meteorological Magazine.*

ON the evening of Tuesday, June 25th, 1901, a very vivid and beautiful sun pillar was seen from Portland, Dorset. All the atmospheric conditions were favourable. Near the horizon there was a dense dark mist, sufficient to prevent the actual setting of the sun from being seen. The sun's disc was bright red, and the column of light which rose direct from the sun was bright yellowish crimson. It rose from the horizon about 40 degrees of arc, widening a little towards its highest portion. It was seen from 8 p.m. until about 9 p.m., when it gradually faded away from the summit. It was a most impressive and beautiful vision, requiring the brush of a Turner to faithfully depict it. The barometer stood at 30·43 in., the thermometer at 70°, and the relative humidity at 74 per cent.

W. R. M. WAUGH, F.R.A.S.

*The Observatory, Portland.*

### THE PRESENT SUMMER.

*To the Editor of Symons's Meteorological Magazine.*

A SHORT time ago I called attention to a curious "rule of thumb" about our London summers—those in the later half of a decade (5–9) show, in general, a greater average of heat than those in the earlier half (0–4).

Here is a table of mean temperature, and of the number of those very hot days with max. temperature 80° or more :—

| | Mean Temp. of Summer. | Relation to average, 61°·2. | No. of Very Hot Days. | Relation to average, 15. |
|---|---|---|---|---|
| 1841 ... | 58°·0 | —3°·2 | 2 | —13 |
| 1851 ... | 60·9 | —0·3 | 9 | — 6 |
| 1861 ... | 61·6 | +0·4 | 11 | — 4 |
| 1871 ... | 60·8 | —0·4 | 15 | aver. |
| 1881 ... | 61·1 | —0·1 | 17 | + 2 |
| 1891 ... | 59·8 | —1·4 | 9 | — 6 |

So far as these data go, we may at least say that if the summer of 1901 has a higher mean temperature than 61°·6, or more than 17 very hot days (80° or more), it will be the first time since 1840 that the summer of a year ending in 1 has been so hot. Permit me also to send you this table :—

MEAN TEMP. OF SUMMER (GREENWICH).

| | aver. | | | aver. | diff. |
|---|---|---|---|---|---|
| 1802—04 | 63°·3 | ..... | 1806—08 | 64°·9 | +1°·6 |
| 1812—14 | 59·6 | ..... | 1816—18 | 60·5 | + ·9 |
| 1822—24 | 61·1 | ..... | 1826—28 | 63·1 | +2·0 |
| 1832—34 | 61·3 | ..... | 1836—38 | 61·7 | + ·4 |
| 1842—44 | 60·8 | ..... | 1846—48 | 62·0 | +1·2 |
| 1852—54 | 60·5 | ..... | 1856—58 | 63·1 | +2·6 |
| 1862—64 | 60·0 | ..... | 1866—68 | 62·3 | +2·3 |
| 1872—74 | 61·9 | ..... | 1876—78 | 62·5 | + ·6 |
| 1882—84 | 60·5 | ..... | 1886—88 | 60·9 | + ·4 |
| 1892—94 | 61·1 | ..... | 1896—98 | 62·2 | +1·1 |

The values prior to 1841 are from Buchan's table. I may be singularly constituted, but it seems to me difficult to think all this fortuitous. ALEX. B. MACDOWALL.

## REVIEWS.

*Atlas Meteorologico de la República Argentina, Primera Parte, Provincia de Buenos Aires.* Por ENRIQUE A. S. DELACHAUX. Buenos Aires, 1901. Size $13\frac{1}{2} \times 10\frac{1}{2}$. Pp. 24 and 24 maps.

WE are indebted to the kindness of Dr. Francisco P. Moreno for an early opportunity of examining this interesting atlas, which for the first time represents in a graphic manner the climate of the chief province of the Argentine Republic. The maps are admirably produced in colour, by the South American Bank Note Company, and on account of the very uniform configuration of the country, the eighteen stations for general meteorological observations, supplemented by about eighty additional rainfall stations, give a fair approximation to the general climate. Still, in a province with an area of 120,000 square miles, a hundred stations cannot be expected to give a very exact delineation, although, as a first attempt, they are invaluable. The maps show the mean temperature, pressure

and winds, and relative humidity, for the year, and for each of the four seasons, the rainfall for the year, for the dry season, and for the wet season, and four extra maps showing certain abnormal conditions.

M. Delachaux has utilized the work of the provincial and of the national governments, and he lays stress in his introduction on the great importance of obtaining a full knowledge of the climatic conditions of a country, and especially of its rainfall, with the object of turning its resources to the best account.

The Argentine Republic, both as regards the federal and the provincial governments, has proved itself an enlightened nation in its appreciation of scientific work; its great museum and observatory at La Plata, and its observatory at Cordoba, might serve as models not only to South America, but to many countries in Europe. Quite recently the federal government has voted a large sum of money for the establishment of a magnetic and meteorological observatory on Staten Island, the nearest land to the Antarctic circle in touch with civilization, so that, along with Great Britain and Germany, it stands in the front rank of scientific exploration towards the south pole. The telegraph system of the Argentine has now, we believe, been extended to include the whole span of the south temperate zone, from the tropic to the Antarctic Ocean, and considering the vast importance of an exact knowledge of weather changes to an agricultural and pastoral people, many of whom depend on the results of irrigation, and to fishermen, we shall be greatly surprised if a Central Weather Service, publishing daily synoptic charts of the whole country, and issuing storm warnings, is not soon established. Meteorology would greatly benefit by the increase in knowledge of the weather of the southern hemisphere, which would thus be secured.

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*Moore's Meteorological Almanac and Weather Guide*, 1901. *For the Farmer, the Horticulturist, the Shipper, the Mariner, the Merchant, the Tourist, the Healthseeker, and for those who wish to learn the Art of Weather-forecasting.* By PROFESSOR WILLIS L. MOORE, LL.D., Chief United States Weather Bureau, Washington, D.C. Chicago and New York: Rand, McNally & Co. Price 50 cts.

THIS is an interesting attempt to popularise scientific weather study, and particularly to acquaint the American public with the work of the Weather Bureau. While the author is by no means so confident of the course of future weather as "Old Moore" was in his celebrated almanac, he differs from his ancient namesake by giving reasons for every statement, which cannot fail to convince fair-minded readers. He utters a strong and much needed warning on the subject of charlatans and long-period forecasts, proving the absurdity of their pretensions. A list of the highest and lowest recorded temperatures in each month at 120 selected stations is useful to the

American reader; but meteorologists in this country will turn with most interest to the articles on the construction and use of weather maps, the employment of kites in meteorological research, and the methods of rainfall observation officially adopted.

We have only noted one blunder, and that in a very subsidiary position, but it is so amazing that we must quote it *in extenso*:—"A severe storm so scattered and damaged the British armada on May 29, 1858, that the fleet was forced back to port for repairs. This delay enabled the English to make further preparations for the invasion."

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*The Circulation of the Surface Waters of the North Atlantic Ocean.* By H. N. DICKSON, B.Sc. [*Phil. Trans.* Series A, **196**, 61–203]. London: Published for the Royal Society by Dulau & Co., 1901. Size 12 × 9. Pp. 44. *Plates.*

WE regret that we cannot give adequate space to a review of this important memoir, which contains the details of as solid and laborious a piece of research in physical geography as we have seen. The belief that the physics of the atmosphere cannot be considered apart from those of the hydrosphere or ocean has now become a demonstrated truth, and Mr. Dickson's monthly maps of the surface temperature and salinity of the North Atlantic for the two complete years 1896 and 1897 supply a solid basis on which to establish the real nature of the relationship between the conditions of sea and air. This Mr. Dickson proposes to deal with in a second paper which will be eagerly awaited by meteorologists.

Meanwhile we may state the general conclusions at which he has arrived. The water of the eastern shore of the Atlantic north of 30° N., consisting of a mixture from the Gulf Stream and Labrador Current, drifts across the Atlantic and is banked up off the coast of south-western Europe. This action is strongest when the Atlantic anticyclone attains its greatest development in summer, and the proportion of Gulf Stream water brought to Europe is accordingly greatest at that season. The drifts in the northern part of the ocean are under the control of the cyclones crossing it, and they are accordingly strongest in winter, when more of the Labrador Current water reaches the shores of Europe. The water banked up off the coasts of Europe escapes northward in a current, which Mr. Dickson names the European Stream, through the Faerö-Shetland Channel and between Faerö and Iceland, which is always strongest in summer. This warm water melts enormous quantities of Arctic ice, and being greatly freshened and cooled thereby, spreads over the surface of the North Atlantic in autumn and winter until it becomes gradually mixed by the currents with the underlying water. Attention is called to the results as to the influence of the ocean on the air worked out by Professors Pettersson and Meinardus, a line of research which is expected to be notably forwarded by the proposed international exploration of the eastern Atlantic.

# METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858–97.

## TEMPERATURE.—MEANS.

| Months. | Mean 9 A.M., 9 P.M., Max. and Min. | | | 9 A.M. | | | 9 P.M. | | | Maximum. | | | Minimum. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean. | Highest Month. | Lowest Month. | Mean. | Highest Month. | Lowest Month. | Mean | Highest Month. | Lowest Month. | Mean. | Highest Month. | Lowest Month. | Mean. | Highest Month. | Lowest Month. |
| January | 38·1 | 43·9 | 31·3 | 37·7 | 43·4 | 30·2 | 38·4 | 44·3 | 31·8 | 43·0 | 48·9 | 35·8 | 33·3 | 39·2 | 26·1 |
| February | 39·8 | 45·9 | 29·1 | 39·2 | 45·8 | 28·1 | 39·7 | 45·5 | 29·6 | 45·5 | 51·7 | 36·1 | 34·7 | 40·6 | 22·5 |
| March | 42·1 | 46·3 | 36·8 | 41·8 | 46·7 | 36·1 | 41·3 | 45·7 | 35·6 | 50·2 | 56·6 | 44·9 | 35·5 | 39·9 | 30·4 |
| April | 48·1 | 53·3 | 43·9 | 48·5 | 53·5 | 44·2 | 46·1 | 50 0 | 41·0 | 58·1 | 67·7 | 52·4 | 39·7 | 43·2 | 35·3 |
| May | 54·0 | 58·9 | 49·8 | 55·1 | 61·7 | 50·5 | 51·6 | 55·5 | 47·2 | 64·7 | 70·4 | 59·3 | 44·4 | 49·3 | 40·5 |
| June | 60·4 | 66·5 | 56·4 | 61·5 | 68·1 | 57·1 | 58·1 | 63·5 | 53·2 | 71·3 | 79·1 | 64·7 | 50·9 | 55·1 | 46·9 |
| July | 63·3 | 68·9 | 58·9 | 64·1 | 70·4 | 59·2 | 60·9 | 67·1 | 56·9 | 74·1 | 82·4 | 67·1 | 54·0 | 58·4 | 50·2 |
| August | 62·1 | 66·1 | 58·6 | 62·8 | 67·4 | 59·4 | 59·7 | 64·4 | 56·1 | 72·6 | 77·9 | 66·6 | 53·3 | 56·4 | 49·0 |
| September | 57·7 | 63·6 | 54·1 | 58·1 | 63·9 | 54·7 | 55·6 | 59·7 | 51·7 | 67·3 | 76·4 | 62·8 | 49·7 | 54·5 | 45·6 |
| October | 49·8 | 55·3 | 45·4 | 49·6 | 54·8 | 44·7 | 48·8 | 53·9 | 44·0 | 57·5 | 64·4 | 52·6 | 43·3 | 48·1 | 38·9 |
| November | 43·0 | 48·8 | 37·5 | 42·7 | 49·1 | 36·9 | 42·9 | 48·8 | 36·8 | 48·7 | 54·2 | 43·6 | 37·7 | 43·3 | 32·8 |
| December | 39·2 | 46·0 | 30·0 | 39·0 | 46·1 | 29·7 | 39·6 | 46·4 | 30·8 | 44·0 | 50·7 | 34·0 | 34·4 | 41·0 | 25·5 |
| Means | 49·8 | 55·3 | 44·3 | 50·0 | 55·9 | 44·2 | 48·6 | 53·7 | 42·9 | 58·1 | 65·0 | 51·7 | 42·6 | 47·4 | 37·0 |
| Highest Month | 63·3 | 68·9 | 58·9 | 64·1 | 70·4 | 59·4 | 60·9 | 67·1 | 56·9 | 74·1 | 82·4 | 67·1 | 54·0 | 58·4 | 50·2 |
| Lowest Month | 38·1 | 43·9 | 29·1 | 37·7 | 43·4 | 28·1 | 38·4 | 44·3 | 29·6 | 43·0 | 48·9 | 34·0 | 33·3 | 39·2 | 22·5 |

| Year. | |
|---|---|
| Mean | 49·8 |
| Highest Year | 52·3 |
| Lowest Year | 46·8 |

## METEOROLOGICAL NEWS AND NOTES.

THE ANNUAL VISITATION of Greenwich Observatory took place on June 1st, when the Board of Visitors and a number of invited guests were shown over the Observatory. The Astronomer Royal's Report details the work done at the Observatory during the year ending May 10, 1901, and of course it mainly refers to astronomical observations. The magnetic observations have been to some extent affected by the electric tramways, but it is satisfactory to find that precautions may be taken which will obviate any very serious interference with the records. The meteorological observations have been supplemented by a Stevenson screen in the Magnetic Pavilion enclosure for comparison with the Glaisher stand and with the Stevenson screen in the Observatory grounds. The mean temperature of 1900 was 50°·5, or 1° above the average for the fifty years 1841-90, the rainfall was 20·22 in., or 4·32 in. below the average of fifty years.

A NEW METEOROLOGICAL OBSERVATORY has been opened at Horta, in the Azores, by the King of Portugal. The *Times* states that the observatory "is in connection with the Agricultural Department of Washington"; but it is scarcely necessary to point out that the importance of the observations at this unique mid-Atlantic station will be greater to the meteorological services of Europe than to those of America, and our impression is that the observatory is international. The importance of founding this observatory has been strongly urged by the Prince of Monaco and supported by many British men of science.

MR. WILLIAM ELLIS, F.R.S., who was for nearly twenty years in charge of the meteorological and magnetic work at Greenwich Observatory, and is still an honoured authority on meteorological science, is the subject of a biographical note, illustrated by a portrait, in the May number of *Terrestrial Magnetism*.

DEALING WITH THE COLD-AIR CYCLONE as a form of atmospheric movement, Dr. A. Harvey, of Toronto, writing to the *Geographical Journal* for June, points out that the alternation of temperature in the long day and night of the polar year must give rise to such a phenomenon on an intense as well as an extensive scale, and formulates the thesis—"It is this polar alternation of heat and cold which sets our atmosphere in motion, and at the poles, not at the equator, we must begin our studies of meteorology."

JOURNALISM ABOUNDS IN SURPRISES, and the questions put to meteorological experts by interviewers or special commissioners sometimes convey or elicit unexpected information. Thus in an article on "Spring Rainfalls and Droughts" in the *Church Family Newspaper* describing an interview at 63, Victoria Street, on the measurement of rainfall, we observe the question, "I suppose observations reach the theological office from all parts of the country?" and the answer, "Yes, there are gauges everywhere."

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JANUARY, 1901.

| STATIONS. (*Those in italics are South of the Equator.*) | Absolute. Maximum. Temp. | Date. | Absolute. Minimum. Temp. | Date. | Average. Max. | Min. | Dew Point. | Humidity. | Absolute. Max. in Sun. | Min. on Grass. | Total Rain. Depth. | Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0-100 | ° | ° | inches | | |
| London, Camden Square | 55·0 | 27 | 20·5 | 9 | 43·3 | 33·5 | 35·4 | 89 | 72·6 | 19·9 | ·55 | 12 | 6·7 |
| Malta | 62·9 | 31 | 39·5 | 6 | 57·9 | 48·4 | 46·0 | 80 | 114·3 | 35·4 | 5·39 | 16 | 3·9 |
| *Cape Town* | 83·4 | 14 | 51·0 | 30 | 75·5 | 58·9 | 56·7 | 70 | ... | ... | 5·09 | 9 | 4·3 |
| *Mauritius* | 90·7 | 1 | 70·5 | 8 | 86·4 | 73·4 | 70·2 | 73 | 150·1 | 65·1 | 18·60 | 14 | 6·1 |
| Calcutta | 80·3 | 27 | 50·1 | 25 | 73·9 | 55·5 | 54·0 | 70 | 132·4 | 45·3 | 1·31 | 6 | 2·8 |
| Bombay | 86·6 | 23 | 63·0 | 5 | 80·9 | 66·9 | 63·1 | 69 | 136·5 | 53·4 | ·74 | 2 | 1·8 |
| Colombo, Ceylon | 91·7 | 31 | 69·2 | 27 | 88·4 | 72·6 | 70·3 | 78 | 154·0 | 66·0 | 11·91 | 14 | 3·1 |
| *Melbourne* | 98·2 | 19 | 46·6 | 10 | 75·6 | 54·6 | 50·8 | 65 | 153·6 | 39·6 | 3·01 | 12 | 5·3 |
| *Adelaide* | 108·0 | 19 | 47·1 | 5 | 83·5 | 60·7 | 50·7 | 47 | 161·8 | 43·0 | 1·07 | 9 | 3·2 |
| *Sydney* | 92·1 | 4 | 57·7 | 17 | 77·5 | 62·6 | 54·1 | 60 | 152·8 | 48·9 | 6·47 | 11 | 4·2 |
| *Wellington* | 79·0 | 19 | 44·0 | 13*b* | 67·4 | 55·0 | 50·4 | 68 | 140·0 | 37·0 | 4·14 | 11 | 4·8 |
| *Auckland* | 79·0 | 6 | 48·0 | 27 | 70·0 | 58·8 | 53·6 | 68 | 152·0 | 44·0 | 3·22 | 16 | 5·7 |
| Jamaica, Halfway Tree | 87·0 | 11 | 61·0 | 28 | 83·9 | 66·0 | 63·9 | 76 | ... | ... | 1·39 | 2 | 2·1 |
| Trinidad | 91·0 | 29 | 60·0 | 31 | 87·2 | 67·9 | 71·3 | 82 | 160·0 | 51·0 | 1·99 | 4 | ... |
| Grenada | 85·0 | 28*a* | 68·2 | 13 | 81·9 | 72·9 | 68·7 | 69 | 150·0 | ... | 5·93 | 14 | 2·1 |
| Toronto | 45·4 | 9 | —10 9 | 19 | 31·5 | 16·7 | 21·2 | 82 | 57·2 | —12·5 | 2·47 | 16 | 7·8 |
| Fredericton New Brunswick, | 43·9 | 22 | —19·8 | 20 | 25·0 | 3·7 | 8·3 | 79 | ... | ... | 3·81 | 8 | 6·2 |
| Winnipeg, Manitoba | 31·0 | 13 | —36·8 | 2 | 7·6 | —14·5 | ... | ... | ... | ... | ·81 | 9 | 5·2 |
| Victoria, British Columbia | 51·7 | 12 | 24·0 | 4 | 43·2 | 34·7 | | ... | ... | ... | 4·15 | 20 | 7·7 |

*a*—and 30. *b*—and 26.

REMARKS.

MALTA.—Mean temp. of air 52°·9 or 0°·4 below the average. Mean hourly velocity of wind 12·9 miles or 1·6 above average. Mean temp. of sea 59°·3. TSS on 6 days. L on 2 days, and H on 6 days. J. F. DOBSON.

*Mauritius.*—Mean temp. of air 0°·5 above, of dew point 0°·1 below, and R 11·26 in. above their respective averages. Mean hourly velocity of wind 14·2 miles, or 3·0 miles above the average; extremes, 72·0 miles on 12th and 2·0 on 16th; prevailing direction N.E. and S.E. by E., with occasional light airs from N.W. to N. L and T on 25th. A cyclone, the centre of which passed between Mauritius and Bourbon on the night of January 12th—13th, caused considerable damage in the latter Island. At Mauritius the damage was principally confined to the collapse of straw huts, though several houses of more substantial construction suffered. T. F. CLAXTON.

COLOMBO, CEYLON.—Mean temp. of air 0°·4 above, of dew point 0°·5 above, and R 8·67 in. above, their respective averages. Mean hourly velocity of wind 7·3 miles; prevailing direction N.E. and N.W. TSS occurred on three days; L was seen on 2 days. W. C. S. INGLES.

*Adelaide.*—Mean temp. of air 2°·1 below the average. Very cool in the first half, but warm in the latter half of the month, R moderate in the S.E.; practically rainless inland. C. TODD, F.R.S.

*Sydney.*—Mean temp. of air 1°·5 below, humidity 10·8 below, and R 2·80 in. above, their respective averages. H. C. RUSSELL, F.R.S.

*Wellington.*—Mean temp. of air 1°·4 below, and R ·24 in. above their respective averages. Fine in the early part of the month, but strong N.W. winds and showery from 5th to 11th, then fine to 22nd, and light wind or calm; the rest of the month was very wet. H on 4 days. Fog on 7th. Very slight earthquake on 18th, about 10 a.m. R. B. GORE.

*Auckland.*—Unusually cool. Mean temp. of air being nearly 4° below the average. R ·75 in. above the average. T. F. CHEESEMAN.

TRINIDAD.—R ·95 in. below the 30 years' average. J. H. HART.

# SUPPLEMENTARY TABLE OF RAINFALL, JUNE, 1901.

| Div | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| I. | Uxbridge, Harefield Pk.. | 1·42 | XI. | Castle Malgwyn ..... | 3·76 |
| II. | Dorking, Abinger Hall . | 2·44 | ,, | Builth, Abergwesyn Vic. | 4·15 |
| ,, | Sheppey, Leysdown ..... | ·88 | ,, | Rhayader, Nantgwillt... | 3·20 |
| ,, | Hailsham ..... | ·97 | ,, | Lake Vyrnwy ..... | 2·63 |
| ,, | Crowborough..... | 1·19 | ,, | Corwen, Rhug ..... | 2·07 |
| ,, | Ryde, Thornbrough ..... | ... | ,, | Criccieth, Talarvor ..... | 2·72 |
| ,, | Emsworth, Redlands ... | 3·73 | ,, | I. of Anglesey, Lligwy.. | 2·38 |
| ,, | Alton, Ashdell ..... | 1·94 | ,, | Douglas, Woodville..... | 3·35 |
| ,, | Newbury, Welford Park | 1·83 | XII. | Stoneykirk, Ardwell Ho. | 3·12 |
| III. | Oxford, Magdalen Coll.. | 1·39 | ,, | New Galloway, Glenlee | 3·66 |
| ,, | Banbury, Bloxham ..... | 1·49 | ,, | Moniaive, Maxwelton Ho. | 3·78 |
| ,, | Pitsford, Sedgebrook ... | 2·27 | ,, | Lilliesleaf, Riddell ..... | 2·32 |
| ,, | Huntingdon, Brampton. | 1·41 | XIII. | N. Esk Res. [Penicuick] | 2·10 |
| ,, | Wisbech, Bank House... | ·63 | XIV. | Glasgow, Queen's Park.. | 2·81 |
| IV. | Southend ..... ..... | ·62 | XV. | Inveraray, Newtown ... | 5·84 |
| ,, | Colchester, Lexden ..... | 1·72 | ,, | Ballachulish, Ardsheal... | 5·67 |
| ,, | Saffron Waldon, Newport | 1·35 | ,, | Islay, Eallabus..... | 4·28 |
| ,, | Rendlesham Hall ..... | 1·43 | XVI. | Dollar..... | 2·41 |
| ,, | Swaffham ..... | 1·10 | ,, | Balquhidder, Stronvar... | 6·33 |
| V. | Salisbury, Alderbury ... | ·87 | ,, | Coupar Angus Station... | 1·64 |
| ,, | Bishop's Cannings ..... | 1·95 | ,, | Blair Atholl ... ..... | 2·69 |
| ,, | Blandford, Whatcombe . | 1·93 | XVII. | Keith H.R.S..... | 3·79 |
| ,, | Ashburton, Druid House | 1·59 | ,, | Forres H.R.S. ... ..... | 2·48 |
| ,, | Okehampton, Oaklands. | 2·61 | XVIII. | Fearn, Lower Pitkerrie.. | 1·58 |
| ,, | Hartland Abbey ..... | 3·77 | ,, | S. Uist, Askernish ..... | 2·96 |
| ,, | Lynton, Glenthorne ... | ... | ,, | Invergarry..... | 4·53 |
| ,, | Probus, Lamellyn ..... | 2·14 | ,, | Aviemore, Alvie Manse. | 3·63 |
| ,, | Wellington, The Avenue | 2·93 | ,, | Loch Ness, Drumnadrochit | 2·65 |
| ,, | North Cadbury Rectory | ·96 | XIX. | Invershin ..... | 3·55 |
| ,, | Clifton, Pembroke Road | 1·91 | ,, | Durness..... | ... |
| VI. | Ross, The Graig ..... | 2·15 | ,, | Watten H.R.S..... | 2·37 |
| ,, | Wem, Clive Vicarage ... | 2·20 | XX. | Dunmanway, Coolkelure | 3·52 |
| ,, | Wolverhampton, Tettenhall | 3·00 | ,, | Cork, Wellesley Terrace | 1·48 |
| ,, | Cheadle, The Heath Ho. | 1·98 | ,, | Killarney, District Asyl. | 3·58 |
| ,, | Coventry, Priory Row... | 2·67 | ,, | Caher, Duneske ..... | 2·32 |
| VII. | Market Overton ..... | 2·19 | ,, | Ballingarry, Hazelfort... | 2·94 |
| ,, | Grantham, Stainby ..... | 2·11 | ,, | Limerick, Kilcornan ... | ... |
| ,, | Horncastle, Bucknall ... | 1·24 | ,, | Miltown Malbay ..... | 3·65 |
| ,, | Worksop, Hodsck Priory | 1·66 | XXI. | Gorey, Courtown House | 2·71 |
| VIII. | Neston, Hinderton ..... | 2·10 | ,, | Moynalty, Westland ... | 2·69 |
| ,, | Southport, Hesketh Park | 1·71 | ,, | Athlone, Twyford ..... | 3·49 |
| ,, | Chatburn, Middlewood. | 1·49 | ,, | Mullingar, Belvedere ... | 2·74 |
| ,, | Duddon Val., Seathwaite Vic. | 4·75 | XXII. | Woodlawn ..... | 3·13 |
| IX. | Baldersby ..... | 1·48 | ,, | Crossmolina, Enniscoe .. | 3·64 |
| ,, | Scalby, Silverdale ..... | 1·90 | ,, | Collooney, Markree Obs. | 3·58 |
| ,, | Ingleby Greenhow Vic.. | 2·06 | XXIII. | Enniskillen, Model Sch. | 3·71 |
| ,, | Middleton, Mickleton ... | 1·46 | ,, | Warrenpoint..... | 1·76 |
| X. | Haltwhistle, Unthank H. | ... | ,, | Miltown, Banbridge..... | 2·69 |
| ,, | Bamburgh ..... | 1·34 | ,, | Belfast, Springfield ..... | 3·81 |
| ,, | Keswick, The Bank..... | 2·65 | ,, | Bushmills, Dundarave.. | 3·72 |
| XI. | Llanfrechfa Grange ..... | 2·65 | ,, | Stewartstown ..... | 2·63 |
| ,, | Treherbert, Tyn-y-waun | 3·98 | ,, | Killybegs ..... | ... |
| ,, | Llandovery ..... | 2·71 | ,, | Horn Head ..... | 2·87 |

# JUNE, 1901.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1890-9. | Greatest Fall in 24 hours. Dpth | Date | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Max. Date | Min. Deg. | Min. Date. | No. of Nights below 32°. In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches. | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | 1·25 | — ·65 | ·49 | 30 | 9 | 82·8 | 9 | 40·9 | 19 | 0 | 0 |
| II. | | Tenterden ..... | 1·60 | — ·59 | ·64 | 30 | 9 | 76·0 | 22 | 39·5 | 15 | 0 | ... |
| „ | | Hartley Wintney ..... | 1·65 | — ·30 | ·68 | 30 | 10 | 79·0 | 22 | 37·0 | 19 | 0 | ... |
| III. | | Hitchin ..... | ·95 | — ·83 | ·41 | 30 | 9 | 77·0 | 9 | 37·0 | 18 | 0 | ... |
| „ | | Winslow (Addington) ..... | 1·20 | — ·65 | ·66 | 30 | 13 | 79·0 | 9 | 33·0 | 19 | 0 | 1 |
| IV. | | Bury St. Edmunds (Westley) | 1·27 | — ·77 | ·35 | 30 | 10 | 80·5 | 9 | 38·0 | 13 | 0 | ... |
| „ | | Norwich (Brundall) ..... | 1·55 | ... | ·50 | 17 | 14 | 79·0 | 9 | 40·2 | 13 | 0 | 0 |
| V. | | Winterbourne Steepleton ... | 1·15 | ... | ·59 | 19 | 10 | 76·8 | 29 | 38·0 | 9 | 0 | 2 |
| „ | | Torquay (Cary Green) ... ..... | 1·01 | ... | ·33 | 29 | 8 | 68·5 | 6 | 44·2 | 13 | 0 | 0 |
| „ | | Polapit Tamar [Launceston].. | 2·26 | — ·13 | ·50 | 20 | 13 | 73·1 | 29 | 37·0 | 26 | 0 | ... |
| VI. | | Stroud (Upfield) ..... | 2·46 | + ·46 | 1·05 | 30 | 13 | 80·0 | 29 | 44·0 | 14 | 0 | ... |
| „ | | Church Stretton (Woolstaston) | 2·79 | + ·65 | 1·10 | 30 | 15 | 74·0 | 28 | 39·5 | 13 | 0 | ... |
| „ | | Worcester (Diglis Lock) ..... | 2·63 | + 1·01 | 1·22 | 30 | 11 | ... | ... | ... | ... | ... | ... |
| VII. | | Boston ..... | 1·00 | — ·68 | ·65 | 30 | 8 | 80·0 | 9 | 38·0 | 13 | 0 | ... |
| „ | | Hesley Hall [Tickhill]..... | 1·26 | — ·41 | ·48 | 30 | 10 | 83·0 | 9 | 33·0 | 19 | 0 | ... |
| „ | | Derby (Midland Railway)..... | 1·84 | — ·21 | ·90 | 30 | 10 | 83·0 | 28 | 39·0 | 18 | 0 | ... |
| VIII. | | Manchester (Plymouth Grove) | 1·80 | — ·94 | ·69 | 20 | 14 | 82·0 | 8, 28 | 41·0 | 12*a* | 0 | ... |
| IX. | | Wetherby (Ribston Hall) ... | 1·08 | — 1·01 | ·35 | 17 | 6 | ... | ... | ... | ... | ... | ... |
| „ | | Skipton (Arncliffe) ..... | 2·36 | — 1·37 | ·46 | 20 | 15 | ... | ... | ... | ... | ... | ... |
| „ | | Hull (Pearson Park)..... ..... | 2·04 | + ·07 | ·54 | 21 | 13 | 79·0 | 9 | 36·0 | 19 | 0 | 1 |
| X. | | Newcastle (Town Moor) ..... | 1·15 | — ·73 | ·33 | 17 | 12 | ... | ... | ... | ... | ... | ... |
| „ | | Borrowdale (Seathwaite)..... | 6·63 | — ·47 | 1·40 | 20 | 14 | 76·0 | 28 | 42·7 | 13 | 0 | ... |
| XI. | WALES. | Cardiff (Ely)..... | 2·98 | + ·65 | 1·27 | 20 | 10 | ... | ... | ... | ... | ... | ... |
| „ | | Haverfordwest ..... | 3·80 | + 1·47 | ·85 | 22 | 14 | 78·6 | 29 | 41·7 | 8 | 0 | 0 |
| „ | | Aberystwith (Gogerddan) ... | 4·05 | + 1·41 | ·90 | 20 | 13 | 84·0 | 28 | 34·0 | 13 | 0 | ... |
| „ | | Llandudno..... | 1·90 | — ·07 | ·54 | 13 | 15 | 71·0 | 29 | 44·0 | 13 | 0 | ... |
| XII. | | Cargen [Dumfries] ..... | 3 96 | + 1·24 | 1·24 | 22 | 12 | ... | ... | ... | ... | ... | ... |
| XIII. | | Edinburgh (Royal Observatory) | 2·10 | ... | ·60 | 23 | 13 | 73·4 | 8 | 39·2 | 11 | 0 | ... |
| XIV. | | Colmonell ..... | 2·62 | — ·05 | ·78 | 22 | 11 | 79·0 | 29 | 36·0 | 6 | 0 | ... |
| XV. | | Tighnabruaich ..... | 4·69 | ... | 1·05 | 19 | 13 | 70·0 | 28 | 40·0 | 7*b* | 0 | ... |
| „ | | Mull (Quinish)..... | 4·67 | + 1·24 | ·84 | 2 | 18 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Leven Sluices ..... | 2·34 | — ·04 | ·63 | 23 | 12 | ... | ... | ... | ... | ... | ... |
| „ | | Dundee (Eastern Necropolis) | 2·25 | + ·42 | ·85 | 22 | 11 | 81·2 | 8 | 37·1 | 15 | 0 | ... |
| XVII. | | Braemar ..... .. | 2·89 | + ·56 | ·45 | 22 | 14 | 75·6 | 8 | 34·0 | 18 | 0 | 7 |
| „ | | Aberdeen (Cranford) ... ..... | 1·47 | — ·67 | ·30 | 22 | 20 | 72·0 | 8 | 38·0 | 8, 18 | 0 | ... |
| „ | | Cawdor (Budgate) ..... | 2·18 | — ·14 | ·40 | 17 | 18 | ... | ... | ... | ... | ... | ... |
| XVIII | | Strathconan [Beauly] ..... | 3·15 | — ·36 | ·85 | 11 | 11 | ... | ... | ... | ... | ... | ... |
| „ | | Glencarron Lodge..... | 4·89 | — ·85 | ·90 | 12 | 19 | 74·1 | 30 | 39·0 | 11 | 0 | ... |
| XIX. | | Dunrobin ..... | 2·26 | + ·22 | ·52 | 10 | 13 | 64·2 | 27 | 37·0 | 11 | 0 | 0 |
| „ | | S. Ronaldshay (Roeberry) ... | 3·25 | + 1·29 | ·45 | 11 | 17 | 67·0 | 21 | 38·0 | 11*c* | 0 | ... |
| XX. | | Darrynane Abbey..... | 2·82 | — ·28 | 1·32 | 22 | 17 | ... | ... | ... | ... | ... | ... |
| „ | | Waterford (Brook Lodge) ... | 2·95 | + ·34 | 1·28 | 22 | 8 | 74·0 | 29 | 38·0 | 13 | 0 | ... |
| „ | | Broadford (Hurdlestown) ... | 2·50 | + ·09 | 1·20 | 22 | 15 | 76·0 | 30 | 38·0 | 12 | 0 | 0 |
| XXI. | | Carlow (Browne's Hill) ..... | 2·31 | + ·04 | ·81 | 22 | 13 | ... | ... | ... | ... | ... | ... |
| „ | | Dublin (Fitz William Square) | 1·63 | — ·29 | ·71 | 22 | 13 | 71·6 | 29 | 42·6 | 18 | 0 | 0 |
| XXII. | | Ballinasloe ..... ..... | 3·61 | + ·96 | 1·55 | 22 | 12 | 78·0 | 8 | 40·0 | 5*d* | 0 | ... |
| „ | | Clifden (Kylemore) ..... .. | 4·40 | + 1·03 | 1·13 | 18 | 14 | ... | ... | ... | ... | ... | ... |
| XXIII | | Seaforde..... | 2·77 | + ·21 | 1·05 | 22 | 13 | 73·0 | 27 | 40·0 | 6 | 0 | ... |
| „ | | Londonderry (Creggan Res.). | 3·95 | + ·81 | ·69 | 22 | 19 | ... | ... | ... | ... | ... | ... |
| „ | | Omagh (Edenfel) ..... | 3·34 | + ·33 | 1·06 | 22 | 18 | 75·0 | 29 | 39·0 | 6 | 0 | ... |

+ Shows that the fall was above the average ; — that it was below it.

*a*—and 25. *b*—and 11, 16, 17. *c*—and 12, 16. *d*—and 13, 15.

# METEOROLOGICAL NOTES ON JUNE, 1901.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm: R for Rain; H for Hail; S for Snow.

## ENGLAND.

LONDON, CAMDEN SQUARE.—With the exception of heavy showers in the early morning of the 22nd, no R of any consequence fell before the 30th, when two sharp TSS occurred, followed by a steady downpour in the evening. An exceptionally well-defined sun pillar was seen from 7.45 to 8.15 p.m. on the 26th. Mean temp. 60°·6, or 0°·2 above the average.

TENTERDEN.—A partial drought for 34 days ended on the 11th: showers on 12th and 21st gave little relief, but on 30th the fall was sufficient to do good, though too late to save the hay crop.

HARTLEY WINTNEY.—With the exception of slight showers in the middle of the month, the weather continued very dry, with cold S.W. and N.W. winds. On the 29th we were on the edge of a TS of short duration, with little R falling, the severest part of the storm being about 30 miles further S. TS on 30th. Ozone on 8 days, with a mean of 4·5.

WINSLOW, ADDINGTON.—A great deal of very fine weather, but deficiency of R. Pastures were much dried up before the end. The nights were generally cold, there being 2° of frost on the grass on 19th, doing much damage to some garden crops. T on 30th, with heavy R, more than half of the month's total falling after 5 p.m. on that day.

BURY ST. EDMUNDS, WESTLEY.—A most unfavourable month for vegetation. The crops in the mixed soils of west Suffolk were the worst grown for 50 years. Distant T on 3rd.

WINTERBOURNE STEEPLETON.—The first and last weeks were warm, especially the days in the last week, and the middle of the month was cool. TS on 30th. The R for the first half of the year was decidedly below the average, amounting only to 12·59 in.

TORQUAY, CARY GREEN.—R 1·21 in. below the average. Mean temp. 1°·7 below the average, and duration of sunshine 28·7 hours below the average; 3 sunless days. Mean ozone 5·1, the greatest amount being 9·0 on 1st, with S.S.W. wind, and the least 2·0 on 22nd, with S.E. wind.

POLAPIT TAMAR [LAUNCESTON].—The first part was dry and warm. From the 18th to the end nice rains fell, and on 29th heavy R, with T and vivid L. The wind throughout was generally northerly or easterly, and very drying.

MANCHESTER, PLYMOUTH GROVE.—Fine summer weather from 6th to 9th, and from 27th to the end, but upon the whole it was very unsettled, with cold north-westerly wind.

HULL, PEARSON PARK.—The total R was not heavy yet there were a few heavy showers during the month, and a fair amount of sunshine. The temp. was rather variable, the days being frequently hot, and the nights cold. TS on 3rd.

## WALES.

HAVERFORDWEST.—The weather was unsettled, but warm, with very little sunshine, and no very high temp. Hay crops generally were slight, though corn is looking well, and potatoes are good, but eveything is backward. Duration of sunshine 155·8 hours. TS on 29th; T at times on 30th.

ABERYSTWITH, GOGERDDAN.—Extraordinarily wet for the time of year. There was very little growing weather, the wind being in the N. and N.E.

## SCOTLAND.

TIGHNABRUAICH, CRAIGANDARAICH.—R was normal for the month, and for the half-year the amount was 4·12 in. less than for the same period in 1900.

ABERDEEN, CRANFORD.—N.W. gales on 11th, 12th and 13th, and on 17th.

S. RONALDSHAY, ROEBERRY.—A wet, cold and blustering month. Mean temp. 51°·0, 1°·0 below the average of 11 years.

## IRELAND.

DARRYNANE ABBEY.—The first part was changeable and rather cold, and the last few days fine and hot.

BROADFORD, HURDLESTOWN.—A very favourable month. Crops of all kinds doing well. The R for the first half-year was 4·96 in. less than that of the same period last year.

DUBLIN, FITZWILLIAM SQUARE.—Although not so fine, sunny and dry as May, June was a favourable month. The mean temp., R and rainy days were all somewhat below the average, and the wind still clung to the colder points of the compass, especially N.W. and E.N.E. There was a complete absence of T and L. Mean temp. 56°·9, or 0°·9 below the average. High winds were noted on 12 days, attaining the force of a gale on 13th and 23rd. The temp. reached, or exceeded, 70° on only one day.

OMAGH, EDENFEL.—Almost until its very end June was a cold, harsh month, with strong, generally polar, winds, and a mean temp. rendered low rather by the absence of warmth in the day time, than by any approach to frost by night. R was considerably over the average, chiefly on account of a remarkable fall of 1·07 in. on 22nd. On the 26th the weather changed completely, and afterwards was warm, and almost hot and summerlike.

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## WATERSPOUT ON JULY 6TH.

The *Times* of July 8th publishes the following:—"Little Buckingham Farm, lying just north-west of Shoreham, was devastated on Saturday afternoon by a waterspout in the hills above. A large column of water rushed along the valley in which the farm lies, tearing up mangels and oats. Two cottages, in which some farm labourers lived, stood right in the track of the flood, and their occupants had to be rescued from the upper windows. The rush of water rendered the ladder unsteady and made the work of succour difficult. Some crops on another farm higher up the valley were also damaged. Mr. Burfoot's nursery of cut flowers on the Old Shoreham-road and a lower road leading to Shoreham Cemetery were under water and traffic was interrupted for some four hours."

Mr. T. P. Newman remarks that no rain fell at Haslemere, though heavy black clouds were visible to the south. Miss Cook, writing from Nutley, Uckfield, reports a fall of 1·88 in. of rain in half-an-hour, between 1·45 and 2.15 p.m., during a thunderstorm on the same day.

SYMONS'S

# METEOROLOGICAL MAGAZINE.

No. CCCCXXVII.] AUGUST, 1901. VOL. XXXVI.

## Admiral de Brito Capello.

VICE-ADMIRAL JOÃO CARLOS DE BRITO CAPELLO, who had been Director of the Infante D. Luiz Observatory at Lisbon for twenty six years, died on May 2nd, very shortly after his retirement from active scientific work. He had represented Portuguese Meteorology at International Conferences for many years, and had contributed several important memoirs to the literature of his subject. Amongst these we may mention his maps of the winds and currents of the Gulf of Guinea, which were translated and re-issued by the French Government, and the three first sheets of a series of charts of the winds and currents of the Atlantic; a work which he did not live to complete. He was also the author of a treatise on the variation of the compass.

Admiral Capello was an honorary member of the Meteorological Societies of London and Berlin, and he had been rewarded for the naval and scientific services which he rendered to his own Government by a shower of Orders.

## THE LONDON THUNDERSTORM OF JULY 25TH.

MR. SYMONS probably "touched the spot" of the St. Swithin myth when, in this magazine for August, 1892 (Vol. **27**, p. 102) he suggested that the old belief might with some appearance of truth be put in the form "that somewhere in the British Isles there would be within a week of St. Swithin's Day a fall of from two to five inches of rain." Perhaps it might be put in a simpler form still by merely stating that severe thunderstorms are fairly common in the second half of July.

After an absolute drought of nineteen days a thunderstorm of unusual intensity, accompanied by extremely heavy rain, broke over London on Thursday, July 25th. It was interesting for many reasons, amongst others for its restricted locality, and for the slowness with which its influence extended from the centre of greatest activity. So far as we can ascertain that centre was situated somewhere in the vicinity of King's Cross, and certainly not very far

from Camden Square. The following account, of the phenomenon, as observed there, appeared in the *Times* of July 27th :—

The storm of to-day recalls that of July 27th last year, which also terminated a long period of drought and heat. On the present occasion the heat has been less intense, and the absolute drought lasted only 19 days, whereas in July, 1900, it prevailed for 20 days. Thunder was first heard at 11.45 this forenoon, when the sky had assumed a very lurid appearance, especially in the east; large drops of rain began to fall at 0.10 p.m., and the first lightning was almost simultaneous with the commencement of heavy rain at 0.14 p.m. Hail soon mingled with the rain, and continued with frequent lightning and thunder till 0.35 p.m., when the storm, which had commenced in the east, appeared to be working off to the west. The hail was heaviest about 0.18 p.m., when the ground was almost covered. The hailstones were of two forms; irregular shaped pieces of clear ice, the largest seen being 0·45 in. in greatest diameter, and roughly conical stones of opaque, but hard, ice, many 0·5 in. in greatest diameter, and several just over 0·6 in.

There was a decided lull in the storm between 0.35 p.m. and 0.45 p.m., the hail ceasing, and the rain, thunder, and lightning diminishing in intensity, but at 0.47 p.m. it broke again with two vivid and intensely blue flashes of lightning extremely near, and again heavy hail which whitened the ground, but was smaller and softer than in the previous fall. The storm continued with severity till 1.15 p.m., and then gradually passed away to the west, the rain continuing with somewhat frequent lightning and thunder till nearly 4 p.m.

The barometric trace shows distinct disturbance at the two periods of greatest intensity, but there is a marked absence of the typical thunderstorm curve. The lightning and thunder, though at times near, were in no way remarkable. The hail was unusually large, but the main feature of the storm was the rainfall.

Between 0.15 p.m. and 4.30 p.m., when the rain had ceased, 2·85 in. fell, and this amount has been exceeded on only one day in the 44 years since the late G. J. Symons commenced the record here—namely, in the great thunderstorm of June 23rd, 1878, when 3·28 in. of rain fell in an hour-and-a-half, the actual duration of the rain being only 56 minutes. The following are the periods of heaviest rain in to-day's storm :—

| Time. | Period. | Amount of rain. | Rate per hour. |
|---|---|---|---|
| 0.48 p.m. to 0.50 p.m. | 2 min. | ·23 in. | 6·90 in. |
| 0.48 p.m. to 0.54 p.m. | 6 min. | ·45 in. | 4·50 in. |
| 0.20 p.m. to 0.35 p.m. | 15 min. | ·71 in. | 2·84 in. |
| 0.20 p.m. to 0.40 p.m. | 20 min. | ·83 in. | 2·49 in. |
| 0.47 p.m. to 1.15 p.m. | 28 min. | 1·34 in. | 2·88 in. |
| 0.20 p.m. to 1.15 p.m. | 55 min. | 2·20 in. | 2·40 in. |

In an hour-and-a-half from the commencement of the storm 2·66 in. of rain fell, or about 80 per cent. of the fall in the same time in the great storm of June 23rd, 1878.

With regard to the nature of the storm in other parts of London we have been favoured with notes from several correspondents. Mr. J. E. CLARK, writing from the Wool Exchange, E.C. while the storm was in progress at 3 p.m., states that it began at about 11.45 a.m. and was well at work by noon, being practically synchronous with Camden Square, and he also observes that there was no sign of the characteristic barometer curve.

Many observers have remarked on the fact that long after the storm was raging fiercely over central London it remained dry and even sunny in the west. Mr. G. VON U. SEARLE states that at West Kensington the rain did not begin until 1 p.m. and was not exceptionally heavy, the total for the day being ·57 in. At Addison Gardens, Kensington, where the rain also began about 1 p.m., Mr. G. H. M. WHISH reports a fall of ·68 in., and at Willesden Green the total fall for the twenty-four hours was ·35 in.

Mr. D. W. HORNER writes from Clapham Park, S.W., on the 31st :—

"The storm, which appears to have been fairly general throughout the metropolitan area, commenced in this locality at about noon, with distant T to the N.E. and S.W. simultaneously, and large drops of R. There seemed, in fact, to be two storms, the one lying over London, and the second over the Surrey Hills.

By 0.15 p.m. R was falling steadily, but L was not observed till 0.35, when R had practically ceased. A sharp display of L then ensued, the thunder following at an average interval of 5 secs., R by this time (0.42) having ceased altogether. At 0.45 R recommenced, and two minutes later was descending very heavily, to the accompaniment of long and loud peals of T. No L was observed, however, till 0.51, when a series of vivid flashes occurred, with a time interval of about two seconds, R meanwhile coming down heavily. At 0.57 H began, and a few violent electrical discharges between 0.58 and 1.2 (time interval only one second) brought down a heavy precipitation of H and R. T and L, with heavy R, continued till 1.30, the sharpest L being at 1.1.8 and 1.2.2, when T and L were simultaneous. On measuring R at 2 p.m., 0·57 in. was found in the gauge. At 3 p.m. a second storm came on, and lasted till 4.30, when 0·33 in. more was measured, making a total of 0·90 in. in four-and-a-half hours.

The wind varied between S.E. and S.W., temperature stood perfectly steady at 60°, and the barometer fell one-twentieth of an inch up to 3 p.m., and rose a similar distance later."

It is remarkable, considering the vividness of the lightning and its great frequency, that so little damage was done. A cab-horse was said to have been struck in Charing Cross Road and a number of flag-staffs were shattered, but nothing serious is reported. With the rain, however, it was different. The drains and sewers in the neighbourhood of King's Cross were insufficient to carry off the flood water, which rushed in great volume into the tunnels of the Underground Railway, bringing the train service to a standstill, and in one

case at least partially drowning out the fire of an engine. So large a number of houses were flooded that several of the Board Schools near King's Cross were thrown open to accommodate about 300 people who had been flooded out.

This is merely a summary of raw facts regarding a particular thunderstorm rain; but we hope in an early issue to publish an article of a more general nature on the same subject.

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## RAINFALL TRADITIONS.

No traditions are more interesting or more tenacious in their hold on the human mind than those which associate the fall of rain with the intercession of some particular saint. St. Swithin occurs to all minds, and we have seen in several newspapers about the end of July, remarks almost suggestive of surprise that although the 15th of July this year was dry in London, rains of unusual severity fell long before the traditional forty days had elapsed. We progress slowly, for it appears from the interesting reprints of selected news of the corresponding day's issue of 1801, now appearing daily in *The Times*, that a paragraph was published in that paper a century ago, intimating that the spell of fine weather following a wet St. Swithin's day would surely, at last, dissipate public belief in the superstition.

We have received a letter from an American friend who has travelled in all countries and lived amongst many peoples, and although it is in no sense scientific, it has a meteorological flavour which may perhaps justify its insertion. We trust that the majority of our readers will peruse this number of the magazine while enjoying a holiday, for the unclouded serenity of which they have our heartiest wishes. At such a time it is refreshing to glance at one of the curious mediæval survivals in the New World, of simple faith in the power of good men long departed to control the powers of the air. The letter runs:—

"Fortunately you are not living in the days of Giordano Bruno, or your idea that there is a scientific reason for every rainfall might cause you to become the central figure of an *auto da fé*, for be it known to you that some parts of this earth are, at least as regards rainfall, under the protecting care of San Benito, a pious meteorologist of the first water. Many years ago I met his representative at Colonia del Sacramento, a little port of Uruguay, opposite the city of Buenos Aires. I had occasion to live there for three months or more. The weather was dry, the little town was sleepy, the sun beat upon the sandy shore and bluffs with a metallic quiver in every ray; the ruins of a brick bastion, which, in Colonial days, protected an enormous contraband trade, seemed to look tired of being baked; every blade of grass was bowing its head in prayer for water; sheep and cattle in the camps were dying by thousands; famishing dogs

lay panting in the streets. It was the great cholera season which so scourged the Plata district in 1868, the atmosphere was charged with strange influences, and frequently during the day my muscles and nerves would twitch and jerk as if subjected to electric shocks. If ever the services of some generous saint were required it was then, and so thought all of the woe-stricken inhabitants of the town.

Opposite to my house in the plaza was a little whitewashed church, and looking out of my window one morning I saw a large and solemn crowd of men and women entering the Church. Crossing the plaza, I learned that an appeal was to be made to San Benito to produce rain, but to properly propitiate him and put him in a humour to confer the desired blessing it was thought well to take him from his niche, put him on a little platform, and escort him to a small chapel about a mile distant to visit another saint whose particular name I forget, but believe it was Saint Joseph. So San Benito was taken to the plaza. When I saw that he was a black saint, and appeared to enjoy the sunshine, I began to doubt if he were the right man to perform the desired miracle. However, I determined to do all in my power to help him, and therefore joined in the long procession, in the midst of which San Benito on the platform carried by four men wended his way to pay the pious visit. After a religious ceremony at the chapel, we returned to Colonia, replaced the saint in his niche, dispersed to our respective homes and waited for it to rain. Not a drop fell! and the next day the same relentless sunshine seemed to indicate that the morals of the town were undeserving of San Benito's generous tears. At this the inhabitants got angry, and the following day they again took San Benito into the plaza, but this time, instead of an excursion, they gave him a sound thrashing with sticks. The next day it rained copiously!—G. E. C."

## REVIEWS.

*Meteorologische Beobachtungen vom XIV. bis XVII. Jahrhundert. Mit einer Einleitung. (Neudrucke von Schriften und Karten über Meteorologie und Erdmagnetismus, herausgegeben von* PROFESSOR DR. G. HELLMANN. No. 13). Berlin, A. Asher & Co. Size $10 \times 8\frac{1}{2}$. Pp. 78 + 128. *Plates.*

THIS is the thirteenth number of Professor Hellmann's beautiful series of reprints, and it is one specially interesting to the English reader on account of the large part taken by Englishmen in the earliest centuries of observational meteorology. Readers of this Magazine will remember Professor Hellmann's letter to Mr. Symons in 1890, which led to the discovery of the MS. of William Merle's observations made at Driby, Lincolnshire, between 1337 and 1344, in the Bodleian Library at Oxford; and to the reproduction of the work itself in facsimile and in English translation ten years ago.

Two pages of the facsimile are reproduced here, and the latin text is transcribed. An anonymous set of notes for October to December, 1439, made somewhere in England, is also reproduced. The observer records several dates in November as "Dies serena et splendidissima," but his latin breaks down occasionally, and a word or two of the mother tongue creeps in, as on November 29th :— "Misty usque ad noctem cum gelu magno et cecidit in nocte ryme." The oldest continental record reproduced dates from 1502, the oldest from South America from 1640, and from North America, 1644. The earliest instrumental observations in England that are reproduced, possibly the earliest that were made, were those by Mr. Locke, in Oxford, in 1666, for three summer months. The thermometer employed was quite an experimental form, the defects of which are naively set forth in an accompanying "explication." A diagram of the rise and fall of the barometer for each month of the year 1684 is reprinted from the *Philosophical Transactions*, probably the first example of the graphic method. The reprints conclude with a number of records of observations at sea between 1492 and 1700.

Professor Hellmann's introduction gives a sketch of the history of meteorological observations, and a critical analysis of each of the examples he has published. The work as a whole is of the greatest historical value, and shows in a very interesting way how similar the weather of recent centuries has been, supplying a link of almost personal experience with the past.

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*The Weather at Clifton from* 1890 *to* 1900. *Being a Sequel to "Thirty Years' Weather at Bristol from* 1860 *to* 1889. By ROBERT F. STURGE, F.R.Met.Soc. Bristol: Printed for Private Circulation. 1901. Size, $7\frac{1}{2} \times 5$. Pp. 98.

A SERIES of notes on the weather of the individual months, with yearly summaries and occasional short descriptions of remarkable phenomena, and general remarks on the decade. A short account of the position in which the observations were made and some account of the instruments employed would have been useful additions. During the eleven years under consideration the highest maximum temperature was 87° in 1893, the lowest minimum 14° in 1891. The wettest year was 1891, with a total fall of 42·98 in.; the driest 1892, with 26·35 in.; the greatest number of rainy days was 200 in 1894, and the smallest number 155 in 1899. A table is given showing the mean, maximum and minimum monthly rainfall and number of rainy days for the forty-five years from 1856 to 1900. The driest month was February, 1891, with ·01 in., the wettest October, 1891, with 8·71 in. The mean rainfall shows April to be the driest month with 2·18 in., and October the wettest with 3·78 in., the mean annual fall being 34·86 in.

## BOOKS RECEIVED.

Falmouth Observatory. Meteorological and Magnetical Tables and Reports for the year 1900; also additional Meteorological Tables for Falmouth for six consecutive lustra, 1871 to 1900, and tables of sea temperature by Wilson Lloyd Fox, F.R.Met.Soc., and Edward Kitto, F.R.Met.Soc. Reprinted from the Annual Report of the Royal Cornwall Polytechnic Society, 1900. Falmouth, 1901. Size $8\frac{1}{2} \times 5\frac{1}{2}$, ,p. 28.

Magnetical, Meteorological and Seismological Observations made at the Government Observatory, Bombay, 1898 and 1899, under the direction of N. A. F. Moos, Esq., B.Sc., F.R.S.E. With Appendices. Printed by order of His Majesty's Government. Bombay, 1901. Size $14 \times 10$. Pp. [192]. *Plates.*

Report on Cloud Observations and Measurements in the plains of the North Western Provinces of India during the period December, 1898. to March, 1900, by E. G. Hill, Esq., B.A., Professor of Natural Science, Muir Central College, Allahabad. Being Vol. 11, Part 3 of the Indian Meteorological Memoirs. Calcutta, 1901. Size $14 \times 10$. Pp. [50].

Le Climat de la Belgique en 1899, par A. Lancaster. Bruxelles, 1901. Size $7\frac{1}{2} \times 5$. Pp. 180. This and other papers kindly forwarded by M. Lancaster, are reprints from the *Annuaire Météorologique* for 1900, noticed in this Magazine for May, p. 65.

Meteorologische Beobachtungen angestellt in Jurjew im Jahre 1897. Zuryeff, 1901. Size $9\frac{1}{2} \times 6\frac{1}{2}$. Pp. 118. "Jurjew" is the German phonetic rendering of the Russian name which to English ears sounds Zuryeff, now applied to the ancient University town of Dorpat, in Russia.

Ueber die Wärmeleitungsfähigkeit des Schnees vod Martin Jansson. (On the thermal conductivity of snow). Ofversigt af Kongl. Vetenskaps-Akademiens Föhandlingar, 1901, No. 3. Stockholm. Size $8\frac{1}{2} \times 5\frac{1}{2}$. Pp. (14). A study carried out at the University of Upsala.

Ergebnisse der Meteorologischen Beobachtungen an der Station I. Ordnung Chemnitz im Jahre 1898. Herausgegeben von Dr. Paul Schreiber. Chemnitz, 1901. Size $12\frac{1}{2} \times 10$. Pp. 40. *Plates.*

Decaden Monatsberichte (Vorläufige Mittheilung) des Königl. sächsischen Meteorologischen Institutes, 1900. Jahrgang III. Herausgegeben vom Director Professor Dr. Paul Schreiber. Chemnitz, 1901. Size $12\frac{1}{2} \times 8$. Pp. 48.

Climate, by William Miller. Cork, 1901. Size $7\frac{1}{2} \times 5$. Pp. 16.

Mysore Meteorological Memoirs, No. 1. Containing for the period 1895-1898 the hourly records obtained with the autographic instruments at the Bangalore Observatory; containing also a descriptive sketch of the Observatory and the Instruments. By John Cook, M.A., F.R.S.E. Bangalore, 1901. Size $14 \times 11$. Pp. vi. + 100. *Plates.*

Report on Rainfall Registration in Mysore for 1900, by John Cook, M.A., F.R.S.E., Director of Meteorology in Mysore. Bangalore, 1901. Size $12 \times 10$. Pp. 30. *Plates and Maps.*

Bulletin annuel de la Commission de la Météorologie du Département du Bouches-du-Rhone. Année 1900—19me. année. Marseille, 1901. Size $11\frac{1}{2} \times 9$. Pp. 104. *Plates.*

Jahrbuch der Meteorologischen Beobachtungen der Wetterwarte der Magdeburgischen Zeitung im Jahre 1899, Herausgegeben von Rudolph Weidenhagen. Band xviii. Jahrgang xix. Magdeburg, 1901. Size $12 \times 9\frac{1}{2}$. Pp. 94. *Plates.*

## METEOROLOGICAL NEWS AND NOTES.

THIS month sees the departure of two fully equipped scientific expiditions to explore the Antartic area, paying special attention to Magnetic and Meteorological Observations, but neglecting no branch of natural science. The British expedition in the *Discovery* sailed from London on July 31st, and from Spithead on August 5th, under the command of Captain R. F. Scott, R.N., with Mr. George Murray, F.R.S., as Chief of the Scientific Staff. Dr. H. R. Mill accompanied the vessel to Madeira, in order to assist in arranging the routine of oceanographical observations. The German ship *Gauss* sailed nearly simultaneously with an expedition under the command of Professor Erich von Drygalski, of the University of Berlin.

WE note with pleasure that an effort is being made at Windermere to obtain exact records of the duration as well as the amount of fall of rain. Possibly some holiday-makers are deterred by the notorious wetness of the Lake District from visiting the most beautiful scenery in England, and steps are now being taken at Bowness to establish a recording gauge which shall supply data as to the number of hours, as well as the number of inches of falling rain, and enable the tourist to estimate his chances of dry weather. It is worth remembering that the fine weather of districts of high rainfall is perhaps the very finest weather to be found, and that intense rains are usually soon over.

FREEZING FRESH WATER in Nature presents the puzzling phenomenon that even while ice is forming, the temperature of the water remains higher than 32° F. A recent number of *Petermanns Mitteilungen* contains a note by Herr Schuls, of Gmunden, in Upper Austria, who describes an experiment he made last February in the Gmunden lake, while it was beginning to freeze. By the use of a floating horizontal minimum thermometer he found that the extreme surface layer of the water was at 32° before the ice appeared; but it was impossible to dip a thermometer in the water in the ordinary way without mixing this very thin layer with the warmer water beneath, and so raising the temperature to 34° or 35°.

THE INFLUENCE OF FORESTS on the dampness of the ground and the yield of springs is discussed by Professor H. Gravelius in *Petermanns Mitteilungen* for March, in a review of a number of recently-published treatises on the subject, most of which have appeared in the Russian language, and so require an interpreter to bring them before even the learned of western Europe. The result is to show very clearly that forests do not preserve the moisture of the ground or promote the flow of springs. All the experiments showed that the level of ground water was lower under great forests than in open country, even in the Russian steppe. The forest appears to protect the ground altogether from light rains, which are

absorbed by the foliage or evaporated from the immense surface formed by the leaves as the drops trickle downwards. Heavy rains reach the ground nearly as freely as in open land, but here the tree roots play their part, and the transpiration of the vegetation keeps the soil dry to a considerable depth. These facts go to prove the immense value of forests on mountain sides for checking floods, and of the planting of woods in swampy country as an aid to drainage in drying the land.

A CLASSIFICATION OF CLIMATES, by Professor W. Köppen, occupies a large share of the March issue of the *Meteorologische Zeitschrift*, although it is only an abstract of the complete memoir published elsewhere. The classification is extremely elaborate, and is explained by supposing an ideal continent to stretch from pole to pole, with the sea on both sides. The tropical zone stretches straight across the centre, while three cooler zones on the north and south are wide on the west coast, narrowing towards the east. From the west side of the tropical zone an arid zone stretches northeastward, and another southeastward, across the cooler zones into the centre of the continent. There are thus, in addition to the tropical zone, four climatic divisions to the north, and the same four divisions repeated to the south. These great divisions are sub-divided with reference to range of temperature and amount of rainfall, and each of the thirty sub-climates is named after one of its characteristic plants or animals. The merit of this classification lies in the recognition of the great climatic contrasts between the east and the west sides of continents, as well as the sharper contrasts between the equatorial and polar regions.

THE MEAN TEMPERATURE AT PARIS for the period 1851–1900 is discussed by M. Angot in the April number of the *Annuaire* of the French Meteorological Society. He gives the following monthly means and absolute extremes, which we translate into Fahrenheit degrees :—

| Month ... | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sep. | Oct. | Nov. | Dec. | Year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean ... | 36·2 | 38·6 | 42·6 | 49·9 | 55·4 | 61·7 | 65·0 | 63·8 | 58·5 | 50·1 | 42·5 | 36·9 | 50·1 |
| Max. ... | 60·3 | 69·3 | 75·0 | 84·9 | 92·5 | 95·7 | 101·1 | 99·3 | 95·9 | 79·7 | 71·1 | 64·1 | 101·1 |
| Min. ... | 1·4 | 4·3 | 12·2 | 25·7 | 29·7 | 35·8 | 42·3 | 41·2 | 33·1 | 22·5 | 5·0 | -14·1 | -14·1 |

RAINFALL OBSERVATIONS seem to be badly wanted on the drainage area feeding the Great Salt Lake of Utah, the shrinkage of which has been causing some alarm in Salt Lake City. So much of the water which would naturally flow into the lake is now diverted for irrigation, that an exact knowledge of the available supply, by the establishment of a complete system of rain gauges, would seem to be as profitable to the state of Utah as a geological survey to the territory of Alaska. It is always difficult to grasp the idea of the intrinsic value as a national asset of the powers of the atmosphere rendered available by the form of the land; but in some parts of the world the necessity of doing so is becoming very apparent.

MR. H. H. HARDING, in an article which has appeared in several newspapers, gave an interesting epitome of the weather of the nineteenth century, devoting a few lines to the salient features of each of the hundred years. He dealt of course with the general weather of the country, not that of any particular locality, and two circumstances strike one on reading the curt summaries; first, the remarkable variety of the weather from year to year, so that the description does not become wearisome from monotony; and second, the surprising similarity of the general type, extreme years being scattered with some approach to uniformity throughout the series. How difficult it is to form a true average of any element of weather from observations extending over a short period is shown by the fact that the first nine years of the century were without exception greatly deficient in rain (indeed, as Mr. Symons showed in *British Rainfall*, 1891, the rainfall of the country was above the average on only three years between 1800 and 1820, while it was below the average only on one year between 1875 and 1886, the longest wet period). The worst storm of the century is said to have been that of Christmas Day, 1836, and the wettest year 1852, while 1864 was one of the driest. The winters of 1816 and 1879 are recorded as the most severe in the century, and June, 1846 was the hottest summer month on record. Such a summary, while without the definite value which figures alone can give, is very useful as an aid to the memory of old people, who naturally tend to remember extremes and forget the many common-place years which lie between.

A SAND-BOW is apparently a new phenomenon, the observation of which is reported in *Science* by Prof. J. E. Talmage, of Utah University, who explains the appearance of a large "rainbow" when rain was not falling by the reflection of light from the outer surface of spherical grains of oolitic sand raised by the wind from the shore of Great Salt Lake.

## Correspondence.

### THE MAIDENHEAD STORM OF JULY 12TH.

*To the Editor of Symons's Meteorological Magazine.*

I SEE a letter from you in to-day's *Times* with regard to yesterday's storm. It may interest you to know that in the great storm here on the 12th inst. I measured 3·05 in. My neighbour, at a distance of half-a-mile, measured 3·22 in., and at Cookham Mr. Rogers measured 3·48 in. The storm here lasted from 7 to 11, during which time there was an interval of at least one hour, so that the rain fell at the rate of over an inch an hour. I have never before measured as much as two inches, and, as you know, I have kept registers for twenty-five years.

G. H. PALMER.

*Stafferton Lodge, Maidenhead,*
*26th July, 1901.*

## A CONTRAST IN RAINFALL.

*To the Editor of Symons's Meteorological Magazine.*

THE following records of rainfall at Hazelhurst may be worth putting on record :—

| | |
|---|---|
| From April 17th to April 30th (14 days), 1 day with rain..... | 0·07 in. |
| ,, May 1st to 31st (31 days), 7 days with rain ..... | 1·02 ,, |
| ,, June 1st to 28th (28 days), 7 days with rain ..... | 0·67 ,, |
| Making 73 days, with rain on 15 ..... | 1·76 in. |
| June 29th, Thunderstorm..... | 0·45 in. |
| ,, 30th, ,, ,, ..... | 0·85 ,, |
| July 1st ..... | ... |
| ,, 2nd ..... | 1·16 ,, |
| In 4 days ..... | 2·46 in. |

The rain of July 2nd occurred principally between 10 and 11 a.m., during which time about 1 inch fell. There was no thunderstorm.

T. P. NEWMAN.

*Hazelhurst, Haslemere,*
*July 7th, 1901.*

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## A WARM MONTH AT NEWCASTLE.

*To the Editor of Symons's Meteorological Magazine.*

PERHAPS the following may interest some of your readers. On the 19th July the thermometer in the Stevenson screen rose to 86°·3, which is the highest temperature recorded here during the years 1887—1901. On July 20th the thermometer rose to 86°. The previous record for the same period was 84°·5 on September 4th, 1898. The thermometer has reached or exceeded 83° during the years 1887—1901 only nine times, and has reached or exceeded 80° only thirty-four times. This month has proved very warm :—

80°·6 on 5th, 84°·2 on 12th, 81°·2 on 18th,
86°·3 on 19th, 86°·0 on 20th,

while the thermometer has failed to reach 70° on only seven days so far. The situation of my screen is much above the town (altitude 314 ft.), where, of course, higher readings have been obtained.

E. L. MERZ

*The Quarries, Newcastle-upon-Tyne,*
*July 22nd, 1901.*

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, FEBRUARY, 1901.

| STATIONS. (*Those in italics are South of the Equator.*) | Absolute. Maximum. Temp. | Date. | Absolute. Minimum. Temp. | Date. | Average. Max. | Min. | Dew Point. | Humidity. | Absolute. Max. in Sun. | Min. on Grass. | Total Rain. Depth. | Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0-100 | ° | ° | inches | | |
| London, Camden Square | 53·3 | 28 | 17·9 | 14 | 41·2 | 31·4 | 32·1 | 85 | 85·7 | 16·3 | 1·21 | 9 | 6·9 |
| Malta | 67·2 | 2 | 40·3 | 15 | 60·1 | 48·2 | 46·5 | 80 | 122·3 | 36·2 | 3·68 | 12 | 4·6 |
| *Cape Town* | 99·1 | 23 | 48·7 | 21 | 79·1 | 60·3 | 58·3 | 67 | ... | ... | ·64 | 9 | 3·3 |
| *Mauritius* | 88·7 | 19 | 64·1 | 10 | 86·2 | 72·1 | 70·6 | 77 | 152·4 | 57·0 | 3·67 | 13 | 5·9 |
| Calcutta | 87·1 | 4, 5 | 53·1 | 26*a* | 81·5 | 61·6 | 58·5 | 66 | 143·5 | 47·9 | 1·95 | 3 | 3·5 |
| Bombay | 90·6 | 25 | 58·4 | 22 | 80·4 | 66·2 | 59·3 | 62 | 140·7 | 48·9 | ·00 | 0 | 2·0 |
| Colombo, Ceylon | 94·0 | 19 | 71·0 | 20 | 90·4 | 73·5 | 73·4 | 81 | 154·0 | 69·8 | 3·55 | 11 | 3·5 |
| *Melbourne* | 109·5 | 7 | 49·1 | 4 | 80·7 | 57·5 | 54·0 | 62 | 158·3 | 36·8 | ·64 | 3 | 5·0 |
| *Adelaide* | 110·0 | 6 | 51·1 | 16 | 91·4 | 67·1 | 52·7 | 41 | 160·9 | 46·4 | ·03 | 2 | 4·6 |
| *Sydney* | 90·0 | 8 | 59·3 | 4 | 77·3 | 65·0 | 63·1 | 74 | 150·5 | 51·5 | 2·04 | 16 | 5·6 |
| *Wellington* | 75·0 | 22 | 46·0 | 26 | 67·4 | 55·0 | 49·8 | 67 | 132·0 | 43·0 | 2·65 | 12 | 4·5 |
| *Auckland* | 76·5 | 20 | 50·5 | 8 | 70·3 | 58·1 | 52·4 | 65 | 146·0 | 47·0 | 3·98 | 12 | 5·5 |
| Jamaica, Halfway Tree | 87·0 | 25 | 23·0 | 5 | 84·5 | 66·9 | 65·4 | 75 | ... | ... | ·00 | 0 | 1·3 |
| Trinidad | 93·0 | 27 | 61·0 | 17*b* | 90·3 | 65·3 | 69·7 | 79 | 162·0 | 54·0 | 1·12 | 4 | ... |
| Grenada | 85·2 | 19 | 69·0 | 3 | 82·8 | 72·5 | 69·1 | 72 | 153·0 | ... | 1·33 | 13 | 2·0 |
| Toronto | 34·0 | 25 | —2·4 | 10 | 24·3 | 8·9 | 12·7 | 80 | 57·0 | —8·2 | 1·44 | 12 | 6·1 |
| Fredericton, New Brunswick | 39·9 | 5 | —14·3 | 2 | 26·1 | 7·2 | 9·0 | 73 | ... | ... | 3·28 | 11 | 6·3 |
| Winnipeg, Manitoba | 35·5 | 28 | —27·6 | 20 | 11·2 | —11·0 | ... | ... | ... | ... | ·90 | 9 | ... |
| Victoria, British Columbia | 58·4 | 28 | 28·3 | 9 | 45·8 | 36·3 | | ... | ... | ... | 3·36 | 16 | 6·0 |

*a*—and 27. *b*—and 27.

### REMARKS.

MALTA.—Adopted mean temp. of air 53°·7 or 0°·4 below the average. Mean hourly velocity of wind 11·0 miles or 0·9 below average. Mean temp. of sea 60°·2. TSS on 3 days. H on 2 days. J. F. DOBSON.

*Mauritius.*—Mean temp. of air 0°·3, of dew point 0°·3, and R 2·99 in. below their respective averages. Mean hourly velocity of wind 7·2 miles, or 3·9 miles below the average; extremes, 18·1 on 1st and 1·8 on 13th; prevailing direction S.E. by E. to E. by N., and with occasional light airs from W. T on 4 days, L on 2 days, and L and T on 5 days. T. F. CLAXTON.

COLOMBO, CEYLON.—Mean temp. of air 0°·5 above, of dew point 3°·1 above, and R 1·66 in. above, their respective averages. Mean hourly velocity of wind 7·1 miles; prevailing direction N.E. and S.W. TSS occurred on 2 days, and L on 2 days. W. C. S. INGLES.

*Adelaide.*—Mean temp. of air 5°·2 above the average, having only twice been higher in February in 44 years. R ·61 in. below average. Fine well distributed rains over the interior of the State and the N. Territory. Dry and very hot in the more settled districts. C. TODD, F.R.S.

*Sydney.*—Mean temp. of air 0°·2 above, and R 3·05 in. below, their respective averages. H. C. RUSSELL, F.R.S.

*Wellington.*—Mean temp. of air 1°·3 below, and R ·89 in. below their respective averages. Generally showery, but with intervals of fine weather; cool for the time of year. Prevailing wind N.W., and often strong. R. B. GORE.

*Auckland.*—Unusually cool, mean temp. 3° below the average. R half-an-inch above the average. T. F. CHEESEMAN.

TRINIDAD.—R ·57 in. below the 30 years' average. J. H. HART.

# SUPPLEMENTARY TABLE OF RAINFALL, JULY, 1901.

| Div | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| I. | Uxbridge, Harefield Pk.. | 1·38 | XI. | Castle Malgwyn ..... | 3·19 |
| II. | Dorking, Abinger Hall . | 1·77 | ,, | Builth, Abergwesyn Vic. | 2·14 |
| ,, | Sheppey, Leysdown ..... | 2·31 | ,, | Rhayader, Nantgwillt ... | ... |
| ,, | Hailsham ..... | 1·70 | ,, | Lake Vyrnwy ..... | 3·85 |
| ,, | Crowborough..... | 2·28 | ,, | Corwen, Rhug ..... | 2·99 |
| ,, | Ryde, Thornbrough ..... | ... | ,, | Criccieth, Talarvor ..... | 2·91 |
| ,, | Emsworth, Redlands ... | 1·87 | ,, | I. of Anglesey, Lligwy.. | ·70 |
| ,, | Alton, Ashdell ..... | 2·80 | ,, | Douglas, Woodville..... | 1·21 |
| ,, | Newbury, Welford Park | 3·82 | XII. | Stoneykirk, Ardwell Ho. | 1·29 |
| III. | Oxford, Magdalen Coll.. | 4·34 | ,, | New Galloway, Glenlee | ·84 |
| ,, | Banbury, Bloxham ..... | 4·52 | ,, | Moniaive, Maxwelton Ho. | 1·60 |
| ,, | Pitsford, Sedgebrook ... | 1·66 | ,, | Lilliesleaf, Riddell ..... | 3·63 |
| ,, | Huntingdon, Brampton. | 1·93 | XIII. | N. Esk Res. [Penicuick] | ·85 |
| ,, | Wisbech, Bank House... | 1·48 | XIV. | Glasgow, Queen's Park.. | 2·39 |
| IV. | Southend ..... ..... | 1·52 | XV. | Inveraray, Newtown ... | 2·22 |
| ,, | Colchester, Lexden ..... | 2·53 | ,, | Ballachulish, Ardsheal... | 3·68 |
| ,, | Saffron Waldon, Newport | 1·96 | ,, | Islay, Eallabus..... | 1·49 |
| ,, | Rendlesham Hall ..... | ·57 | XVI. | Dollar..... | 1·45 |
| ,, | Swaffham ..... | ·92 | ,, | Balquhidder, Stronvar... | 4·51 |
| V. | Salisbury, Alderbury ... | 2·49 | ,, | Coupar Angus Station... | 1·47 |
| ,, | Bishop's Cannings ..... | 2·74 | ,, | Blair Atholl ... ..... | 2·04 |
| ,, | Blandford, Whatcombe . | 1·70 | XVII. | Keith H.R.S..... | 2·51 |
| ,, | Ashburton, Druid House | 2·44 | ,, | Forres H.R.S. ... ..... | 3·75 |
| ,, | Okehampton, Oaklands. | 1·81 | XVIII. | Fearn, Lower Pitkerrie.. | 3·23 |
| ,, | Hartland Abbey ..... | 1·53 | ,, | S. Uist, Askernish ..... | 3·00 |
| ,, | Lynton, Glenthorne ... | ... | ,, | Invergarry..... | ·87 |
| ,, | Probus, Lamellyn ..... | 1·25 | ,, | Aviemore, Alvie Manse. | 1·37 |
| ,, | Wellington, The Avenue | 2·38 | ,, | Loch Ness, Drumnadrochit | 2·64 |
| ,, | North Cadbury Rectory | 2·04 | XIX. | Invershin ..... | 2·84 |
| ,, | Clifton, Pembroke Road | 2·71 | ,, | Durness..... | ... |
| VI. | Ross, The Graig ..... | 2·96 | ,, | Watten H.R.S..... | 1·83 |
| ,, | Wem, Clive Vicarage ... | 3·89 | XX. | Dunmanway, Coolkelure | 1·88 |
| ,, | Wolverhampton, Tettenhall | ... | ,, | Cork, Wellesley Terrace | ·47 |
| ,, | Cheadle, The Heath Ho. | 3·24 | ,, | Killarney, District Asyl. | 1·01 |
| ,, | Coventry, Priory Row .. | 2·39 | ,, | Caher, Duneske ..... | ·59 |
| VII. | Market Overton ..... | 4·54 | ,, | Ballingarry, Hazelfort... | 1·17 |
| ,, | Grantham, Stainby ..... | 3·70 | ,, | Limerick, Kilcornan ... | ... |
| ,, | Horncastle, Bucknall ... | 2·03 | ,, | Miltown Malbay ..... | 2·19 |
| ,, | Worksop, Hodsck Priory | 3 05 | XXI. | Gorey, Courtown House | 1·38 |
| VIII. | Neston, Hinderton ..... | 2·57 | ,, | Moynalty, Westland ... | 1·33 |
| ,, | Southport, Hesketh Park | 1·72 | ,, | Athlone, Twyford ..... | 1·32 |
| ,, | Chatburn, Middlewood. | 1·96 | ,, | Mullingar, Belvedere ... | ·94 |
| ,, | Duddon Val., Seathwaite Vic. | 1·95 | XXII. | Woodlawn ..... | 1·68 |
| IX. | Baldersby ..... | 1·89 | ,, | Crossmolina, Enniscoe .. | 1·41 |
| ,, | Scalby, Silverdale ..... | 2·37 | ,, | Collooney, Markree Obs. | 1·81 |
| ,, | Ingleby Greenhow Vic.. | 4·23 | XXIII. | Enniskillen, Model Sch. | 2·07 |
| ,, | Middleton, Mickleton ... | 1·25 | ,, | Warrenpoint..... | ·73 |
| X. | Haltwhistle, Unthank H. | ... | ,, | Miltown, Banbridge..... | 1·15 |
| ,, | Bamburgh ..... | 2·07 | ,, | Belfast, Springfield ..... | 1·37 |
| ,, | Keswick, The Bank..... | 1·14 | ,, | Bushmills, Dundarave.. | 1·60 |
| XI. | Llanfrechfa Grange ..... | 2·56 | ,, | Stewartstown ..... | 1·12 |
| ,, | Treherbert, Tyn-y-waun | 2·28 | ,, | Killybegs ..... | 1·35 |
| ,, | Llandovery ..... | 2·44 | ,, | Horn Head ..... | 1·89 |

# JULY, 1901.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1890-9. | Greatest Fall in 24 hours. Dpth | Date | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date | Min. Deg. | Date. | No. of Nights below 32°. In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches. | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | 5·04 | + 2·79 | 2·85 | 25 | 8 | 89·9 | 19 | 48·4 | 8 | 0 | 0 |
| II. | | Tenterden ..... | 2·22 | — ·38 | ·54 | 26 | 8 | 85·0 | 12*b* | 48·5 | 8 | 0 | ... |
| ,, | | Hartley Wintney ..... | 1·82 | — ·54 | ·38 | 26 | 11 | 91·0 | 18 | 45·0 | 1, 17 | 0 | ... |
| III. | | Hitchin ..... ..... | 1·83 | — ·58 | ·85 | 26 | 7 | 87·0 | 19 | 46 0 | 8 | 0 | ... |
| ,, | | Winslow (Addington) ..... | 1·40 | — 1·07 | ·39 | 26 | 8 | 90·0 | 19 | 45·0 | 8 | 0 | ... |
| IV. | | Bury St. Edmunds (Westley) | 1·06 | — 1·85 | ·69 | 26 | 5 | 87·5 | 18 | 46·0 | 10 | 0 | ... |
| ,, | | Norwich (Brundall) ..... | 1·19 | ... | ·46 | 24 | 6 | 83·3 | 21 | 46·8 | 10 | 0 | 0 |
| V. | | Winterbourne Steepleton ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Torquay (Cary Green) ... ..... | 1·84 | ... | ·62 | 27 | 7 | 78·6 | 10 | 50·3 | 16 | 0 | ... |
| ,, | | Polapit Tamar [Launceston].. | 1·20 | — 1·82 | ·73 | 24 | 9 | 85·2 | 19 | 39·5 | 16 | 0 | ... |
| VI. | | Stroud (Upfield) ..... | 2·27 | — ·34 | ·48 | 13 | 9 | 86·0 | 19*c* | 55·0 | 13*e* | 0 | ... |
| ,, | | Church Stretton (Woolstaston) | 3·83 | + 1·50 | 1·56 | 24 | 12 | 83·0 | 18 | 51·0 | 1*f* | 0 | ... |
| ,, | | Worcester (Diglis Lock) ..... | 2·69 | + ·93 | ·77 | 24 | 8 | ... | ... | ... | ... | ... | ... |
| VII. | | Boston ..... | 1·74 | — ·38 | ·59 | 24 | 7 | 90·0 | 18 | 50·0 | 16 | 0 | ... |
| ,, | | Hesley Hall [Tickhill]..... | 2·33 | + ·36 | ·88 | 24 | 9 | 92·0 | 19 | 41·0 | 14 | 0 | ... |
| ,, | | Derby (Midland Railway)..... | 3·31 | + 1·00 | 1·28 | 24 | 9 | 91·0 | 18*b* | 47·0 | 14 | 0 | ... |
| VIII. | | Manchester (Plymouth Grove) | 3·30 | + ·18 | 2·07 | 25 | 9 | 93·0 | 20 | 48·0 | 13 | 0 | ... |
| IX. | | Wetherby (Ribston Hall) ... | 1·22 | — 1·07 | ·40 | 1 | 11 | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) ..... | 1·96 | — 3·07 | 1·29 | 27 | 9 | ... | ... | ... | ... | ... | ... |
| ,, | | Hull (Pearson Park). ... ..... | 1·96 | — ·36 | ·84 | 27 | 10 | 84·0 | 5*d* | 45·0 | 14 | 0 | ... |
| X. | | Newcastle (Town Moor) ..... | 3·52 | + ·83 | 1·29 | 19 | 13 | ... | ... | .. | ... | ... | ... |
| ,, | | Borrowdale (Seathwaite)..... | 2·27 | — 7·14 | 1·02 | 14 | 9 | 84·0 | 20 | 46·4 | 14 | 0 | ... |
| XI. | WALES. | Cardiff (Ely)..... | 3·57 | + ·33 | 1·09 | 28 | 8 | ... | ... | ... | ... | ... | ... |
| ,, | | Haverfordwest ..... ..... | 1·16 | — 2·18 | ·34 | 24 | 8 | 84·5 | 20 | 47·1 | 16 | 0 | 0 |
| ,, | | Aberystwith (Gogerddan) ... | 2·58 | — 1·04 | ·96 | 24 | 8 | 93·0 | 20 | ... | ... | ... | ... |
| ,, | | Llandudno..... | 2·10 | — ·48 | ·95 | 25 | 13 | 89·5 | 20 | 49·0 | 7 | 0 | ... |
| XII. | SCOTLAND. | Cargen [Dumfries] ..... | 1·75 | — 1·59 | ·85 | 20 | 6 | 89·0 | 20 | 45·0 | 31 | 0 | ... |
| XIII. | | Edinburgh (Royal Observatory) | .96 | ... | ·26 | 24 | 12 | 80·6 | 11 | 44·7 | 4 | 0 | 0 |
| XIV. | | Colmonell ..... | ·92 | — 2·28 | ·25 | 21 | 7 | 85·0 | 20 | 43·0 | 6 | 0 | ... |
| XV. | | Tighnabruaich ..... ..... | 1·43 | ... | ·50 | 21 | 10 | 75·0 | 20 | 46·0 | 2, 6 | 0 | ... |
| ,, | | Mull (Quinish)..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Leven Sluices ..... | ·69 | — 2·38 | ·31 | 22 | 6 | ... | ... | ... | ... | ... | ... |
| ,, | | Dundee (Eastern Necropolis) | ·90 | — 1·46 | ·30 | 26 | 8 | 82·7 | 18 | 48·4 | 2 | 0 | ... |
| XVII. | | Braemar ..... .. | 1·32 | — 1·45 | ·25 | 26 | 11 | 78·0 | 4 | 41·0 | 3 | 0 | ... |
| ,, | | Aberdeen (Cranford) ... ..... | 2·05 | — ·58 | ·50 | 24 | 13 | 82·0 | 30 | 43·0 | 6 | 0 | ... |
| ,, | | Cawdor (Budgate) ..... | 3·20 | — ·22 | 1·33 | 25 | 12 | ... | .. | ... | ... | ... | ... |
| XVIII | | Strathconan [Beauly] ..... | 2·42 | — 2·24 | ·70 | 23*a* | 6 | .. | ... | ... | ... | ... | ... |
| ,, | | Glencarron Lodge..... | 4·07 | — 2·83 | ·62 | 20 | 17 | 79·1 | 3 | 37·0 | 22 | 0 | ... |
| XIX. | | Dunrobin ..... | 2·93 | + ·23 | ·87 | 25 | 12 | 78·5 | 7 | 41·0 | 12 | 0 | ... |
| ,, | | S. Ronaldshay (Roeberry) ... | 1·50 | — 1·39 | ·95 | 25 | 13 | 78·0 | 18 | 46·0 | 2, 3 | 0 | ... |
| XX. | IRELAND. | Darrynane Abbey..... | 1·16 | — 2·56 | ·24 | 16 | 13 | ... | ... | ... | ... | ... | ... |
| ,, | | Waterford (Brook Lodge) ... | 1·22 | — 2·16 | ·49 | 28 | 10 | 81·0 | 19 | 41·0 | 7 | 0 | ... |
| ,, | | Broadford (Hurdlestown) ... | 1·33 | — 1·65 | ·32 | 1 | 18 | 80·0 | 18 | 48·0 | 15 | 0 | ... |
| XXI. | | Carlow (Browne's Hill) ..... | 1·09 | — 1·86 | ·32 | 1 | 10 | ... | ... | ... | ... | ... | ... |
| ,, | | Dublin (Fitz William Square) | 2·08 | — ·50 | ·75 | 1 | 13 | 81·8 | 17 | 49·9 | 7 | 0 | 0 |
| XXII. | | Ballinasloe ..... ..... | 1·66 | — 1·61 | ·64 | 1 | 14 | 82·0 | 21 | 44·0 | 5, 6 | 0 | ... |
| ,, | | Clifden (Kylemore) ..... .. | 2·49 | — 4·10 | ·41 | 15 | 13 | ... | ... | ... | ... | ... | ... |
| XXIII | | Seaforde..... | 1·59 | — 1·60 | ·41 | 24 | 11 | 79·0 | 11*c* | 43·0 | 6 | 0 | ... |
| ,, | | Londonderry (Creggan Res.). | 1·52 | — 2·18 | ·46 | 18 | 16 | ... | ... | ... | ... | ... | ... |
| ,, | | Omagh (Edenfel) ..... | 1·65 | — 1·90 | ·29 | 21 | 14 | 78·0 | 20 | 48·0 | 11*b* | 0 | ... |

+ Shows that the fall was above the average ; — that it was below it.

*a*—and 24. *b*—and 19. *c*—and 20. *d*—and 17, 18. *e*—and 15. *f*—and 16, 26.

# METEOROLOGICAL NOTES ON JULY, 1901.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

LONDON, CAMDEN SQUARE.—Absolute drought prevailed from the 3rd to 21st; slight R fell on 22nd and 23rd, and heavy R daily from 24th to 27th. The fall on the 25th is the greatest since June 23rd, 1878, when 3·28 in. fell. L and T on 25th, 27th and 29th. Mean temp. of the month 66°·5, or 3°·2 above the average.

TENTERDEN.—Dry weather continued with increased heat and occasional TSS, some of which were very partial, more than ·75 in. falling at Biddenden on 29th, and none at Tenterden. Duration of sunshine, 270·5 hours. TSS on 6th, 13th, 25th and 26th.

HARTLEY WINTNEY.—The rains were sufficiently heavy to produce nearly a normal fall, but so far apart as to make the prolonged drought since April 16th severe. The last week was showery. Distant TSS on 12th, 16th, 28th and 29th. Shade temp. of 91°, 90° and 90° occurred on 18th, 19th and 20th. Light breezes from N. were prevalent. Ozone on 10 days, with a mean of 3·2.

WINSLOW, ADDINGTON.—Another July with a small R. T on 12th, 13th, 24th and 26th, generally distant. From the 16th to 21st the max. temp. was very high.

BURY ST. EDMUNDS, WESTLEY.—A very hot month, the max. temp. being only twice below 65°. No R fell from the 7th to the 23rd, and the TSS of 25th, 26th and 27th were very partial.

NORWICH, BRUNDALL.—A fine summer month, and the third exceptionally warm July in succession. The rains in the fourth week were exceedingly local in character. TSS on 1st, 5th and 25th. Much L on 21st.

POLAPIT TAMAR [LAUNCESTON].—A dry and exceptionally hot month. The max. shade temp. on the 18th, 19th and 20th, namely, 84°·7, 85°·2 and 83°·9, are the highest readings in the 8 years' record, and the average shade max. was 72°·1. During the night of the 20th the temp. in the screen did not fall below 62°·5. Absolute drought prevailed from 3rd to 21st inclusive.

MANCHESTER, PLYMOUTH GROVE.—Fine summer weather prevailed till the 20th; TSS on 21st and 26th. The mean temp., 66°·5, is the highest in July since 1868.

## WALES.

HAVERFORDWEST.—The month was fine and warm, with a fair amount of bright sunshine. On 5 days the temp. exceeded 80°, and the minima were generally high, the highest being 62°·0 on the 21st. The max. temp (84°·5) has been exceeded only twice in July in 50 years; viz., by 88°·5 in 1870, and 86°·6 in 1876.

ABERYSTWITH, GOGERDDAN.—The first three weeks were very hot, with drying winds chiefly from the E. In the last week welcome R came in a deluge from all quarters, and the total fall is the largest for some years.

## SCOTLAND.

CARGEN [DUMFRIES].—An exceptionally severe TS occurred on the 20th between 8 p.m. and 10 p.m. A wire fence within 200 yards of this house was fused, and a wooded stool split to matchwood. T and L on the 14th and 22nd also, and T on 10th and 21st.

COLMONELL, CLACHANTON.—Mean temp. 63°·2, being 4°·2 above the average of 25 years, and the highest in that period. T and L on 20th and 21st.

TIGHNABRUAICH, CRAIGANDARAICH.—A perfect summer month.

ABERDEEN, CRANFORD.—A very warm month. Sharp TS on 15th.

S. RONALDSHAY, ROEBERRY.—A dry, fine month. Mean temp. 57°·2, or 2°·2 above the average of 11 years.

## IRELAND.

DARRYNANE ABBEY.—A dry month. It was hot at first and then for some days cold; it was again hot during the last three days. There was a good deal of fog towards the end.

BROADFORD, HURDLESTOWN.—A very dry July, and water was very low, many streams and wells being quite dry. Cattle were very short of grass, and meadows were very poor. Other crops doing well. TS on 27th.

DUBLIN, FITZWILLIAM SQUARE.—A warm and pleasant month, in many respects resembling July, 1900. Mean temp. 63°·5, or 2°·9 above the average. High winds were noted on only 3 days. The temp. in screen reached or exceeded 70° on 16 days. TSS on 21st, 24th and 25th, and L on 26th and 27th. Foggy on 1st and 8th.

OMAGH, EDENFEL.—A warm, settled month, but with sufficient R to prevent anything like a parching or premature ripening of grass, cereals or green crops, all of which give promise of great abundance. Although the max. temp. has often been exceeded, the min. of 64°, on the night of 17th, is the highest min. recorded in 36 years. On only two nights did the min. fall below 50°, which is also a record.

## THE SCOTTISH METEOROLOGICAL SOCIETY.

THE half-yearly general meeting of the Scottish Meteorological Society was held on July 24th, in Edinburgh, Sir Arthur Mitchell, K.C.B., in the chair. The Report from the Council gave an account of the work of the Society since the previous meeting, and expressed the regret that was felt at the death of Professor P. G. Tait, and of the Earl of Moray. The preparation of the first of the three volumes of observations at the Ben Nevis Observatory, and the associated Low Level Observatory at Fort William, was stated to be in so advanced a state as to make it possible to promise its publication during next winter.

It was announced that the same generous donor who has maintained the Ben Nevis Observatory for the last three years, Mr. Mackay Bernard, has volunteered to contribute a fourth sum of £500 to keep the observatory in operation until the end of 1902, by which time regular hourly observations will have been carried on continuously for twelve years. The Meteorological Council also continues its grant of £250 to the Low Level Observatory.

Dr. A. Buchan, F.R.S., read a paper on the "Fogs round the Scottish coasts," and Mr. R. T. Omond read a paper on "The Utilisation of the high-level meteorological observatories of Europe." These papers will be published in full in the *Journal* of the Society.

SYMONS'S

# METEOROLOGICAL MAGAZINE.

No. CCCCXXVIII.] SEPTEMBER, 1901. VOL. XXXVI.

## Charles Meldrum.

KIRKMICHAEL, BANFFSHIRE, 1821.—EDINBURGH, 1901.

DR. CHARLES MELDRUM, C.M.G., F.R.S., whose researches on the meteorology of Mauritius and the Indian Ocean were of fundamental importance, died on August 28th, at Edinburgh, where he had resided since his retirement from active duties in 1896. After passing through the University of Aberdeen, he entered the Bombay Education Department in 1846, and was transferred two years later to the scene of his life's work in Mauritius. At first a Professor of Mathematics in the Royal College, he early turned his attention to meteorology, and in 1851 assisted in founding the Meteorological Society of Mauritius, of which he was Secretary for many years. The Society published many papers of importance, and was, so far as we are aware, the only meteorological society that has ever flourished outside Europe and North America. Dr. Meldrum was appointed Government Meteorological Observer in 1862, and since 1875 he had been Director of the Royal Alfred Observatory. For the last ten years of his life in Mauritius he was also a member of the Government Council of the colony.

Dr. Meldrum's name will always be associated with his work on the law of storms, especially the cyclones of the Indian Ocean, and with his early investigation of the relation of rainfall and other meteorological conditions to the sunspot cycle.

## METEOROLOGY ON THE BRITISH ANTARCTIC EXPEDITION.

BY THE EDITOR.

HAVING had the privilege of accompanying the Antarctic exploring vessel "Discovery" as far as Madeira, on her voyage to the south, we are able to give an account of her equipment for meteorological work, perhaps the most important part of the scientific routine, if we except the magnetic observations.

During the voyage out observations will be made regularly every two hours, by the officer of the watch, and the various duplicate instruments capable of being tested on board ship will be carefully compared. Subsequently the observations on board will be kept

up, while even more complete arrangements will be made in connection with any land station that may be established.

We cannot give here a full description of the "Discovery." It must suffice to say that she is built of wood throughout, in the manner which the long experience of arctic whalers has shown to be the best for resisting polar ice, and she is undoubtedly the strongest ship of her size that has ever been built. The magnetic observatory, which stands amidships, under the bridge, is the scientific centre of the vessel, and the ship has been planned so that no iron or steel exists within 30 feet of the swinging table on which the magnetic instruments are placed. The zoological and botanical laboratories, one on each side of the magnetic observatory, are not allowed to contain so much as a bottle-brush of steel wire, or an iron tool of any kind. The engine-room is right aft, and the steam pipes to the winches forward are of copper. The bow of the ship is heavily plated with steel, so as not to be damaged by ice, but the length of the vessel is sufficient to keep this outside the magnetic zone.

For the ordinary routine observations a form of Stevenson screen is erected on the wall of the botanical laboratory on the port side. and when the ship is under way there will always be a current of air blowing through the gangway between it and the magnetic house. The screen contains a wet and dry bulb thermometer, a mercurial maximum, and a Sixe's maximum and minimum. The barometer, on the Kew pattern, is in the magnetic house, with its cistern about 12 feet above the water-line, and a barograph is kept at work in one of the companions. A thermograph and a hair hygrograph are placed on the outer walls of the magnetic house, and the three recording instruments are kept running to Greenwich time, a mark being made on the curve each day at local noon, so that a local time-scale may be afterwards applied. As the ship's time will be changed daily by amounts varying from a few minutes up to perhaps an hour or more, it would of course be impossible to adjust the recording instruments to follow it. The value of the hair hygrograph at sea is somewhat dubious. When the deck is being washed the indicator leaps up close to the saturation point, and falls gradually as the boards become dry ; but the records on shore, or in the ice, should be of value. The temperature readings are checked by means of an Assmann's Aspiration Psychrometer, and sling thermometers are also provided for comparison. Rainfall observations are to be attempted by means of a marine rain gauge and evaporator on Dr. Black's pattern, the placing of which was a matter of some difficulty, on account of the way in which any part of the vessel may be sheltered when she is under sail. The method finally adopted was to place the raingauge on the top of the small deck house aft, on the weather side, shifting it whenever the ship changes her tack ; the evaporator occupying a similar position on the lee side.

The surface temperature of the sea is taken each time the instru-

ments on board are read, a small canvas bucket being used from the bridge for the purpose of drawing a sample of water. Once daily, at noon, the colour of the sea-water is measured by means of Forel's colour-scale, or xanthometer, an instrument which attracted the special attention and admiration of the Queen when she accompanied the King to inspect the vessel at Cowes on the eve of departure.

The whole of the meteorological work on board is under the charge of the first officer, Lieutenant Charles Royds, R.N., who has had considerable experience in observing.

It is intended to make special observations in the Antarctic regions on the conditions of the upper atmosphere, and for this purpose a captive balloon is carried with a large supply of compressed hydrogen in long steel cylinders as used in military ballooning. For reaching great elevations, however, reliance is to be placed on kites, and for this purpose light aluminium meteorographs like those used at Blue Hill have been provided for attachment to the large box-kites of Hargrave's pattern. While at sea an experiment was made in flying a couple of small box-kites tandem-fashion from the ship, and they were found to rise readily and maintain their altitude steadily for nearly an hour when the ship was running before the wind and therefore in the least favourable condition for the experiment. No instruments were attached, and the only difficulty found was that when the kites descended it was impossible to haul in the line fast enough to keep them up, and the moment the slender structure of light sticks and cotton touched the water it went to pieces on account of the speed with which it was towed along by the ship. There is every reason, however, to believe that with the larger kites and a stronger wind this difficulty will not arise.

The kites and balloon are intended to be used mainly among the ice in the far south, and a large number of special instruments is being taken out for use on shore. These include spirit thermometers both for dry bulb and minimum readings, which are graduated as low as —90° F., special Stevenson screens, low-reading thermographs, sunshine recorders adapted for the peculiar conditions of a sun that never sets, earth-thermometers intended for use in borings made in the ice, etc. A Dines's pressure anemometer and an anemograph of similar pattern will be erected at the land-station on the Antarctic continent. A photographic spectrometer will, it is hoped, throw some light on the character of the *aurora australis*, and Professor Ramsay has supplied a crypton vacuum tube in order that the highly characteristic green line of that element may be compared directly with the similar line in the spectrum of the aurora.

The oceanographical observations to be made during the voyage will include determinations of the density of the surface water twice daily by means of the Buchanan hydrometer, and also direct measurements of salinity by the titration of the sea water with a standard solution of silver nitrate. This department of the work

will be under the charge of Lieutenant E. H. Shackleton, R.N.R When deep-sea soundings are made samples of water will be collected from various depths for the measurement of their density and salinity. The temperature will be determined by the use of deep-sea thermometers of various familiar patterns, but most dependence will be placed upon the Pettersson-Nansen insulating water-bottle, from which very accurate temperature readings are to be looked for. Lieutenant M. Barne, R.N., will take charge of the deep-sea temperatures, and on the voyage out to Melbourne Mr. George Murray, F.R.S., of the Natural History Museum, who has had great experience in scientific work at sea, will take general charge of all the deep-sea work, physical as well as biological.

Researches more or less allied to those in meteorology will be carried out on land in the far south with the seismometer to investigate the crustal movements, and with very delicate pendulums to determine the force of gravity. The latter is of importance mainly in arriving at the figure of the Earth, but incidentally also in supplying a necessary correction for the barometer readings. Of the magnetic observations, which are under the charge of the navigating officer, Lieutenant A. Armitage, R.N.R., on board ship, and of Mr. Louis Bernacchi on shore, we have only space to say that they are perhaps the most carefully planned and completely thought out of all the branches of scientific work to be carried on on the expedition.

In addition to the officers and scientific staff the "Discovery" carries a highly-trained meteorological observer in the person of the cook's mate, who was for many years cook at Ben Nevis Observatory, where he took regular watches with the scientific observers.

Under the firm but sympathetic guidance of the commander, Captain R. F. Scott, R.N., with the enthusiasm of the officers and scientific staff, and the magnificent physique and thorough training of the crew we expect very solid results from the voyage of the "Discovery" to the Antarctic regions, which she will probably enter in the last week of the year.

## ON THUNDERSTORMS.

By R. H. Curtis.

The thunderstorm is a phenomenon about which we have still a great deal to learn, whether we regard it from the point of view of the electrician, or take the wider range of the meteorologist, which embraces the atmospheric conditions that lead up to its genesis and development and also control the direction in which it is to travel, as well as the phenomena of wind, rain, or hail, by which the more strictly electrical phenomena are usually accompanied.

As a rule the text books on meteorology tell us very little about the origin of thunderstorms, and for the obvious reason that until we know more than we do at present respecting the conditions which exist in the upper strata of the atmosphere at the time of

their occurrence, we can do little more than speculate upon the subject. No doubt something is to be learned from a careful study of the cloud forms and movements which accompany the storms, and from the changes which can sometimes be observed to take place amongst the clouds themselves we can surmise something respecting the probable conditions of temperature which exist at their levels. But this does not carry us very far in our study, for at best such data possess a large element of uncertainty, and theories based upon them must necessarily be little more than guesses.

Our hope is great that in the near future the systematic use of kites for obtaining synchronous observations of the pressure, temperature, and humidity conditions at different heights in the free air will supply us with reliable data which will enlighten us as to the life-history of thunderstorms, and help us to solve many other meteorological problems whose solution awaits the collection of similar observations.

In the meantime, however, we are forced to confine ourselves mainly to a study of the conditions exhibited by simultaneous observations made at or very near the ground level, and although, as we have said, these leave a great hiatus which it is necessary to bridge over for a full understanding of the problem, yet they are frequently instructive and very interesting.

There can be no doubt that the distribution of temperature plays a very important—perhaps the most important—part in the production of a thunderstorm, and although the differences which exist through the atmosphere in a vertical direction are probably of most importance, yet those which co-exist at the ground level are by no means without a value of their own, and must not be overlooked.

The series of thunderstorms which were experienced over England towards the close of July this year, illustrates this statement very well.

The daily weather chart issued by the Meteorological Office shows that on the morning of the 24th, a shallow area of low pressure had become developed over England, the pressure to the northward and southward, and also over the continent to the eastward, being relatively high; to the westward of this shallow depression the incurving winds were northerly or north-westerly, and the temperature was relatively low, whilst on its eastern side warmer southerly and south-westerly winds were experienced.

Here then was a type of pressure distribution which is almost invariably associated, at anyrate in summer and in the British Isles, with the development of thunderstorms, and with heavy downpours of rain. Apparently one result of the meeting of two currents of air such as those referred to above, of different temperatures and probably of different degrees of humidity, is to force upwards large masses of the warmer air into regions where they become quickly chilled and where their moisture is rapidly condensed. The pressure gradients being slight the mingling of the air currents is generally

slow and probably somewhat irregular, which is perhaps one reason why the inversions of temperature which result from them appear very often to extend over comparatively limited areas, and why when heavy falls of rain occur at some places, other places close at hand get no rain at all.

The movements of the barometer during the three or four days following the 24th were slight. There was a gradual but intermittent increase of pressure, and the centre of the depression appeared to contract in size, whilst its general character remained unchanged; considerable differences in temperature were still observed, and thunderstorms of greater or less severity continued to occur over the south-east of England.

In many respects the thunderstorms of this period differed from those sometimes observed. They do not appear to have travelled along definite or prolonged tracks, as thunderstorms sometimes do; nor were they accompanied, in the instances which we have been able to examine, by those peculiar oscillations of the barometer so frequently observed, especially in storms of more than ordinary severity. In the remarkable storms of August 18th and 20th, 1898, these oscillations were of an unusually pronounced character, and the direction and rate of progress of the storms could be traced from the times at which similar phases of the accompanying oscillation occurred at different places along the paths they travelled.

The absence of any very marked barometrical movements in the thunderstorms of July seems to suggest that in some respects their accompanying conditions differed materially from those which existed in 1898, and precisely what that difference was is one of the points which we hope ere long to see made clear.

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## Correspondence.

### A HOT DAY IN NORTH-WEST LANCASHIRE.

*To the Editor of Symons's Meteorological Magazine.*

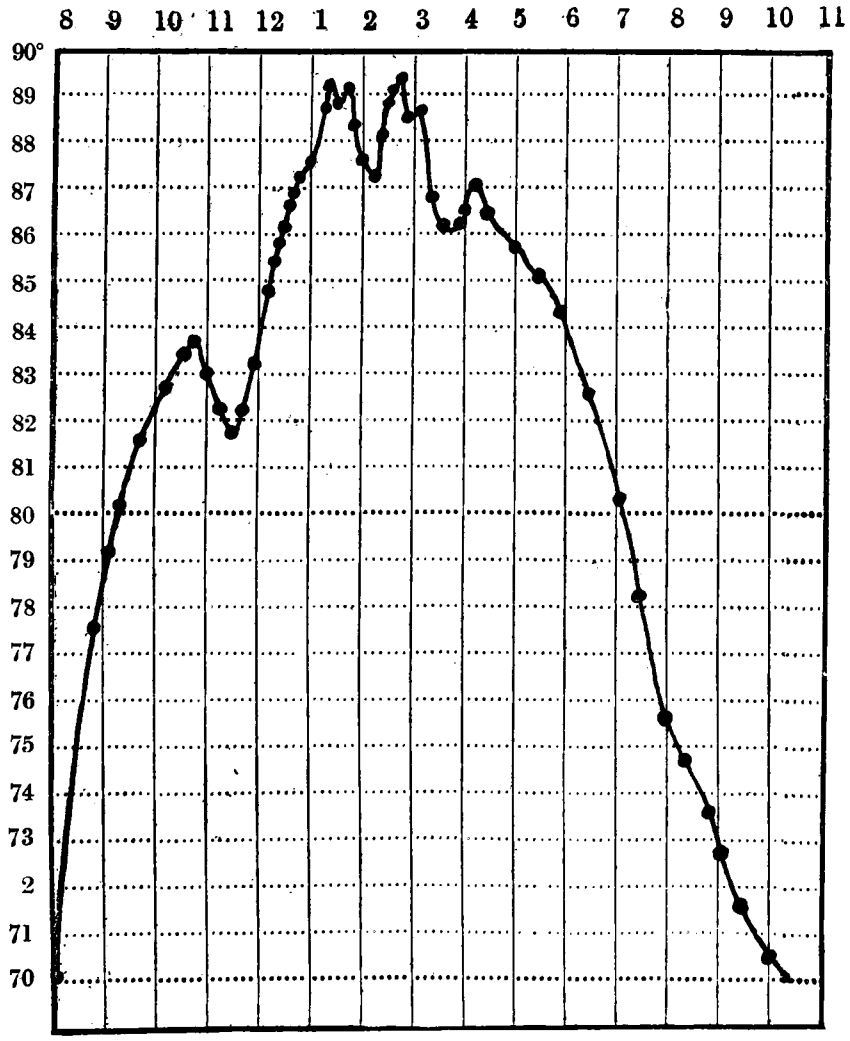
THE enclosed observations of temperature recorded here on July 20th may be of interest to readers of your journal. The readings are from thermometers verified at Kew and placed in a Stevenson screen 93 feet above sea level and 7 miles from the sea.

At 8.0 a.m. on Saturday, July 20th, the air was calm, the barometer steady, and the temperature, 70°·2, was rising rapidly; the sun was shining from a cloudless sky, after a clear night, during which the minimum had been 53°·5. With these conditions there appeared every probability that a sea breeze would shortly spring up, which would generally have the effect of preventing the temperature rising higher than about 75° Instead of this, however, a fairly strong S.E. wind commenced at 8.15, which, with the brilliant sun, made the temperature rise rapidly, 77°·6 being reached at

8.48 a.m. It rose steadily to 83°·7 at 10.50, when, owing to the large amount of smoke brought over by the S.E. wind from the manufacturing districts of S.E. Lancashire (there were no clouds), the sun was so dimmed that the temperature fell to 81°·8 at 11.30, at which time the sun scarcely shone sufficiently to produce a shadow.

After this the wind veered to a little west of south, so that it then blew from a point west of the smoke-producing district, and yet it was not sufficiently westerly to be from the sea. The smoke haze soon cleared off, and the temperature rose rapidly, reaching 89°·2 at 1.25 p.m. It then fell a little, apparently owing to the strength of the wind, but rose to 89°·4 at 2.45 p m.

The wind was of considerable strength from the S. all the afternoon, and the sky remarkably free from cloud, which accounts for



the particularly high readings of 87°·1 at 4.15, and 83°·6 at 6.0 p.m. The temperature was above 80° from 9.25 a.m. to 7.0 p.m.

I may mention that the summer maximum readings here are often kept comparatively low owing to sea breezes; whilst, on the other hand, when the conditions of pressure are such as to produce a south-easterly wind sufficient to overcome the tendency to sea breeze formation, the maxima are kept down owing to the sun being partially obscured by smoke from the East Lancashire and West Yorkshire manufacturing districts.

During the fortnight preceding July 20th, I registered maxima of over 70° on 10 days, and of over 80° on 3 days, whilst on the night of the 18th to 19th the minimum was as high as 66°.

The maximum of 89°·4 on the 20th and the minimum of 66°·2 during the night between the 20th and 21st are the highest respectively during the 16 years I have kept a register, and both readings are doubtless *most exceptional.*

I have seldom recorded maxima above 83° here, 85°·5 being the previous highest on June 18th, 1893.

SYDNEY WILSON.

*Bruna Hill, Garstang, 26th July, 1901.*

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## THE YORKSHIRE THUNDERSTORM OF AUGUST 10TH.

*To the Editor of Symons's Meteorological Magazine.*

WOULD you allow me, through your pages, to ask any of your North Country readers who are willing to send me their rainfall for Saturday, August 10th, the day of the great thunderstorm over East Yorkshire? Notes on the storm would also be acceptable, especially as to when the first rain fell in the afternoon.

I had a rather unique opportunity of watching the initial stages of its development, an account of which can be seen in *The Friend*, for August 23rd, and am desirous of tracing its development.

J. EDMUND CLARK.

*112, Wool Exchange, London, E.C., Aug. 28th, 1901.*

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## REVIEWS.

*Report of the Director of the Observatory to the Marine Committee, and Meteorological Results deduced from the Observations taken at the Liverpool Observatory, Bidston, Birkenhead, in the year* 1900. Published by order of the Mersey Dock and Harbour Board. Liverpool, 1901. Size $9\frac{1}{2} \times 6\frac{1}{2}$. Pp. 42.

THIS report gives the daily readings for the year, and adopts the excellent plan of printing a summary of monthly values in British and Metric units so as to admit of ready comparison with Continental observations.

*Sur les Observations Pluviométriques faites dans la Zone Equatoriale de* 10 *degrés nord à* 10 *degrés sud.* Par M. V. RAULIN. (Extrait des Comptes rendus de l'Association Française pour l'avancement des Sciences, 1900). Paris. Size 9 × 6. Pp. 24.

THE author publishes the average monthly rainfall for between 400 and 500 stations lying within 10° of the equator north or south, mentioning in each case the number of years from which the average is calculated. The results are of course very unequal in value, but we must remember that in the equatorial zone the range of all climatic conditions, both diurnal and annual, is at a minimum; so that figures that would be absolutely useless for Europe may yet give valuable information as to the tropics.

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*Koninklijk Nederlandsch Meteorologisch Instituut,* DR. H. EKAMA. *Onweders, Optische Verschijnselen Enz. in Nederland. Naar Vrijwillige Waarnemingen in* 1900. Deel xxi. Amsterdam: H. G. Bom, 1901. Size 9 × 6½. Pp. 128. *Plates.*

AN account of the atmospheric disturbances in Holland during 1900, with very full data from a large number of voluntary observers of various optical atmospheric phenomena, such as lightning, St. Elmo's fire, auroras, rainbows, halos, etc. A short appendix details some observations of the curious marine noises named in Dutch "*Mistpoeffers,*" a word which other languages prefer to adopt rather than translate, but the nature and origin of the phenomenon remain mysterious.

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*Results of Meteorological Observations made at the Radcliffe Observatory, Oxford, in the Eight Years* 1892-99. *Edited by* ARTHUR A. RAMBAUT, M.A., D.Sc., F.R.S. Vol. XLVIII. Oxford: James Parker & Co., 1901. Size 10 × 6½. Pp. 246. *Plates.*

THIS volume contains the full daily values of all the meteorological elements recorded at an Observatory of the first order, together with the daily reading of experimental instruments, such as max. and min. thermometers placed on the tower, daily details of wind and ozone, and monthly summaries and notes. The readings of the platinum electric-resistance earth-thermometers are also given. Monthly values are printed for two rain gauges on the ground, and of other gauges at 22 feet and 112 feet respectively.

The letterpress consists of an introduction of 24 pages, and is mainly devoted to a discussion of the observations made at various depths by means of the electrical-resistance thermometers.

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ERRATA.

P. 115, line 21 and line 23, *for* Zuryeff *read* Yuryeff.
,, ,, 25, ,, vod ,, von.
,, ,, 27, ,, Föhandlingar *read* Förhandlingar.
P. 116, ,, 3, ,, Antartic ,, Antarctic.

# METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858–97.

## TEMPERATURE.—EXTREMES IN SHADE.

| Months. | HIGHEST. | | | | LOWEST. | | | | MAXIMUM. | | | | | MINIMUM. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9 A.M. | | 9 P.M. | | 9 A.M. | | 9 P.M. | | | | | | | | | | | |
| | Reading. | Mean of all. | Reading. | Mean of all. | Reading. | Mean of all. | Reading. | Mean of all. | Absolute Highest. | Lowest Highest. | Highest Lowest. | Absolute Lowest. | Mean of all Highest. | Absolute Highest. | Lowest Highest. | Highest Lowest. | Absolute Lowest. | Mean of all Lowest. |
| | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° |
| January | 53·9 | 50·2 | 54·6 | 50·3 | 7·2 | 25·0 | 12·8 | 27·4 | 56·4 | 45·2 | 40·4 | 16·9 | 53·1 | 52·3 | 36·5 | 32·2 | 6·7 | 21·8 |
| February | 54·0 | 49·6 | 54·0 | 49·6 | 15·2 | 28·4 | 17·2 | 29·4 | 62·5 | 46·2 | 44·1 | 24·2 | 55·2 | 51·2 | 34·1 | 31·4 | 7·3 | 24·1 |
| March | 57·9 | 52·2 | 57·2 | 51·4 | 20·4 | 31·3 | 24·7 | 31·7 | 70·1 | 54·0 | 48·7 | 31·4 | 61·9 | 51·3 | 38·4 | 29·4 | 15·6 | 25·3 |
| April | 68·0 | 58·9 | 63·2 | 56·3 | 33·5 | 38·8 | 31·5 | 36·8 | 81·4 | 61·7 | 54·9 | 40·0 | 70·7 | 54·8 | 43·2 | 34·5 | 24·5 | 29·8 |
| May | 78·2 | 67·0 | 72·4 | 62·6 | 38·7 | 45·5 | 35·5 | 41·8 | 87·6 | 68·0 | 59·0 | 42·5 | 78·1 | 60·3 | 48·8 | 42·7 | 28·4 | 33·8 |
| June | 80·8 | 72·0 | 76·1 | 67·9 | 48·4 | 52·3 | 44·3 | 49·5 | 92·6 | 71·9 | 69·1 | 53·5 | 83·1 | 63·8 | 55·0 | 46·9 | 35·6 | 41·8 |
| July | 80·3 | 73·6 | 79·7 | 69·7 | 45·4 | 55·8 | 49·4 | 53·5 | 94·6 | 72·7 | 70·9 | 55·5 | 85·2 | 66·3 | 56·7 | 48·9 | 40·3 | 45·4 |
| August | 84·3 | 71·6 | 76·3 | 68·1 | 45·2 | 54·8 | 47·0 | 52·0 | 93·6 | 70·3 | 68·5 | 58·5 | 84·0 | 65·8 | 57·4 | 50·1 | 38·2 | 44·3 |
| September | 77·0 | 66·5 | 71·8 | 64·1 | 43·1 | 49·0 | 39·5 | 46·9 | 91·0 | 69·5 | 64·4 | 50·1 | 77·1 | 64·2 | 54·0 | 44·2 | 33·0 | 39·1 |
| October | 67·5 | 60·5 | 64·5 | 59·2 | 29·6 | 36·9 | 30·9 | 37·9 | 80·9 | 60·4 | 53·1 | 37·2 | 68·1 | 60·5 | 47·3 | 39·6 | 23·8 | 31·4 |
| November | 61·2 | 54·8 | 59·7 | 54·3 | 23·8 | 31·2 | 22·0 | 32·3 | 63·9 | 50·3 | 45·2 | 28·6 | 58·4 | 54·7 | 40·7 | 34·6 | 20·1 | 27·2 |
| December | 56·0 | 51·6 | 56·5 | 51·7 | 12·1 | 26·4 | 17·3 | 27·5 | 58·9 | 43·7 | 40·8 | 24·3 | 54·5 | 52·8 | 36·6 | 31·5 | 6·7 | 22·9 |
| Mean | 68·3 | 60·7 | 65·5 | 58·8 | 30·2 | 39·6 | 31·0 | 38·9 | 77·8 | 59·5 | 54·9 | 38·6 | 69·1 | 58·2 | 45·7 | 38·8 | 23·4 | 32·2 |
| Highest | 84·3 | 73·6 | 79·7 | 69·7 | 48·4 | 55·8 | 49·4 | 53·5 | 94·6 | 72·7 | 70·9 | 58·5 | 85·2 | 66·3 | 57·4 | 50·1 | 40·3 | 45·4 |
| Lowest | 53·9 | 49·6 | 54·0 | 49·6 | 7·2 | 25·0 | 12·8 | 27·4 | 56·4 | 43·7 | 40·4 | 16·9 | 53·1 | 51·2 | 34·1 | 29·4 | 6·7 | 21·8 |

## METEOROLOGICAL NEWS AND NOTES.

THE LATEST NUMBER of the *Quarterly Journal* of the Royal Meteorological Society states that—"The Council of the Royal Society has lately reconstructed the Meteorological Council, as follows:—General Sir R. Strachey (Chairman), Prof. G. H. Darwin, Dr. A. Buchan, and Mr. W. N. Shaw, together with the Hydrographer of the Admiralty, are appointed Directors. The Earl of Rosse, Mr. J. Y. Buchanan, Mr. W. H. Dines, Mr. R. H. Scott and Prof. A. Schuster are appointed other members of the Association; the first two to serve for five years, the last three for three years. No honorarium is to be paid to these additional members."

SUN-SPOT PERIODICITY in relation to weather having recently received renewed attention, much interest attaches to a paper by Dr. W. J. S. Lockyer, read at a meeting of the Royal Society in May, on "Solar Activity, 1833–1900." The author adduces evidence from which he has drawn the following conclusions:—

1. There is an *alternate* increase and decrease in the length of a sunspot period reckoning from minimum to minimum.
2. The epoch of maximum varies *regularly* with respect to the preceding minimum. The amplitude of this variation about the mean position is about $\pm 0{\cdot}8$ years. The cycle of this variation is about thirty-five years.
3. The total spotted area included between any two consecutive minima varies regularly. The cycle of this variation is about thirty-five years.
4. There is no indication of the fifty-five-year period as suggested by Dr. Wolf.
5. The climate variations indicated by Professor Brückner are generally in accordance with the thirty-five-year period.
6. The frequency of auroræ and magnetic storms since 1833 show indications of a secular period of thirty-five years.

PROFESSOR E. MASCART, head of the Central Meteorological Office in Paris, is the subject of a biographical sketch, illustrated by a portrait, in the July number of *Terrestrial Magnetism*.

## BOOKS RECEIVED.

Cornwall County Council. Sanitary Committee. Annual Report, Vital Statistics and Meteorological Summary for 1900. Truro, 1901. Size $9\frac{1}{2} \times 6\frac{1}{2}$. Pp. 20.

Meteorological Notes, 1900. (From observations taken at Bradestone House, Brundall, Norfolk). By Arthur W. Preston, F.R.Met.Soc. Reprinted from the Transactions of the Norfolk and Norwich Naturalists' Society, Vol. 7. Size $8\frac{1}{2} \times 5\frac{1}{2}$. Pp. 8.

The International Congresses of Aeronautics and of Meteorology. By A. Lawrence Rotch. Extract from Report of the Commissioner-General of the United States to the International Universal Exposition, Paris, 1900. Vol. 6. Size $9 \times 6$. Pp. 8.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MARCH, 1901.

| STATIONS. (*Those in italics are South of the Equator.*) | Absolute. Maximum. Temp. | Date. | Absolute. Minimum. Temp | Date. | Average. Max. | Min. | Dew Point. | Humidity. | Absolute. Max. in Sun. | Min. on Grass. | TotalRain. Depth. | Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0-100 | ° | ° | inches | | |
| London, Camden Square | 55·2 | 4, 5 | 23·2 | 29 | 46·9 | 34·0 | 34·7 | 82 | 96·7 | 19·0 | 2·14 | 16 | 7·6 |
| Malta | 71·5 | 26 | 45·2 | 25 | 64·4 | 51·1 | 49·7 | 80 | 129·5 | 39·9 | ·81 | 6 | 3·4 |
| *Cape Town* | 85·8 | 20 | 42·8 | 25 | 75·5 | 57·3 | 55·3 | 69 | ... | ... | ·33 | 7 | 2·4 |
| *Mauritius* | 88·5 | 16 | 70·1 | 12*a* | 85·2 | 73·2 | 72·4 | 82 | 153·1 | 62·2 | 9·68 | 18 | 6·6 |
| Calcutta | 101·7 | 31 | 59·3 | 3 | 93·2 | 68·0 | 60·5 | 54 | 154·0 | 54·6 | ·00 | 0 | 1·6 |
| Bombay | 96·4 | 12 | 67·8 | 2 | 86·4 | 74·0 | 70·1 | 73 | 144·4 | 60·8 | ·00 | 0 | 1·6 |
| Colombo, Ceylon | 92·8 | 11 | 71·0 | 10 | 90·5 | 74·4 | 75·1 | 83 | 152·5 | 68·0 | 5·12 | 13 | 4·2 |
| *Melbourne* | 102·2 | 2 | 45·5 | 20 | 75·5 | 54·5 | 51·5 | 66 | 154·0 | 39·4 | 3·14 | 11 | 4·9 |
| *Adelaide* | 98·7 | 8 | 47·4 | 31 | 79·4 | 57·4 | 50·5 | 55 | 156·2 | 39·1 | ·70 | 6 | 3·5 |
| *Sydney* | 88·9 | 10 | 55·4 | 31 | 75·7 | 62·7 | 60·2 | 76 | 145·0 | 45·0 | 3·72 | 13 | 4·7 |
| *Wellington* | 73·5 | 16 | 45·0 | 22 | 64·9 | 51·6 | 47·4 | 68 | 124·0 | 38·0 | 2·05 | 11 | 4·2 |
| *Auckland* | 74·0 | 6 | 53·5 | 22 | 68·1 | 57·2 | 50·6 | 65 | 146·0 | 49·0 | 5·11 | 16 | 6·4 |
| Jamaica, Halfway Tree | 90·0 | 10 | 65·0 | 18 | 85·4 | 68·2 | 65·1 | 71 | ... | ... | ·74 | 3 | 1·9 |
| Trinidad | 93·0 | 3 | 61·0 | 21*b* | 88·5 | 65·7 | 71·6 | 83 | 163·0 | 54·0 | 2·30 | 13 | ... |
| Grenada | 88·4 | 26 | 70·2 | 1 | 82·8 | 72·5 | 68·7 | 72 | 154·2 | ... | 2·17 | 18 | 2·5 |
| Toronto | 45·6 | 25 | 0·0 | 6 | 36·9 | 23·1 | 25·2 | 79 | 60·2 | —3·5 | 2·74 | 15 | 7·0 |
| Fredericton, New Brunswick | 47·8 | 22 | —9·3 | 8 | 37·6 | 16·1 | 18·0 | 67 | ... | ... | 4·55 | 10 | 5·9 |
| Winnipeg, Manitoba | 38·0 | 12 | —22·7 | 4 | 28·9 | 2·3 | ... | ... | ... | ... | ·26 | 3 | 4·7 |
| Victoria, British Columbia | 57·5 | 1 | 32·8 | 24 | 49·6 | 39·3 | | ... | ... | ... | ·93 | 13 | 7·3 |

*a*—and 13. *b*—and 22, 24.

### REMARKS.

MALTA.—Mean temp. of air 56°·8, or 0°·9 above the average. Mean hourly velocity of wind 11·3 miles or 0·5 above average. Mean temp. of sea 61°·9. TSS on 5th and 11th; H on 5th. J. F. DOBSON.

*Mauritius.*—Mean temp. of air 1°·1, of dew point 1°·8, and R 1·34 in. above their respective averages. Mean hourly velocity of wind 7·6 miles, or 2·3 miles below average; extremes, 23·1 on 5th and 00 on 2nd; prevailing direction E. by N. to S.E., with occasional light airs from N.W. L and T on 6 days; T on 3 days. T. F. CLAXTON.

COLOMBO, CEYLON.—Mean temp. of air 0°·3 below, of dew point 2°·2 above, and R ·37 in. above, their respective averages. Mean hourly velocity of wind 6·1 miles; prevailing direction N.W. to N.E. TSS occurred on 7 days. W. C. S. INGLES.

*Adelaide.*—Mean temp. of air 2°·0 below average; R ·36 in. below 44 years' average. C. TODD, F.R.S.

*Sydney.*—Mean temp. of air 0°·1 below, humidity 0°·3 above, and R 1·46 in. below, their respective averages. H. C. RUSSELL, F.R.S.

*Wellington.*—Mean temp. of air 3°·9 below, and R 1·49 in. below, their respective averages. Generally fine, with wet intervals; prevailing S. and N.W. wind, and generally moderate. Earthquake on 15th at 11.15 p.m., short and sharp. R. B. GORE.

*Auckland.*—Mean temp. 2° below, R largely in excess, being more than twice the average. A cloudy and rainy month. T. F. CHEESEMAN.

TRINIDAD.—R ·43 in. above the 30 years' average. J. H. HART.

TORONTO.—TSS on 10th and 25th. R. F. STUPART.

# SUPPLEMENTARY TABLE OF RAINFALL, AUGUST, 1901.

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| I. | Uxbridge, Harefield Pk.. | 1·86 | XI. | Castle Malgwyn ..... | 4·15 |
| II. | Dorking, Abinger Hall . | 1·76 | ,, | Builth, Abergwesyn Vic. | 6·14 |
| ,, | Sheppey, Leysdown ..... | 1·43 | ,, | Rhayader, Nantgwillt ... | 3·62 |
| ,, | Hailsham ..... | 1·59 | ,, | Lake Vyrnwy ..... | 3·78 |
| ,, | Crowborough..... | 1·78 | ,, | Corwen, Rhug ..... | ... |
| ,, | Ryde, Thornbrough ..... | ... | ,, | Criccieth, Talarvor ..... | 4·95 |
| ,, | Emsworth, Redlands ... | 1·63 | ,, | I. of Anglesey, Lligwy.. | 3·80 |
| ,, | Alton, Ashdell ..... | 1·77 | ,, | Douglas, Woodville..... | 4·12 |
| ,, | Newbury, Welford Park | 2·17 | XII. | Stoneykirk, Ardwell Ho. | 3·57 |
| III. | Oxford, Magdalen Coll.. | 1·94 | ,, | New Galloway, Glenlee | 5·18 |
| ,, | Banbury, Bloxham ..... | 1·94 | ,, | Moniaive, Maxwelton Ho. | 5·22 |
| ,, | Pitsford, Sedgebrook ... | 1·56 | ,, | Lilliesleaf, Riddell ..... | 4·74 |
| ,, | Huntingdon, Brampton. | 1·48 | XIII. | N. Esk Res. [Penicuick] | 6·15 |
| ,, | Wisbech, Bank House... | 1·84 | XIV. | Glasgow, Queen's Park.. | 3·59 |
| IV. | Southend ..... ..... | 1·38 | XV. | Inveraray, Newtown ... | 5·75 |
| ,, | Colchester, Lexden ..... | ·91 | ,, | Ballachulish, Ardsheal... | 6·18 |
| ,, | Saffron Waldon, Newport | 2·02 | ,, | Islay, Eallabus..... | 5·83 |
| ,, | Rendlesham Hall ..... | 1·07 | XVI. | Dollar..... | 5·30 |
| ,, | Swaffham ..... | 1·51 | ,, | Balquhidder, Stronvar... | 5·14 |
| V. | Salisbury, Alderbury ... | 2·11 | ,, | Coupar Angus Station... | 3·73 |
| ,, | Bishop's Cannings ..... | 2·21 | ,, | Blair Atholl ... ..... | 3·35 |
| ,, | Blandford, Whatcombe . | 2·51 | XVII. | Keith H.R.S..... | 3·49 |
| ,, | Ashburton, Druid House | 2·11 | ,, | Forres H.R.S. ... ..... | 2·60 |
| ,, | Okehampton, Oaklands. | 1·97 | XVIII. | Fearn, Lower Pitkerrie.. | 2·53 |
| ,, | Hartland Abbey ..... | 3·50 | ,, | S. Uist, Askernish ..... | 1·39 |
| ,, | Lynton, Glenthorne ... | ... | ,, | Invergarry..... | 1·40 |
| ,, | Probus, Lamellyn ..... | 1·44 | ,, | Aviemore, Alvie Manse. | 3·05 |
| ,, | Wellington, The Avenue | 1·35 | ,, | Loch Ness, Drumnadrochit | 2·37 |
| ,, | North Cadbury Rectory | 2·82 | XIX. | Invershin ..... | 2·81 |
| ,, | Clifton, Pembroke Road | 2·80 | ,, | Durness ..... | ... |
| VI. | Ross, The Graig ..... | 1·45 | ,, | Watten H.R.S..... | 3·61 |
| ,, | Wem, Clive Vicarage ... | 1·98 | XX. | Dunmanway, Coolkelure | 4·45 |
| ,, | Wolverhampton, Tettenhall | ... | ,, | Cork, Wellesley Terrace | 2·47 |
| ,, | Cheadle, The Heath Ho. | 2·32 | ,, | Killarney, District Asyl. | 3·17 |
| ,, | Coventry, Priory Row .. | 1·88 | ,, | Caher, Duneske ..... | ... |
| VII. | Market Overton ..... | 1·27 | ,, | Ballingarry, Hazelfort... | 3·05 |
| ,, | Grantham, Stainby ..... | 1·46 | ,, | Limerick, Kilcornan ... | 2·73 |
| ,, | Horncastle, Bucknall ... | ... | ,, | Miltown Malbay ..... | 6·03 |
| ,, | Worksop, Hodsck Priory | 1·59 | XXI. | Gorey, Courtown House | 3·35 |
| VIII. | Neston, Hinderton ..... | 3·40 | ,, | Moynalty, Westland ... | 4·24 |
| ,, | Southport, Hesketh Park | 2·80 | ,, | Athlone, Twyford ..... | 2·62 |
| ,, | Chatburn, Middlewood. | 3·10 | ,, | Mullingar, Belvedere ... | 2·71 |
| ,, | Duddon Val., Seathwaite Vic. | 8·99 | XXII. | Woodlawn ..... | 3 62 |
| IX. | Baldersby ..... | 1·54 | ,, | Crossmolina, Enniscoe .. | 3·21 |
| ,, | Scalby, Silverdale ..... | ... | ,, | Collooney, Markree Obs. | 4·29 |
| ,, | Ingleby Greenhow Vic.. | ... | XXIII. | Enniskillen, Model Sch. | 4·81 |
| ,, | Middleton, Mickleton ... | 2·43 | ,, | Warrenpoint..... | 3·54 |
| X. | Haltwhistle, Unthank H. | ... | ,, | Miltown, Banbridge..... | 4·28 |
| ,, | Bamburgh ..... | 2·27 | ,, | Belfast, Springfield ..... | 3·83 |
| ,, | Keswick, The Bank..... | 4·69 | ,, | Bushmills, Dundarave.. | 5·07 |
| XI. | Llanfrechfa Grange ..... | 3·22 | ,, | Stewartstown ..... | 3·41 |
| ,, | Treherbert, Tyn-y-waun | 7·44 | ,, | Killybegs ..... | 6·11 |
| ,, | Llandovery ..... | 3·80 | ,, | Horn Head ..... | 4·50 |

# AUGUST, 1901.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1890-9. | Greatest Fall in 24 hours. Dpth | Date | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Max. Date | Min. Deg. | Min. Date. | No. of Nights below 32°. In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches. | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | 1·79 | — ·31 | ·48 | 14 | 9 | 85·3 | 9 | 45·2 | 28 | 0 | 0 |
| II. | | Tenterden ..... | 2·09 | — ·35 | ·78 | 27 | 9 | 80·0 | 18 | 45·0 | 28 | 0 | 0 |
| ,, | | Hartley Wintney ..... | 2·56 | + ·21 | ·86 | 25 | 10 | 84·0 | 18 | 44·0 | 5*d* | 0 | 0 |
| III. | | Hitchin ..... | 1·61 | — ·52 | ·45 | 25 | 11 | 83·0 | 10 | 45·0 | 21*e* | 0 | ... |
| ,, | | Winslow (Addington) ..... | 1·92 | — ·21 | ·53 | 26 | 12 | 84·0 | 10 | 42·0 | 22*f* | 0 | 0 |
| IV. | | Bury St. Edmunds (Westley) | 1·41 | — ·99 | ·53 | 25 | 9 | 84·5 | 10 | 43·0 | 28 | 0 | ... |
| ,, | | Norwich (Brundall) ..... | ·87 | ... | ·23 | 25 | 9 | 83·5 | 9 | 45·0 | 22*f* | 0 | 0 |
| V. | | Winterbourne Steepleton ... | 2·74 | ... | 2·10 | 14 | 10 | 78·1 | 19 | 43·2 | 24 | 0 | 0 |
| ,, | | Torquay (Cary Green) ... ..... | ·89 | ... | ·50 | 14 | 10 | 77·6 | 19 | 47·4 | 28 | 0 | 0 |
| ,, | | Polapit Tamar [Launceston].. | 2·14 | — 1·20 | ·57 | 13 | 14 | 79·7 | 23 | 43·0 | 3 | 0 | 0 |
| VI. | | Stroud (Upfield) ..... | 1·87 | — ·67 | ·48 | 14 | 15 | 78·0 | 1*a* | 46·0 | 27 | 0 | ... |
| ,, | | Church Stretton (Woolstaston) | 1·81 | — 1·03 | ·51 | 26 | 14 | 77·5 | 25 | 45·0 | 2, 28 | 0 | 0 |
| ,, | | Worcester (Diglis Lock) ..... | 2·31 | + ·16 | ·56 | 27 | 13 | ... | ... | ... | ... | ... | ... |
| VII. | | Boston ..... | 1·55 | — ·40 | ·70 | 25 | 8 | ... | ... | ... | ... | ... | ... |
| ,, | | Hesley Hall [Tickhill]..... | 1·55 | — ·66 | ·40 | 10 | 9 | 89·0 | 10 | 41·0 | 21 | 0 | ... |
| ,, | | Derby (Midland Railway)..... | 1·51 | — ·61 | ·32 | 12 | 13 | 85·0 | 10*b* | 45·0 | 28 | 0 | ... |
| VIII. | | Manchester (Plymouth Grove) | 1·56 | — 1·85 | ·35 | 26 | 13 | 82·0 | 22 | 42·0 | 31 | 0 | 0 |
| IX. | | Wetherby (Ribston Hall) ... | 1·79 | — ·48 | ·50 | 14 | 12 | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) ..... | 7·00 | + 1·51 | 1·81 | 13 | 20 | ... | ... | ... | ... | ... | ... |
| ,, | | Hull (Pearson Park)..... ..... | 5·75 | + 3·13 | 3·18 | 10 | 13 | 81·0 | 18 | 42·0 | 28 | 0 | 0 |
| X. | | Newcastle (Town Moor) ..... | 2·25 | — ·66 | ·55 | 26 | 12 | ... | ... | ... | ... | ... | ... |
| ,, | | Borrowdale (Seathwaite)..... | 11·78 | + ·38 | 1·71 | 10 | 21 | 78·5 | 22 | 45·2 | 31 | 0 | ... |
| XI. | WALES. | Cardiff (Ely)..... | 4·90 | + ·73 | 1·43 | 13 | 15 | ... | ... | ... | ... | ... | ... |
| ,, | | Haverfordwest ..... ..... | 5·17 | + 1·51 | 1·73 | 13 | 15 | 78·7 | 18 | 45·4 | 3 | 0 | 0 |
| ,, | | Aberystwith (Gogerddan) ... | 5·85 | + 1·90 | 1·25 | 30 | 15 | 80·0 | 19*c* | 42·0 | 15*g* | 0 | 0 |
| ,, | | Llandudno..... | 3·84 | + 1·04 | 1·41 | 9 | 16 | 76·5 | 25 | 50·0 | 11 | 0 | ... |
| XII. | SCOTLAND. | Cargen [Dumfries] ..... | 4·73 | + ·59 | 1·08 | 10 | 12 | 75·0 | 1 | 42·0 | 31 | 0 | ... |
| XIII. | | Edinburgh (Royal Observatory) | 3·59 | ... | 1·59 | 10 | 12 | 76·5 | 1 | 44·6 | 28 | 0 | 0 |
| XIV. | | Colmonell ..... | 6·31 | + 2·32 | 1·19 | 17 | 17 | 78·0 | 22 | 35·0 | 31 | 0 | ... |
| XV. | | Tighnabruaich ..... | 4·79 | ... | ·58 | 17 | 18 | 66·0 | 1 | 40·0 | 31 | 0 | ... |
| ,, | | Mull (Quinish)..... | 6·04 | + ·92 | 1·16 | 25 | 22 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Leven Sluices ..... | 4·25 | + ·59 | 1·56 | 11 | 12 | ... | ... | ... | ... | ... | ... |
| ,, | | Dundee (Eastern Necropolis) | 3·70 | + ·89 | 1·15 | 10 | 13 | 77·5 | 9 | 45·0 | 17*c* | 0 | ... |
| XVII. | | Braemar ..... .. | 3·56 | — ·11 | 1·34 | 10 | 18 | 73·8 | 21 | 37·0 | 17 | 0 | 1 |
| ,, | | Aberdeen (Cranford) ... ..... | 3·21 | — ·09 | 1·24 | 10 | 20 | 79·0 | 1 | 40·0 | 20 | 0 | ... |
| ,, | | Cawdor (Budgate) ..... | 2·66 | — ·49 | ·83 | 10 | 17 | ... | ... | ... | ... | ... | ... |
| XVIII | | Strathconan [Beauly] ..... | 4·32 | — ·08 | ·75 | 26 | 13 | ... | ... | ... | ... | ... | ... |
| ,, | | Glencarron Lodge..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| XIX. | | Dunrobin ..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | S. Ronaldshay (Roeberry) ... | 3·71 | + ·69 | ·54 | 12 | 23 | 67·0 | 19 | 43·0 | 27 | 0 | ... |
| XX. | IRELAND. | Darrynane Abbey..... | 2·03 | — 2·46 | ·62 | 16 | 20 | ... | ... | ... | ... | ... | ... |
| ,, | | Waterford (Brook Lodge) ... | 4·22 | + ·29 | 1·41 | 9 | 16 | 77·0 | 23 | 39·5 | 11 | 0 | ... |
| ,, | | Broadford (Hurdlestown) ... | 3·66 | + ·08 | ·63 | 5 | 21 | ... | ... | ... | ... | ... | ... |
| XXI. | | Carlow (Browne's Hill) ..... | 3·34 | — ·09 | 1·10 | 9 | 18 | ... | ... | ... | ... | ... | .. |
| ,, | | Dublin (Fitz William Square) | 2·95 | — ·01 | ·89 | 10 | 13 | 76·9 | 8 | 44·2 | 28 | 0 | 0 |
| XXII. | | Ballinasloe ..... ..... | 2·72 | — 1·21 | ·56 | 16 | 17 | 79·0 | 22 | 42·0 | 20 | 0 | ... |
| ,, | | Clifden (Kylemore) ..... .. | 8·57 | + ·67 | 1·32 | 11 | 20 | ... | ... | ... | ... | ... | ... |
| XXIII | | Seaforde..... | 3·16 | — ·14 | ·75 | 9 | 18 | 75·0 | 22 | 42·0 | 23*e* | 0 | ... |
| ,, | | Londonderry (Creggan Res.). | 6·22 | + 1·80 | 1·35 | 25 | 21 | ... | ... | ... | ... | ... | ... |
| ,, | | Omagh (Edenfel) ..... | 4·78 | + ·54 | ·83 | 14 | 20 | 76·0 | 22 | 33·0 | 31 | 0 | 1 |

+ Shows that the fall was above the average ; — that it was below it.

*a*—and 9, 18, 25. *b*—and 25. *c*—and 21. *d*—and 24, 28. *e*—and 31. *f*—and 28. *g*—and 20, 22.

# METEOROLOGICAL NOTES ON AUGUST, 1901.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

TENTERDEN.—Rainfall and mean temperature above that of last year; wells lower, pastures nearly as much burnt up and scarcely at all benefited by the rains. TSS on 15th. Duration of sunshine 242 hours. On 10th the min. in shade was 64°·0.

HARTLEY WINTNEY.—With the exception of showers from the 10th to the 15th the dry weather continued. A short but terrific TS occurred at 1 a.m. on the 26th, the L being synchronous with the T, and damaging five trees and killing two horses. The storm was of only 35 minutes duration, with ·86 in. of R. L in south on 10th. Fog each morning from 20th to 25th. Ozone on ten days, with a mean of 2·8. Swifts last seen on 7th.

WINSLOW, ADDINGTON.—A fine month and more rain is needed, the ground being still dry within a few inches of the surface. Max. temp. generally high till the 25th; then cool, damp and dull weather till the end.

BURY ST. EDMUNDS, WESTLEY.—A hot, dry month. Temp. above 70° on eighteen days. Ponds nearly dry and deep wells rapidly decreasing.

NORWICH, BRUNDALL.—An exceedingly fine month. Mean temp. and rainfall nearly the same as in August, 1899. T and L on 26th and 27th. The R of the first eight months of the year shows a deficiency of 4·45 in.

WINTERBOURNE STEEPLETON.—The month was generally fine, and the R slight, except for the exceptionally heavy fall on the 14th.

TORQUAY, CARY GREEN.—R 1·83 in. below the average; mean temp. 0°·7 above the average. Duration of bright sunshine 26·8 hours above the average. One sunless day. Mean ozone 4·6, max. 6·5 on 17th, with wind from S.E.

POLAPIT TAMAR [LAUNCESTON].—A rather calm dry month. L and T on 9th, T on 11th.

HULL, PEARSON PARK.—Severe TS with H, heavy R and lumps of ice on 10th. TS on 26th.

SEATHWAITE.—TSS on 10th and 26th. Four days on which the R exceeded an inch.

## WALES.

HAVERFORDWEST.—August was on the whole a fine warm month, with a good deal of bright sunshine, more than average R, and generally high temp. Gales occurred on two days, but there was an entire absence of TSS.

ABERYSTWITH, GOGERDDAN.—A month of heavy R. Rapid barometric changes and variable winds throughout. Occasionally cold for the time of year.

LLANDUDNO.—T, L, H and heavy R at 6 a.m. on 10th.

## SCOTLAND.

CARGEN [DUMFRIES].—Notwithstanding the somewhat heavy rainfall during the first half of the month, the harvest was completed very early. Nearly all the crop was secured by the end of the month. T on 11th, 12th and 13th.

CLACHANTON, COLMONELL.—Mean temp. 0°·1 below the average of 25 years. Strong winds on many days.

TIGHNABRUAICH, CRAIGANDARAICH.—Rainfall and temp. about the average, and taken as a whole it was a good harvest month.

ABERDEEN, CRANFORD.—Heavy TS on the 10th.

S. RONALDSHAY, ROEBERRY.—A very good month upon the whole till the 25th, when there were four days of very severe weather. Mean temp. 54°, or 0°·6 below the average of 11 years.

## IRELAND.

DARRYNANE ABBEY.—A variable month with a good deal of fog and drizzle. Very fine and hot from 17th to 24th, with heavy dews at night.

BROADFORD, HURDLESTOWN.—On the whole a fairly fine August. Number of rainy days just the average.

DUBLIN, FITZWILLIAM SQUARE.—R fell heavily at times, but there were intervening spells of fine weather, notably from the 16th to the 25th. A sudden fall of temp. from 75°·8 to 49°·3 in a few hours occurred on the 25th, and a series of cold nights followed. Mean temp. 60°·5 or 0°·8 above the average. High winds on 12 days attaining the force of a gale on 26th and 30th.

OMAGH, EDENFEL.—To judge only by the heavy aggregate rainfall and the large number of rainy days, August might be supposed to have been anything but an agreeable summer month, but as a matter of fact it was very favourable. Most of the rain fell at night and the harvest (the earliest and best for some years) was not interrupted, and at the end three-fourths of the cereals were cut in excellent order. Potatoes and green crops abundant.

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## IRIDESCENT CLOUDS.

*To the Editor of Symons's Meteorological Magazine.*

I NOTICED at this place four days ago a phenomenon of iridescence in clouds which is new to me, and of which I should be interested in knowing the probable explanation, especially if it chanced to throw any light on the question of ice-formation in the higher strata of clouds.

The sky at the time was strewn with brilliantly white clouds of somewhat peculiar shape, coming under none of the ordinary classes of cloud with which I am acquainted. "Cirro-stratus" would, I think, most nearly describe them; but they were rounder, more "blobby," than this term naturally suggests. In fact, they suggested to me very vividly bits of massed eider-down—the edges, for the most part, being extremely soft and rounded and not fretted, though in some cases they were slightly so. These clouds were evidently pretty high, and also thin, as the sun was full behind one of them and yet too bright to look at. On the sun-ward edges of two clouds close by this one, I detected beautiful bands of iridescent colours. To my eyes (curiously, as it seemed to me), instead of the full scale of primary colours there were only two, and these two repeated, viz. (starting from near the sun), pink, green, and then pink and green again. The bands followed the contour, but did not come close up to the edge of the cloud.

I should be very glad to know if similar instances of cloud-colouring have been often observed before; and, if so, with what conditions they are usually associated.

ISABEL FRY.

*Cromarty, N.B., August 3rd, 1901.*

SYMONS'S

# METEOROLOGICAL MAGAZINE.

No. CCCCXXIX.] OCTOBER, 1901. VOL. XXXVI.

## METEOROLOGY AT THE BRITISH ASSOCIATION.

GLASGOW MEETING, 1901.

THE position of Meteorology at the British Association for the Advancement of Science is still very unsatisfactory. There is not at present sufficient original study of the subject in this country to justify an effort to found a new section; and although a day is usually set apart in Section A (Mathematics and Physics) on which meteorological papers are considered, many authors prefer to read their papers in other sections where particular departments or applications of Meteorology are more likely to find an appreciative audience. At the meeting of the Association held in Glasgow from September 11th to 18th, an unfortunate hitch occurred, by which the meteorological papers offered to Section A were partly taken on two days, and the official arrangements for the advancement of our science consequently appeared in a somewhat worse light than usual. The present article is a record and not a criticism, so we postpone any suggestions for improving the condition of things.

The scattered and fragmentary treatment of Meteorology in the sections was, to a certain extent, made up for by the revival of the time-honoured Meteorological Breakfast. Old readers of this Magazine will remember that at the Edinburgh meeting in 1871, Mr. D. Milne Home entertained a large company of meteorologists to breakfast on the day when the meteorological papers were taken in Section A. The breakfast, paid for by the meteorologists themselves for the most part, was repeated annually until 1877, with attendances of from 14 to 20, except at the Glasgow meeting in 1876, when Dr. Muirhead entertained a party of 40. A gap of three years followed; then there was a most successful breakfast at York in 1881, when 40 were present, but an attempt to continue the gathering at Plymouth in 1882 failed in circumstances that can be gathered from the account of that meeting in this Magazine. Dr. Buchan gave a private breakfast to a party of meteorologists at the last Edinburgh meeting, in 1892; but as Mr. Symons had been the leading spirit at all these reunions in the past, we fe t that it was a privilege to co-operate with Mr. Shaw in reviving them at this year's meeting.

The breakfast was held in the Grand Hotel, Charing Cross, Glasgow, at 9 a.m., on Tuesday, 17th September, and in accordance with precedent, we subjoin a list of those who were present. Other meteorological workers would doubtless have been happy to come if it had been possible to obtain sufficient publicity for the invitation :—

Aitken, John, F.R.S.
Alexander, P. Y.
Aspland, W. G.
Becker, Prof. L.
Buchan, Dr. A., F.R.S.
Coates, Henry
Cornish, Dr. Vaughan
Denison, F. Napier
Dickson, H. N.
Dines, W. H., Pres. R.Met.Soc.
Herbertson, Dr. A. J.
Joly, Prof. C. E.
Kitto, E.
Lemaire, Captain
McLeod, Prof. H., F.R.S.
Mill, Dr. H. R.
Milne, Prof. J., F.R.S.
Plummer, W. E.
Rosse, Earl of, F.R.S.
Rotch, A. Lawrence
Shaw, W. N., F.R.S.
Turner, Prof. H. H., F.R.S.

By right of seniority, Dr. Buchan presided, and after a very pleasant hour of conversation he made a short speech full of reminiscences of former meetings of the Association and of the great names which were associated with the study of Meteorology in the middle of the last century. He recalled, amongst our own countrymen, Sabine, Forbes, Brewster, Meldrum and Blanford; Henry, Maury and Myer from the United States; Leverrier and Sourel from France; Quetelet from Belgium; Buys Ballot from Holland; Hofmeyer from Denmark; Hansteen from Norway; Kaemtz from Russia; Jelinek from Austria; Plantamour from Switzerland; Secchi, Donati and Densa from Italy. All these men, now departed, were not only meteorologists, but distinguished physicists as well. He expressed a very strong opinion that meteorological papers as dealing with a branch of Physics, should always be read in the presence of the whole Physical Section A of the British Association.

On account of the impossibility of being in more than one section at one time, no one could hear all the papers of meteorological interest which were read at the meeting; but we reproduce below condensed abstracts of most of them.

In connection with the paper by Mr. Rotch, it is interesting to note that the Association has appointed a committee (Chairman, Mr. Shaw; Secretary, Mr. Dines) to co-operate with the Royal Meteorological Society in initiating experiments on the exploration of the upper air by means of kites, and that a grant of £75 has been given towards the expenses. The following were amongst the papers read :—

*On the Seasonal Variation of the Atmospheric Temperature of the British Isles and its Relation to Wind-direction.* *By* W. N. SHAW, *M.A., F.R.S., and* R. WALEY COHEN, *B.A.* (Read to Section A).

If the twenty-five year means of temperature for each day of the year at the four principal stations of the British Meteorological Office be plotted the curves do not exhibit a smooth run, but show a number of irregularities—often of considerable magnitude. It is thus difficult to assign any specific number

as the normal mean temperature for a particular day, and the immediate object of the work described below was to obtain a smooth curve to which the actual observed temperature of any day might be referred, and to study its characteristics. The curves of actual daily means were first compared with simple harmonic curves having an annual period, a maximum about July 21st, and the same area as the irregular curves. The comparison at once disclosed a lag of spring and an acceleration of autumn, and a corresponding exaggeration of the summer maximum and moderation of the winter minimum. These features, being essentially characteristic of the combination of a first and second order sine curve with a maximum at the same epoch, suggested the idea of combining two such curves to obtain a normal curve of reference. These combined curves give very satisfactory smoothed curves for the whole year for each station, and show that the periodic variations of atmospheric temperature at Kew may be very approximately represented by the summation of two effects, one of which corresponds to a sine curve with an annual period and an amplitude of 12°·04 F., and the other to a sine curve with a semi-annual period and an amplitude of 1°·4 F. Similar statements with similar numerical magnitudes are true of the other stations. This result has been confirmed analytically.

The curves of daily mean atmospheric temperature have been harmonically analysed for each of the stations, and the values of the harmonic coefficients have been determined in the Meteorological Office by means of Sir R. Strachey's formula.* In each case there is a second order curve whose amplitude is about one-eighth of that of the first order, and the amplitudes of the curves of higher order are so small as to be negligible. The first order curve has a maximum at a date which varies at the four stations from July 23rd to August 1st, and the second order curve has maxima which vary from January 28th to February 3rd, and July 30th to August 5th respectively, and minima about the end of April and October respectively.

Assuming the first order curve to represent the primary solar effect, the purpose of this investigation has been to ascertain the nature and cause of the second order effect. Analysis of the temperature at Vienna shows that it does not exist there either to the same extent or at the same epoch. At Agra there is a second order effect of considerable magnitude, but at an entirely different epoch, and hence in no way analogous to the effect in the British Isles. The effect is thus shown to be meteorological and not planetary.

The effect was first studied for Kew. Its cause was sought in the effects and relative frequency of occurrence of cyclonic and anticyclonic weather. For this purpose the mean temperature of cyclonic days for each month throughout the year during the five years 1876–80, and of anticyclonic days during the same period, were separately calculated, and curves were plotted whose ordinates are proportional to the difference between these values and the mean of the ordinates of the first order curve for each month. Both these curves show the main characteristics of the second order curve, and the curve of difference of temperature between cyclonic and anticyclonic weather shows no sign of it. Moreover, by multiplying the percentage of difference of frequency of cyclonic and anticyclonic weather for each month by the difference in temperature, the total effect of type of weather on temperature is obtained, and its curve shows that it does not in any respect resemble the

* *Proc. Royal Soc.*, vol. xlii. pp. 61–79.

second order effect. It is concluded that although the second order effect has a meteorological origin the type of the weather plays no part in causing it.

The effect of wind direction was next examined for the nine-year period 1876–84. The mean temperature of the air during the prevalence of barometric gradients towards each of eight points of the compass in each month were separately calculated, and curves of divergence from the first harmonic component were drawn for each wind (taken as being at right angles to the gradient) in the same way as for the cyclonic and anticyclonic curves. Each of these curves shows at least some characteristic of the second order curve; but on summing them altogether a curve is obtained which differs somewhat from the total curve of divergence from first order curve values.

The effect is largely accounted for as the combined effect of the seasonal variations in temperature of the several winds, and when this part is eliminated the remainder must be attributed to the relative frequency of winds of different temperature. To show this more clearly the winds were grouped together. The mean temperature divergence of east winds is —3°·1 F.; of north-east winds —4°·0 F.; and of north winds —3°·5 F. These winds were grouped as "cold" winds. Similarly the north-west and south-east winds, only —0°·6 F. and —0°·7 F., respectively, were grouped as "temperate winds," and the west, south-west and south winds, whose mean divergences are + 1°·7 F., + 2°·2 F., and + 2°·5 F. respectively, were grouped as "warm" winds. Temperature curves were drawn for each of these groups analogous to the curves for the separate winds. Each curve again shows a general resemblance to the second order curve, but it is noticeable that the October-November minimum is especially prominent in the curve for the temperate winds. The mean frequencies of occurrence of these groups in each month during the nine years were also calculated and expressed as a percentage of the total number of days; the results were plotted on curves whose ordinates are proportional to these percentage frequencies.

The frequency curve for "cold" winds shows a very remarkable maximum frequency in May and a small maximum in November. The frequency curve for warm winds shows minima at these times and maxima in February and August, and the frequency curve for temperate winds, which become distinctly colder in October-November, shows a very high maximum at the end of October. At that time the temperature of these winds is much below the average relative value, and thus the small maximum of the curve of the cold winds at that time is reinforced by the seasonal coldness of the more prevalent winds.

*On Weather Maps.* *By* W. N. SHAW, M.A., F.R.S. (Read to Section E.)

All the weather maps for the first day of the twentieth century received by the Meteorological Office were exhibited, and their special features explained. The want of synchronism in the observations on which the British weather maps were constructed and the forecasts issued was pointed out, and reference made to the advantages which would result if all the observations were made at the same hour instead of at various hours from 7 to 9 a.m. as at present. The countries at present issuing weather maps are (beginning at the far west) Canada, United States, Mexico, United Kingdom, Portugal, Spain, Denmark, Germany, Netherlands, Belgium, France, Switzerland, Bavaria, Italy, Algeria, Austria-Hungary, Rumania, Russia, India, Japan and Australia.

*On the Effect of Sea Temperature upon the Seasonal Variations of Air Temperature of the British Isles.* *By* W. N. SHAW, M.A, F.R.S. (Read to Section A.)

The paper describes an attempt to utilise the mode of geometrical composition and resolution of sine curves of the same period to resolve the principal seasonal variations of temperature at a station into constituents, which may be called the primary solar constituent, and the constituent due to the surroundings of land and sea respectively.

The analysis of atmospheric temperature shows that there is a considerable lag in the occurrence of the seasonal variations of temperature at coast stations as compared with inland stations, and a still greater lag in the variations of temperature in the sea itself.

The variation in sea temperature is regarded as a periodic cause of variation of atmospheric temperature at coast stations, the effect of which is periodic in the same period, and may be compounded with the primary solar effect to give the resultant seasonal variation.

The effects of these curves of equal period may be represented in magnitude by the numerical value of the amplitudes of the first order curves of the respective temperature variations, and they may be compounded geometrically by means of a triangle whose sides are proportional to these amplitudes, and are inclined at angles corresponding to the relative epochs of the curves. In such a triangle the following elements are known :—

1. A side proportional to the observed amplitude at the station.
2. The difference in epoch between the primary solar cause and the resultant, *i.e.*, the angle between the sides proportional to the amplitudes of the primary solar and of the resultant effects.
3. The angle between the sides proportional to the marine and the primary solar effect.

By assuming the primary solar effect to be the same for places in the same latitude it would thus be possible to analyse seasonal variation of temperature at any place into its elements, and an example is given of this analysis in the case of Kew. A point of some interest arising out of this is the lag in the seasons at sea-coast stations, showing that not only the autumn and winter are late at the sea-coast, but also the spring, so that an early spring is to be sought inland. Another point of interest is the effect of the sea, which is not, as is generally supposed, actually to decrease the amplitude of annual temperature oscillation, but to increase it, although to a less extent than a corresponding surrounding area of land. Thus at Nerchinski-Zavod, in Siberia, the effect (calculated as above) of the secondary cause, *i.e.*, the surrounding land, on annual temperature variation has an amplitude of 55° F. ; whilst at Kew, in the same latitude, the effect of the surrounding land and sea has only an amplitude of 8°·3 F. The figures for sea temperature are inadequate for effective numerical analysis, but they suggest a possibility of arriving on these lines at a definite comparison of inland and marine climates.

*The Mean Temperature of the Atmosphere and the Causes of Glacial Periods.* *By* H. N. DICKSON, B.Sc. (Read to Section E.)

If we suppose that secular variations of climate in the past have been due to changes in the mean temperature of the atmosphere, it is most probable that such changes have been accompanied by large relative alterations in the gradient

of temperature between the equator and the poles. But this difference of temperature is the primary cause of the whole planetary circulation of the atmosphere, the form and intensity of which must have varied with it, both absolutely and relatively to the modifications produced at the Earth's surface by the distribution of land and sea. The general conditions lead to the conclusion that a lowering of the mean temperature would be accompanied by an increase of the equator-poleward gradient, and a rise by a diminution of it. Ferrel's theory of atmospheric circulation would then suggest that in the former case the planetary circulation would become more active, the tropical high-pressure belts would be displaced to lower latitudes, and the modifying influence of great continental areas would be relatively diminished; while in the latter case the circulation would be less energetic, the tropical belts would be farther from the equator, and the contrast between oceanic and continental climates would be more sharply defined.

The probable effects of such changes on the distribution of precipitation, and especially on the position and direction of the great cyclone tracks, are examined, and it is suggested that the greater proportion of rainfall received with easterly winds on the polar sides of cyclones, in lower latitudes than at present, may explain some peculiar features of glacial phenomena. In any case, the aspects of the problem to which attention is drawn deserve fuller recognition than they have received; they indicate that the variations of temperature required to account for climatic changes are of smaller range than has been supposed, and they may, by the exclusion of some surviving theories, assist in determining the true cause.

*The Climatology of Africa.—Tenth and Final Report of a Committee consisting of* Mr. E. G. RAVENSTEIN (*Chairman*), Dr. H. R. MILL *and* Mr. H. N. DICKSON (*Secretary*). *Drawn up by the Chairman.* (Read to Section E).

Meteorological returns have been received by your Committee in the course of last year from twenty-one stations in Africa, including Asiut and Omdurman; Old Calabar; Blantyre, Lauderdale, Fort Johnston, and Nkata Bay in Nyasaland; Kisimayu, Malindi, Lamu, Takaunga, Mombasa, and Shimoni on the coast of British East Africa; Machako's, Kitui, Nairobi, and Kikuyu in the interior of that Protectorate; and from the four lake stations in Uganda. We are, moreover, enabled to give the results of seven years' observation on the rainfall at Mengo (Uganda), taken from the unpublished journal of the late Mr. A. M. Mackay. A table giving the rainfall since 1890 at a number of stations has been added.

Since the appointment of your Committee in 1891 meteorological reports from as many as seventy-one African stations have been published through its agency, and it may safely be asserted that many of the more valuable of these observations would never have been made or become generally available had it not been through our action. Amongst these stations, however, there are only fifty-six the records of which embrace a full year, and eleven from which we have received full returns for at least five years. These latter are Lauderdale, Dunraven (rainfall only), Kisimayu, Malindi, Lamu, Takaunga (rainfall only), Mombasa, Chuyu (or Shimoni in Wanga), Machako's, Fort Smith (in Kikuyu), and Mengo (Namirembo and Natete). Among stations having a less extended record, but distinguished for the care with which the observations were taken and the interest attaching to the results, are Bolobo in the Congo

State (3¾ years); Zomba (4 years) and Fort Johnston (28 months) in Nyasaland; Kibwezi (18 months) in British East Africa and Old Calabar. We should also refer here to the high value attaching to the observations on the lake level of Victoria Nyanza. . . . . .

Such of the instruments originally issued by us which have not become unserviceable, been lost, or been otherwise disposed of, have been left in the hands of trustworthy observers, with a reversionary claim upon them by the British authorities within whose territory the stations are situated.

Your Committee have likewise published "Hints to Meteorological Observers in Tropical Africa," which, they are happy to say, have been made widely known and freely accepted by observers. Copies may be obtained on application to the Secretary of the Royal Meteorological Society.

The registers received by your Committee, and not claimed by the observers, have been handed over either to the Meteorological Council or to the Secretary of the Royal Meteorological Society, and may be freely consulted by persons interested.

Your Committee, on bringing their ten years' service to a close, desire to direct the attention of the authorities called upon to organise the meteorological service in British Protectorates or Crown Colonies to the following points:—

1.—The instruments supplied should not only be verified before they leave England, but should also be inspected periodically by a competent official, who would pay particular attention to their exposure, inquire into the competency of the persons charged with filling in the registers, and eventually teach them how to observe.

2.—Inasmuch as all officials may occasionally be called upon to fill up the registers, they should be instructed, before they leave England, in handling and reading the usual meteorological instruments. An hour spent at the office of the Meteorological Council, or with the Secretary of the Royal Meteorological Society, would suffice for that purpose.

3.—It is of far greater importance to have a limited number of stations well equipped, and the registers from which can be thoroughly trusted, than a multiplicity of stations provided with defective instruments, carelessly or intermittingly attended to.

4.—Care should be taken that there should be no interruption in the records kept at the principal stations owing to the illness or temporary absence of the observer. Duly qualified native assistants could be obtained from the Meteorological Department of India.

5.—It is most desirable that the hours of observation recommended in our "Hints" should be strictly adhered to, not for the sake of uniformity only, but mainly because they yield a true mean of barometric pressure, temperature, and humidity without making undue or unreasonable demands upon the time of the observers.

6.—Unless local provision is made for the adequate publication of the observations, the registers should be forwarded (through the Foreign or the Colonial Office) to the Meteorological Council, or to the Secretary of the Royal Meteorological Society, in order that abstracts may be prepared and made generally accessible to meteorologists and others interested. Still better would it be if an annual volume containing all these observations were to be published separately. . . . . .

(*To be continued.*)

## DEFICIENT RAINFALL IN SEPTEMBER.

EXCEPT in Ireland, where the rainfall has considerably exceeded the average, and in the west of Scotland, September, 1901, has been an exceptionally dry month over the British Islands. The rainfall was below the average over nearly the whole of England, Wales, and the east of Scotland. It was only in the Lake District, Wales, and along the south coast that falls exceeding 2 inches for the month were recorded, and a large area in the north of England had less than 1 inch of rain. This, following upon an unusually dry spring and summer, led to anxiety as to the water-supply of many important towns, and in some of these the situation was becoming serious when it was relieved by the rain that fell during the first ten days of October.

To give an idea of the trouble caused by too little rain, we may mention the fact that through traffic had to be stopped on the Leeds and Liverpool Canal, while many manufactories and some collieries in Lancashire and Yorkshire had to shorten their hours or stop altogether on account of the failure of the water-supply for the boilers. As a minor incident, an organ recital at Keighley was postponed, as the supply failed for the hydraulic blower.

In Bradford (according to the *Yorkshire Post*, of September 24th), "there was not much more than a week's supply left in the dams." Leeds, on September 27th, had three weeks' supply; Halifax only thirteen days', although the water was cut off at night. In Huddersfield, on October 1st, there was sufficient water to last seventeen days with an eight-hours' service; but this was reduced to six hours, and the supply to manufactories cut off so as to ensure a domestic supply for three weeks. In Manchester, about September 26th, the consumption of water exceeded 26,000,000 gallons per day, and the available supply from Thirlmere being only 8,250,000 gallons, and that entering the reservoirs at Longdendale 4,000,000 gallons, more than half the quantity used had to be taken from the rapidly dwindling stores, which were calculated to meet the requirements for 20 days at most. The supply was restricted to consumers on July 21st, and it is noted that in the excessively dry Jubilee year, 1887, the supply was restricted on July 21st, and not resumed in normal amount until October 13th.

The following table shows the deficit of rainfall at the stations in the north of England quoted in our monthly returns:—

| | Hesley Hall. | Derby. | Manchester. | Wetherby. | Skipton. | Newcastle. | Scathwaite. |
|---|---|---|---|---|---|---|---|
| September fall | ·87 in. | ·90 in. | ·78 in. | ·85 in. | 2·61 in. | 1·02 in. | 9·32 in. |
| ,, diff. from average | —1·02 ,, | —1·11 ,, | —2·39 ,, | —1·37 ,, | —2·57 ,, | —1·16 ,, | —3·56 ,, |
| ,, per cent. of average | 46·0 | 44·6 | 24·3 | 38·2 | 50·4 | 46·6 | 72·5 |
| Jan.–Sept. fall | 14·88 ,, | 16·36 ,, | 22·45 ,, | 17·01 ,, | 42·50 ,, | 18·29 ,, | 91·75 ,, |
| ,, ,, diff. from average | —3·66 ,, | —1·63 ,, | —6·38 ,, | —2·94 ,, | —8·41 ,, | —2·87 ,, | —28·61 ,, |
| ,, ,, per cent. of average | 75·5 | 90·0 | 71·6 | 82·8 | 80·2 | 84·3 | 68·9 |

The meaning of this table will be made clear by taking the case of Skipton, where the first line shows that the rainfall in September was 2·61 in.; the second that this was 2·57 in. less than the average for 1890-99; the third that the fall in September was 50·4 per cent. or scarcely more than half the average fall for the month. The remaining three lines give the same data for the period from January to September inclusive. It thus appears that the scarcity of water was not brought about by absolute droughts in September, for there do not appear to have been any, but rather by an exceptionally dry September following a succession of dry months. June and September were below the average at all the stations cited; January, February and May at all but one station, and in each of the other months there was a deficit at several of the stations and a large overplus at none.

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## WHIRLWIND OR THUNDERBOLT.

THE *Daily Chronicle* published on September 24th a paragraph headed "Thunderbolt in Bradford," which described "a remarkable atmospheric visitation," which at Horton "took the form of a whirlwind," and in one suburb that of "an electrical discharge, unaccompanied by thunder, which is described as having resembled a 'silent thunderbolt' of unusual extent." Other reports indicated that something unusual had occurred, and we wrote to Mr. A. Wilson, of Ilkley, for further particulars. He replied as follows:—

*To the Editor of Symons's Meteorological Magazine.*

I gladly give you all the information I can about the "Thunderbolt in Bradford." It was, as you surmise, a whirlwind, which, considering that it passed over a thickly populated part of the city, did comparatively little damage. I enclose a cutting from the *Bradford Observer*, which gives an account of it. As I have not seen any further particulars of damage mentioned in the paper since, I conclude its effects were not seriously felt beyond the localities named, which would indicate a length of path of about 1½ miles. I think that the "electric discharge" was nothing more than the sudden change from smoky gloom and comparative darkness to almost sunshine, as the black clouds and smoke passed off to W.N.W. in the rear of the storm.

I was in central Bradford (about one mile N.N.W. from the parts affected) during the 23rd. The morning was foggy at first, and afterwards mostly dull, but with a few gleams of sunshine. Max. temp. about 66°, with light E.S.E. airs; the atmosphere was damp and close. At 1 p.m. I noticed that thunder clouds were forming, and from 2.30 to about 3.45 it became very dark (though not so dark as I have previously seen it on several occasions during the day in Bradford) and rain fell heavily at intervals.

At about 3.45 I saw the clouds and smoke rapidly pass away to the W.N.W., and it came light again very suddenly. The sun did not actually shine, but the contrast from the previous gloom was quite sufficient to account for the wild statements of persons of unscientific mind who *felt* the whirlwind, and also saw the change in the sky. I heard no thunder, owing, perhaps, to noise of street traffic, but I am told that distant thunder was heard in the outskirts of Bradford, and there was a sharp, but short, thunderstorm at Ilkley during the afternoon, with some near lightning, and a rainfall of ·16 in. The evening was fine and calm. There was no wind in central Bradford during the storm. I am told that there was a great noise along the path of the whirlwind, and some people "thought the world was coming to an end!"

ALBERT WILSON.

*Ilkley, September 28th*, 1901.

The *Bradford Observer* almost justifies the language of the *Daily Chronicle's* report, but in its additional details shows that the whirlwind alone was the destructive agent. It seems to have developed first in West Bowling, where many glass globes were broken in the cemetary, and then passed over Ripleyville, damaging some roofs and sending the slates flying. Other roofs suffered in the neighbourhood of the Bradford Workhouse; a horse and waggon were blown against a wall, and a perambulator—empty as it happened—was lifted into the air. A gentleman who saw the phenomenon from the West Bowling golf links compared it to a water-spout, although his description indicates a whirlwind which had drawn a quantity of smoke into the vortex. Between Morton East and Morton West, about six miles north-west of Bradford, a very well-marked whirlwind occurred on the same day (no hour being mentioned we cannot say whether it was the same whirl), and it is noted that it "crossed the canal making the water fly as from a hosepipe." The map in "British Rainfall, 1900," p. 18, illustrating the Ilkley flood, shows the places referred to in this notice.

## Correspondence.

### TEMPERATURE AND SEASONS, 1883–1901.

*To the Editor of Symons's Meteorological Magazine.*

I SEND the following observations made from a southern county record, the temperatures being taken by a thermometer 4 feet from ground, with a north aspect. The earliest dates of high readings in spring seem to correspond fairly with a warm season. The autumn readings naturally show the opposite conditions. Thus, the last reading in 1890 of 70° or upwards was on August 6th; but in 1886 it was as late as October 4th, and the autumn was very warm. The earliest and latest dates in each season are shown in heavier type as well as the temperatures on these days.

*Nineteen Year Record Shade Temperatures.*

| Year. | 1 EARLIEST DATE. 60° or over. I. | 2 EARLIEST DATE. 70° or over. II. | 3 LATEST DATE. 70° or over. I. | 4 LATEST DATE. 60° or over. II. | 5 Actual Maximum Shade Temperatures on the given dates. Spring. | | Autumn. | | 6 No. of Days between columns I. and II. Spring. | Aut'mn |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ° | ° | ° | ° | | |
| 1883... | Apr. 3 | May 21 | Sept. 19 | Oct. 27 | 64 | 70 | 72 | 60 | 48 | 38 |
| 1884... | **Mar. 17** | ,, 11 | ,, 18 | ,, 16 | **61** | 73 | 72 | 61 | 55 | 28 |
| 1885... | Apr. 18 | June 3 | Aug. 17 | Sept. 29 | 62 | 70 | 75 | 61 | 46 | 43 |
| 1886... | Mar. 23 | May 8 | **Oct. 4** | Oct. 31 | 60 | 73 | **74** | 60 | 46 | 27 |
| 1887... | Apr. 19 | **June 8** | Aug. 28 | **Sep. 23** | 62 | **70** | 74 | **60** | 50 | 26 |
| 1888... | ,, 15 | May 19 | Sept. 24 | Oct. 28 | 62 | 73 | 70 | 61 | 34 | 34 |
| 1889... | ,, 19 | ,, 5 | ,, 13 | Sept. 27 | 61 | 73 | 75 | 63 | 16 | 14 |
| 1890.. | ,, 30 | ,, 25 | **Aug. 6** | Oct. 6 | 60 | 71 | **70** | 62 | 25 | 61 |
| 1891... | **May 7** | ,, 12 | Sept. 13 | ,, 9 | **63** | 72 | 71 | 60 | 5 | 26 |
| 1892... | Apr. 2 | ,, 25 | Aug. 24 | Sept. 27 | 60 | 70 | 70 | 62 | 53 | 34 |
| 1893... | ,, 5 | **Apr 20** | Sept. 15 | Oct. 21 | 61 | **71** | 71 | 60 | 15 | 36 |
| 1894... | ,, 1 | June 3 | ,, 1 | ,, 11 | 60 | 74 | 70 | 64 | 63 | 40 |
| 1895... | Mar. 21 | May 9 | ,, 30 | **Nov. 16** | 62 | 74 | 73 | **60** | 49 | 47 |
| 1896... | ,, 22 | ,, 11 | ,, 7 | Oct. 15 | 63 | 70 | 71 | 60 | 50 | 38 |
| 1897... | ,, 23 | Apr. 27 | Aug. 18 | ,, 19 | 60 | 71 | 70 | 65 | 35 | 62 |
| 1898... | ,, 18 | May 22 | Sept 21 | ,, 26 | 61 | 71 | 73 | 61 | 65 | 35 |
| 1899... | ,, 29 | ,, 31 | ,, 13 | ,, 28 | 61 | 72 | 70 | 61 | 63 | 45 |
| 1900... | Apr. 14 | Apr. 21 | ,, 18 | Nov. 1 | 63 | 71 | 71 | 60 | 7 | 44 |
| 1901... | ,, 20 | ,, 23 | ... | ... | 64 | 70 | ... | ... | 3 | ... |
| Average | April 6 | May 15 | Sept. 9 | Oct. 17 | 61·6 | 72·6 | 71·8 | 61·2 | 39 | 38 |

A. F. PARBURY.

*Chiddingfold, Godalming, Surrey.*

## THE INVERNESS EARTHQUAKE OF SEPT. 18TH.

*To the Editor of Symons's Meteorological Magazine.*

I venture to ask the kindly assistance of your readers in my effort to obtain materials for a study of the recent important earthquake in the north of Scotland. I should be very glad to receive accounts, however brief, from any part of the disturbed area, especially from places which seem to be near the boundary of the disturbed area, such as in the extreme north of Scotland, along the western coast, and in the neighbourhood of the line joining Edinburgh and Glasgow. Owing to the hour at which the earthquake occurred, it is most difficult to obtain records of the shock at great distances from the epicentre, and therefore all those received possess a very high value. If any of your readers should be willing to assist me in this work, I shall be pleased to send them forms on which they might enter their own accounts or those of their friends.

CHARLES DAVISON.

*16, Manor Road, Birmingham, Sept. 30th.*

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, APRIL, 1901.

| STATIONS. (*Those in italics are South of the Equator.*) | Absolute. Maximum. Temp. | Date. | Absolute. Minimum. Temp | Date. | Average. Max. | Min. | Dew Point. | Humidity. | Absolute. Max. in Sun. | Min. on Grass. | Total Rain. Depth. | Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0-100 | ° | ° | inches | | |
| London, Camden Square | 76·8 | 23 | 28·1 | 2 | 59·2 | 39·1 | 37·6 | 66 | 118·3 | 20·5 | 2·15 | 14 | 4·6 |
| Malta | 87·7 | 12 | 50·4 | 21 | 68·7 | 55·2 | 52·6 | 76 | 136·8 | 45·6 | ·10 | 1 | 2·8 |
| *Cape Town* | 92·0 | 18 | 43·8 | 10 | 73·3 | 56·1 | 55·5 | 72 | ... | ... | ·75 | 4 | 4·5 |
| *Mauritius* | 85·9 | 6, 7 | 61·5 | 18 | 82·0 | 69·7 | 68·7 | 80 | 147·2 | 54·4 | 3·43 | 11 | 5·1 |
| Calcutta | 103·7 | 16 | 69·2 | 21 | 97·9 | 76·9 | 70·7 | 61 | 155·2 | 67·8 | 1·55 | 2 | 4·4 |
| Bombay | 93·6 | 30 | 76·0 | 1 | 89·6 | 78·8 | 74·8 | 74 | 142·3 | 69·9 | ·04 | 1 | 2·6 |
| Colombo, Ceylon | 93·6 | 16 | 73·0 | 7 | 90·6 | 75·2 | 75·9 | 85 | 151·0 | 72·5 | 8·71 | 19 | 3·3 |
| *Melbourne* | 82·6 | 9 | 39·7 | 18 | 66·4 | 49·5 | 47·4 | 71 | 133·9 | 30·9 | 6·71 | 12 | 6·2 |
| *Adelaide* | 89·2 | 1 | 42·4 | 28 | 72·0 | 53·5 | 47·1 | 65 | 145·4 | 35·1 | 1·94 | 8 | 5·6 |
| *Sydney* | 83·5 | 15 | 51·7 | 24 | 71·1 | 58·8 | 57·2 | 81 | 131·9 | 39·8 | 10·16 | 14 | 5·2 |
| *Wellington* | 74·0 | 6 | 37·0 | 28 | 64·3 | 51·5 | 46·8 | 67 | 117·0 | 30·0 | 2·35 | 9 | 4·2 |
| *Auckland* | 72·5 | 1 | 46·5 | 10 | 66·2 | 55·1 | 49·9 | 68 | 138·0 | 43·0 | 1·12 | 10 | 4·4 |
| Jamaica, Halfway Tree | 90·0 | 24 | 66·0 | 13 | 85·9 | 69·9 | 66·8 | 71 | ... | ... | 1·16 | 4 | 3·0 |
| Trinidad | 94·0 | 6 | 62·0 | 12 | 89·9 | 66·7 | 72·0 | 81 | 165·0 | 53·0 | ·35 | 1 | ... |
| Grenada | 87·0 | 29 | 70·8 | 13 | 84·3 | 73·9 | 70·5 | 73 | 148·2 | ... | ·71 | 5 | 1·6 |
| Toronto | 75·6 | 29 | 30·2 | 12 | 54·8 | 37·6 | 35·9 | 68 | 93·0 | 26·2 | 3·86 | 11 | 6·2 |
| Fredericton New Brunswick, | 76·9 | 26 | 23·4 | 13 | 53·3 | 32·6 | 29·6 | 60 | ... | ... | 4·43 | 11 | 5·9 |
| Winnipeg, Manitoba | 76·4 | 30 | 15·0 | 1 | 55·4 | 30·2 | ... | ... | ... | ... | 1·93 | 6 | 5·7 |
| Victoria, British Columbia | 59·3 | 30 | 32·4 | 7 | 51·8 | 40·0 | | ... | ... | ... | 3·01 | 12 | 6·4 |

### REMARKS.

MALTA.—Mean temp. of air 60°·6, or 1°·1 above the average. Mean hourly velocity of wind 2·8 miles or 1·7 below average. Mean temp. of sea 62°·9. L on 26th.
J. F. DOBSON.

*Mauritius.*—Mean temp. of air 0°·2 below, of dew point equal to, and R 1·86 in. below their respective averages. Mean hourly velocity of wind 9·4 miles, or 1·2 below the average; extremes, 27·6 on 23rd and 0·0 on 2nd; prevailing direction S.E. by E. and E.S.E. L and T on 5 days; T on 1st, and L on 3 days. T. F. CLAXTON.

COLOMBO, CEYLON.—Mean temp. of air 0°·6 below, of dew point 1°·5 above, and R 2·72 in. below, their respective averages. Mean hourly velocity of wind 6·0 miles; prevailing direction S.E. to S.W. TSS occurred on 4 days. L was seen on 3 days.
W. C. S. INGLES.

*Adelaide.*—Mean temp. of air 1°·2 below the average of 44 years; R about normal, but the month was dry over inland parts of the state. C. TODD, F.R.S.

*Sydney.*—Mean temp. of air 0°·4 above, humidity 3·3 above, and R 4·54 in. above, their respective averages. H. C. RUSSELL, F.R.S.

*Wellington.*—Mean temp. of air 0°·9 above, and R 1·18 in. below, their respective averages. Generally fine; occasional showers of rain, but small total fall. Prevailing N.W. winds, generally moderate. T on 25th. Earthquake on 1st at 8.45 a.m., smart E. and W. shock, and on 3rd, at 8.50 p.m., very slight. R. B. GORE.

*Auckland.*—Mean temp. 1° below the average. A remarkably fine month. R not one-half the average of the previous 33 years. T. F. CHEESEMAN.

TORONTO.—Heavy fall of snow on 20th. R. F. STUPART.

WINNIPEG.—Ice began to move down the river on 9th. R. F. STUPART.

# SUPPLEMENTARY TABLE OF RAINFALL, AUGUST, 1901.

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| I. | Uxbridge, Harefield Pk.. | 1·09 | XI. | Castle Malgwyn ..... | 4·33 |
| II. | Dorking, Abinger Hall . | 2·62 | ,, | Builth, Abergwesyn Vic. | 4·18 |
| ,, | Sheppey, Leysdown ..... | ·89 | ,, | Rhayader, Nantgwillt ... | ... |
| ,, | Hailsham ..... | 1·03 | ,, | Lake Vyrnwy ..... | 2·08 |
| ,, | Crowborough..... | 1·80 | ,, | Corwen, Rhug ..... | ... |
| ,, | Ryde, Beldornie Tower.. | 2·25 | ,, | Criccieth, Talarvor ..... | 2·53 |
| ,, | Emsworth, Redlands ... | 2·23 | ,, | I. of Anglesey, Lligwy.. | 1·67 |
| ,, | Alton, Ashdell ..... | 1·58 | ,, | Douglas, Woodville..... | 3·27 |
| ,, | Newbury, Welford Park | 2·36 | XII. | Stoneykirk, Ardwell Ho. | 3·49 |
| III. | Oxford, Magdalen Coll.. | 2·01 | ,, | New Galloway, Glenlee | 5·68 |
| ,, | Banbury, Bloxham ..... | 1·33 | ,, | Moniaive, Maxwelton Ho. | 4·77 |
| ,, | Pitsford, Sedgebrook ... | 1·63 | ,, | Lilliesleaf, Riddell ..... | 1·49 |
| ,, | Huntingdon, Brampton. | 1·01 | XIII. | N. Esk Res. [Penicuick] | 1·65 |
| ,, | Wisbech, Bank House... | ·87 | XIV. | Glasgow, Queen's Park.. | 2·85 |
| IV. | Southend ..... ..... | 1·20 | XV. | Inveraray, Newtown ... | 6·30 |
| ,, | Colchester, Lexden ..... | ·83 | ,, | Ballachulish, Ardsheal... | 6·65 |
| ,, | Saffron Waldon, Newport | 1·35 | ,, | Islay, Eallabus..... ... | 4·77 |
| ,, | Rendlesham Hall ..... | ·88 | XVI. | Dollar..... | 2·11 |
| ,, | Swaffham ..... | 1·21 | ,, | Balquhidder, Stronvar... | 8·43 |
| V. | Salisbury, Alderbury ... | 2·52 | ,, | Coupar Angus Station... | 1·76 |
| ,, | Bishop's Cannings ..... | 1·84 | ,, | Blair Atholl ... ..... | 3·97 |
| ,, | Blandford, Whatcombe . | 5·19 | XVII. | Keith H.R.S..... | 1·01 |
| ,, | Ashburton, Druid House | 4·66 | ,, | Forres H.R.S. ... ..... | 1·20 |
| ,, | Okehampton, Oaklands. | 2·45 | XVIII. | Fearn, Lower Pitkerrie.. | ·71 |
| ,, | Hartland Abbey ..... | 2·66 | ,, | S. Uist, Askernish ..... | 3·88 |
| ,, | Lynton, Glenthorne ... | ... | ,, | Invergarry..... | 2·35 |
| ,, | Probus, Lamellyn ..... | 3·95 | ,, | Aviemore, Alvie Manse. | ·78 |
| ,, | Wellington, The Avenue | 1·94 | ,, | Loch Ness, Drumnadrochit | 1·41 |
| ,, | North Cadbury Rectory | 2·39 | XIX. | Invershin ..... | 1·97 |
| ,, | Clifton, Pembroke Road | 1·96 | ,, | Durness ..... | ... |
| VI. | Ross, The Graig ..... | 1·73 | ,, | Watten H.R.S..... | ·86 |
| ,, | Wem, Clive Vicarage ... | 1·09 | XX. | Dunmanway, Coolkelure | 11·85 |
| ,, | Wolverhampton, Tettenhall | ... | ,, | Cork, Wellesley Terrace | 7·81 |
| ,, | Cheadle, The Heath Ho. | 1·22 | ,, | Killarney, District Asyl. | 6·59 |
| ,, | Coventry, Priory Row .. | 1·32 | ,, | Caher, Duneske ..... | 6·13 |
| VII. | Market Overton ..... | ·86 | ,, | Ballingarry, Hazelfort... | 4·36 |
| ,, | Grantham, Stainby ..... | 1·01 | ,, | Limerick, Kilcornan ... | 4·14 |
| ,, | Horncastle, Bucknall ... | 1·06 | ,, | Miltown Malbay ..... | 6·26 |
| ,, | Worksop, Hodsck Priory | ·69 | XXI. | Gorey, Courtown House | 4·51 |
| VIII. | Neston, Hinderton ..... | ... | ,, | Moynalty, Westland ... | 3·78 |
| ,, | Southport, Hesketh Park | ·86 | ,, | Athlone, Twyford ..... | 5·43 |
| ,, | Chatburn, Middlewood. | ·96 | ,, | Mullingar, Belvedere ... | 5·48 |
| ,, | Duddon Val., Seathwaite Vic. | 4·42 | XXII. | Woodlawn ..... | 6·28 |
| IX. | Baldersby ..... | 1·26 | ,, | Crossmolina, Enniscoe .. | 8·85 |
| ,, | Scalby, Silverdale ..... | ·60 | ,, | Collooney, Markree Obs. | 5·16 |
| ,, | Ingleby Greenhow Vic.. | ·99 | XXIII. | Enniskillen, Model Sch. | 4·00 |
| ,, | Middleton, Mickleton ... | 1·09 | ,, | Warrenpoint..... | 3·54 |
| X. | Haltwhistle, Unthank H. | ... | ,, | Miltown, Banbridge..... | 3·48 |
| ,, | Bamburgh ..... | 1·51 | ,, | Belfast, Springfield ..... | 3·67 |
| ,, | Keswick, The Bank ..... | 3·45 | ,, | Bushmills, Dundarave.. | 3·31 |
| XI. | Llanfrechfa Grange ..... | 2·87 | ,, | Stewartstown ..... | 3·64 |
| ,, | Treherbert, Tyn-y-waun | 5·76 | ,, | Killybegs ..... | 5·06 |
| ,, | Llandovery ..... | 2·91 | ,, | Horn Head ..... | 3·22 |

# SEPTEMBER, 1901.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1890-9. | Greatest Fall in 24 hours. Dpth | Greatest Fall in 24 hours. Date | Days on which '01 or more fell. | TEMPERATURE. Max. Deg. | Max. Date | Min. Deg. | Min. Date. | No. of Nights below 32°. In shade. | No. of Nights below 32°. On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches. | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | 1·62 | — ·45 | ·65 | 16 | 6 | 77·6 | 8 | 40·4 | 16 | 0 | 0 |
| II. | | Tenterden ..... | ·86 | — 1·53 | ·38 | 16 | 9 | 75·0 | 29 | 41·0 | 27 | 0 | ... |
| ,, | | Hartley Wintney ..... | ·95 | — 1·25 | ·44 | 16 | 11 | 75·0 | 12 | 41·0 | 30 | 0 | ... |
| III. | | Hitchin ..... ..... | 1·39 | — ·74 | ·67 | 16 | 7 | 71·0 | 29 | 39·0 | 5, 13 | 0 | ... |
| ,, | | Winslow (Addington) ..... | 1·50 | — ·76 | ·41 | 16 | 7 | 72·0 | 29*b* | 36·0 | 16 | 0 | 0 |
| IV. | | Bury St. Edmunds (Westley) | 1·15 | — 1·34 | ·32 | 8 | 8 | 73·7 | 29 | 40·0 | 6 | 0 | ... |
| ,, | | Norwich (Brundall) ..... | ·86 | ... | ·31 | 17 | 12 | 76·0 | 29 | 41·8 | 2 | 0 | 0 |
| V. | | Winterbourne Steepleton ... | 4·34 | ... | 1·72 | 16 | 13 | 69·0 | 29 | 38·2 | 6 | 0 | 2 |
| ,, | | Torquay (Cary Green) ... ..... | 4·42 | ... | 1·62 | 22 | 15 | 68·1 | 29 | 49·0 | 26 | 0 | 0 |
| ,, | | Polapit Tamar [Launceston].. | 2·71 | — ·59 | ·62 | 22 | 16 | 68·9 | 30 | 39·1 | 15 | 0 | 0 |
| VI. | | Stroud (Upfield) ..... | 1·61 | — ·83 | ·50 | 16 | 11 | 71·0 | 10 | 47·0 | 15 | 0 | ... |
| ,, | | Church Stretton (Woolstaston) | 1·25 | — 1·16 | ·36 | 16 | 12 | 70·0 | 9 | 40·5 | 5 | 0 | ... |
| ,, | | Worcester (Diglis Lock) ..... | 1·12 | — ·70 | ·37 | 16 | 8 | ... | ... | ... | ... | ... | ... |
| VII. | | Boston ..... | 1·06 | — ·92 | ·35 | 8 | 6 | 71·0 | 9 | 42·0 | 1 | 0 | ... |
| ,, | | Hesley Hall [Tickhill]..... | ·87 | — 1·02 | ·31 | 16 | 8 | 73·0 | 25 | 37·0 | 1, 7 | 0 | ... |
| ,, | | Derby (Midland Railway)..... | ·90 | — 1·11 | ·40 | 16 | 9 | 73·0 | 25 | 42·0 | 1 | 0 | ... |
| VIII. | | Manchester (Plymouth Grove) | ·78 | — 2·39 | ·17 | 7 | 11 | 74·0 | 9 | 46·0 | 15 | 0 | ... |
| IX. | | Wetherby (Ribston Hall) ... | ·85 | — 1·37 | ·21 | 21 | 9 | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) ..... | 2·61 | — 2·57 | ·42 | 8 | 16 | ... | ... | ... | ... | ... | ... |
| ,, | | Hull (Pearson Park). ... ..... | ·78 | — 1·45 | ·25 | 16 | 9 | 73·0 | 10 | 38·0 | 2, 16 | 0 | 1 |
| X. | | Newcastle (Town Moor) ..... | 1·02 | — 1·16 | ·20 | 19 | 17 | ... | ... | ... | ... | ... | ... |
| ,, | | Borrowdale (Seathwaite)..... | 9·32 | — 3·56 | 2·70 | 27 | 16 | 66·5 | 11 | 36·3 | 16 | 0 | ... |
| XI. | WALES. | Cardiff (Ely)..... | 3·65 | — ·10 | 1·08 | 13 | 18 | ... | ... | ... | ... | ... | ... |
| ,, | | Haverfordwest ..... .... | 6·13 | + 2·33 | 1·44 | 16 | 20 | 67·8 | 12 | 41·0 | 15 | 0 | 0 |
| ,, | | Aberystwith (Gogerddan) ... | 2·49 | — 1·58 | ·75 | 13 | 12 | 75·0 | 1 | 33·0 | 14 | 0 | ... |
| ,, | | Llandudno..... | 1·28 | — 1·59 | ·21 | 29 | 17 | 71·0 | 8 | 46·0 | 1 | 0 | ... |
| XII. | SCOTLAND. | Cargen [Dumfries] ..... ... | 3 97 | + ·22 | 1·24 | 19 | 17 | 69·0 | 11 | 34·0 | 2 | 0 | 0 |
| XIII. | | Edinburgh (Royal Observatory) | ·92 | ... | ·24 | 13 | 12 | 68·1 | 28 | 43·7 | 5 | 0 | 0 |
| XIV. | | Colmonell ..... ..... | 4·61 | + ·62 | 1·26 | 19 | 16 | 70·0 | 23 | 31·0 | 2 | ... | ... |
| XV. | | Tighnabruaich ..... ..... | 4·06 | ... | ·65 | 19 | 16 | 63·0 | 24 | 41·0 | 29 | 0 | ... |
| ,, | | Mull (Quinish)..... | 5·65 | + ·53 | ·92 | 18*f* | 20 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Leven Sluices ..... | 2·80 | — ·11 | ·64 | 7 | 14 | ... | ... | ... | ... | ... | ... |
| ,, | | Dundee (Eastern Necropolis) | 1·50 | — ·73 | ·30 | 25 | 17 | 70·6 | 9 | 38·4 | 16 | 0 | ... |
| XVII. | | Braemar ..... ..... .. | 2·11 | — 1·01 | ·70 | 19 | 19 | 64·7 | 11 | 29·5 | 16 | 2 | 5 |
| ,, | | Aberdeen (Cranford) ... ..... | 1·50 | — 1·23 | ·35 | 8, 17 | 20 | 69·0 | 9 | 41·0 | 16*c* | 0 | ... |
| ,, | | Cawdor (Budgate) ..... | 1·36 | — 1·73 | ·80 | 28 | 12 | ... | ... | ... | ... | ... | ... |
| XVIII | | Strathconan [Beauly] ..... | 1·55 | — 2·93 | ·65 | 30 | 9 | .. | ... | ... | ... | ... | ... |
| ,, | | Glencarron Lodge..... | 3·92 | — 4·61 | 1·12 | 28 | 12 | 67·5 | 24 | 34·0 | 2 | 0 | ... |
| XIX. | | Dunrobin ..... | 1·58 | — 1·01 | ·55 | 28 | 13 | 66·0 | 29 | 39·0 | 2 | 0 | ... |
| ,, | | S. Ronaldshay (Roeberry) ... | 1·58 | — 1·89 | ·37 | 28 | 17 | 63·0 | 24 | 43·0 | 17 | 0 | ... |
| XX. | IRELAND. | Darrynane Abbey..... | 6·25 | + 2·08 | 1·32 | 19 | 24 | ... | ... | ... | ... | ... | ... |
| ,, | | Waterford (Brook Lodge) ... | 5·28 | + 2·15 | 1·27 | 15 | 21 | 67·0 | 8 | 39·0 | 14 | 0 | ... |
| ,, | | Broadford (Hurdlestown) ... | 5·97 | + 3·10 | 1·15 | 21 | 22 | 68·0 | 8 | 42·0 | 14*d* | 0 | ... |
| XXI. | | Carlow (Browne's Hill) ..... | 5·05 | + 2·32 | 1·12 | 22 | 19 | ... | ... | ... | ... | ... | ... |
| ,, | | Dublin (Fitz William Square) | 3·69 | + 1·57 | ·83 | 16 | 18 | 70·7 | 8 | 43·3 | 1 | 0 | 0 |
| XXII. | | Ballinasloe ..... ..... | 4·80 | + 1·66 | ·75 | 15 | 20 | 70·0 | 8, 9 | 36·0 | 1 | 0 | ... |
| ,, | | Clifden (Kylemore) ..... | 11·74 | + 4·90 | 2·65 | 7 | 22 | ... | ... | ... | ... | ... | ... |
| XXIII | | Seaforde..... | 4·11 | + ·96 | ·64 | 7, 19 | 21 | 67·0 | 2 | 43·0 | 12*e* | 0 | ... |
| ,, | | Londonderry (Creggan Res.). | 3·18 | — ·69 | ·33 | 25 | 23 | ... | ... | ... | ... | ... | ... |
| ,, | | Omagh (Edenfel) ..... | 4·71 | + 1·00 | ·48 | 22*a* | 23 | 68·0 | 8 | 36·0 | 29 | 0 | ... |

+ Shows that the fall was above the average ; — that it was below it.

*a*—and 25. *b*—and 30. *c*—and 17. *d*—and 29. *e*—and 15, 18. *f*—and 28.

# METEOROLOGICAL NOTES ON SEPTEMBER, 1901.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

LONDON, CAMDEN SQUARE.—The first week was generally fine, with no R. Showery weather set in on 8th, and continued more or less till 21st. A considerable amount of fog occurred during the last week, but there were several very beautiful days. Mean temp. 58°·4, or 0°·7 above the average.

TENTERDEN.—A dry month, but grass freshened up a little. Remarkably even max. temp., none being below 61°, and only five above 70°. Duration of sunshine 167 hours.

HARTLEY WINTNEY.—Another remarkably fine and dry month, with only a few showers during the third week, yielding a R far below the average. Fog on 29th and 30th. Ozone on nine days, with a mean of 2·5.

WINSLOW, ADDINGTON.—A fine month. Thick fog on the mornings of 16th and 25th; 29th and 30th were brilliant days.

BURY ST. EDMUNDS, WESTLEY.—A hot, dry month. Max. temp. only once below 62°. Great want of water was felt in W. Suffolk. T on 11th.

NORWICH, BRUNDALL.—Another dry month. The total R for Jan.—Sept. amounts to 12·47 in. only, or 6·25 in. below the average. L on evening of 10th.

TORQUAY, CARY GREEN.—R 2·11 in. above the average. Mean temp. 1°·6 above the average. Duration of sunshine 37·2 hours below the average, with four sunless days. Mean amount of ozone 4·6; highest 7·0 on 8th, with S.S.W. wind, and on 17th with W.S.W. wind, lowest 2·0 on 29th, with N.N.W. wind.

POLAPIT TAMAR [LAUNCESTON].—Warm, calm and dry. The total fall for the first nine months of the year was ·89 in. below the average.

MANCHESTER, PLYMOUTH GROVE.—Fine autumn weather prevailed during the greater part of the month. Full supply of water only turned on from 6 p.m. to 6 a.m., owing to the effects of drought.

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A particularly brilliant meteor was observed from Ross (Hereford), on September 14th, at 9.15 p.m., describing a parabola, which ended about 40° to the west of Ursa Major. It had a fine comet-like tail, and was of a slightly yellow colour.

## WALES.

HAVERFORDWEST.—The first week was fine, with three almost cloudless days. From 8th to 27th R fell every day except 12th. Temp. was moderate generally, the max. being below 60° on two days only. Grass was plentiful everywhere. A good deal of corn was damaged by the wet, and the potato crop was anything but sound. Duration of sunshine 97·4 hours.

ABERYSTWITH, GOGERDDAN.—This month showed no improvement compared with its forerunner, as there was much cloud and R, and the bar. was very unsettled throughout. Wind chiefly S. and S.W., getting into N. and N.E. for a short time early in the month.

## SCOTLAND.

CARGEN [DUMFRIES].—Dull and sunless, remarkable for high night temp.

CLACHANTON, COLMONELL.—Mean temp. 1°·8 above the average of 25 years.

TIGHNABRUAICH, CRAIGANDARAICH.—R fell on the same number of days as in September, 1900, and chiefly about the equinox on both occasions.

MULL, QUINISH.—Crops were generally secured with unusual ease by the middle of the month.

S. RONALDSHAY, ROEBERRY.—A very fine month. Mean temp. 53°·1, or 1°·5 above the average of 11 years.

## IRELAND.

DARRYNANE ABBEY.—A very wet month, the total R having been exceeded in September only three times in 22 years. The fall exceeded an inch on two days.

WATERFORD, BROOK LODGE.—The wettest September since 1896. The max. daily range of temp. was 23°.

BROADFORD, HURDLESTOWN.—The wettest September on record here. S. gale on 29th.

DUBLIN, FITZWILLIAM SQUARE.—Although warm, it was very unsettled, stormy and rainy. The mean temp. was 57°·7, or 1°·9 above the average, being about the same as that of September, 1900, but in no other respect did the weather of that beautiful month reproduce itself. Only during the first few days did quiet summer-like conditions prevail. For the rest atmospheric depressions, sometimes of great size and depth swept northward along the W. coast of Ireland, causing strong S.E. to S. and S.W. winds, and frequent R. High winds were noted on 14 days, and attained the force of a gale on five. Foggy on 2nd.

OMAGH, EDENFEL.—The month began in fine weather, and during the first fortnight some fine days enabled most of the harvest, fortunately an early one, to be saved in fair order. Had it not been so the constant and saturating R of the last fortnight, accompanied as they were by a sweltering, humid atmosphere, would have been destructive even to the oat crop.

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## METEOROLOGICAL NEWS AND NOTES.

SIR JOHN MURRAY, F.R.S., is at present organizing a complete survey of the lakes of the British Islands, the funds for which have been provided by Mr. Laurence Pullar, to whose son, the late Mr. F. P. Pullar of Bridge of Allan, the completed work will form a memorial.

APPLIED METEOROLOGY will be in a class by itself at the Local and International Agricultural Exhibition to be held at Mons in Belgium in 1902. We are requested to state that this exhibition is being organized by the local Agricultural Society, with the support of the town of Mons, the authorities of the neighbouring provinces and of the Belgian Government. Applied Meteorology is to form a class of the section on Agricultural Science, and amongst the subjects to be specially dealt with are enumerated—(1) Plans for the organization of a cheap and effective service for distributing weather forecasts in country districts; (2) Means of preventing damage by hail; (3) Means of protection against white frosts. Full particulars may be obtained from Monsieur Albert Mahien, Erquennes par Dour, Belgium.

SYMONS'S

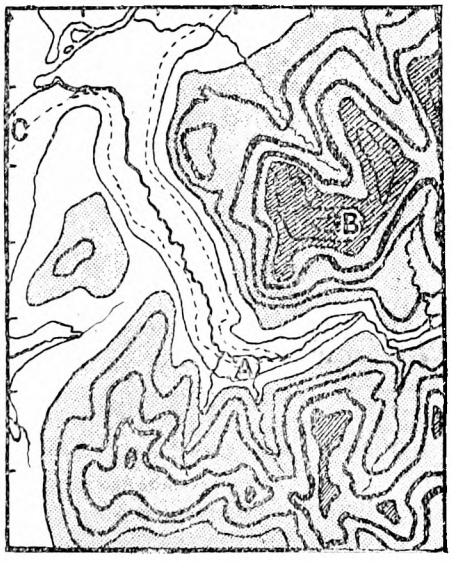
# METEOROLOGICAL MAGAZINE.

No. CCCCXXX.] NOVEMBER, 1901. VOL. XXXVI.

## NEW HIGHLAND METEOROLOGICAL STATION.

BY R. C. MOSSMAN, F.R.S.E.

A NEW meteorological station has been established in the wilds of Lochaber, in connection with the two Ben Nevis Observatories. The new station is situated at Achariach, in Glen Nevis, a remarkably steep and narrow valley, 4¼ miles S.E. of the Low Level Observatory at Fort William and 2¼ miles S.W. of the High Level Observatory on Ben Nevis. Bartholomew's Reduced Ordnance Map of Scotland, sheet 15, gives an excellent picture of the depth and narrowness of the valley in which the new station lies, and the accompanying rough sketch will convey some idea of it to the reader. The station on the valley floor is approximately 150 ft. above sea level, while 1¼ miles to the N.N.E. is the Cairn Dearg of Ben Nevis, with a height of 3348 feet, 2 miles to the S.E. is Lgor-a-Mhaim (3601 feet), 2 miles S.S.E. is Stob Ban (3274 feet), and the same distance S.W. Mulloch nan Coircean (3077 feet). On the east the valley is bordered by the precipitous face of the Meall Cumhann (2306 feet) 2½ miles distant. The station is one in which all the peculiarities of valley conditions should be well marked and capable of being studied. I expect that we shall have very low temperatures in winter during anticyclonic




A Achariach. B Ben Nevis summit.
C Fort William Low Level Station.

The map includes 7 miles by 5½; the lines represent intervals of 500 feet; land above 1000 feet is shown in light tint, and above 3000 feet shaded.

weather, as the descending currents of cold air from the glens will converge at the spot, and the cold air will be ponded up, as it were, by a ridge which shuts in the valley to the W. and N.W. When these conditions prevail at low levels, the adjacent summits are in the anticyclonic down draught of air warmed dynamically by compression, giving rise to the well-known phenomenon of the up-bank thaw. The thermal and hygrometric conditions in the valley and on the adjacent hill-sides will accordingly be studied by ascending the mountain sides and making a series of observations at every 100 or 200 feet.

I propose to spend the winter at the station, taking observations daily at 9 a.m., 10 a.m., noon, 2 p.m., 4 p.m., and 9 p.m., with extra readings when exceptional phenomena present themselves. The equipment of the station is as follows:—Two Stevenson screens are placed on a slightly elevated piece of moorland with a fairly dry subsoil; one contains a thermograph and hygrograph, the other a dry and wet bulb and maximum and minimum thermometers. A black bulb solar radiation thermometer fixed in a brass frame is screwed to one of the screens, but as the sun does not shine on the place for 3½ months in winter on account of the steepness of the surrounding hills, there will not be much for it to do. A grass minimum radiation thermometer is placed on the ground, and close to it a 5 inch copper rain gauge. The barometer is a Fortin's standard, and there are also a Richard barograph and two aneroids. Mr. Dines has kindly lent a pressure tube recording anemometer, the use of which may throw some light on the extraordinary fluctuations of temperature and humidity which are constantly occurring even on wet cloudy nights. A sling thermometer, river thermometers, rainband spectroscope, a ship's chronometer, and a pocket dust counter, are also provided, while special observations on snowfall and rainfall will be made by means of a series of cylinders exposed in different positions.

Observations commenced on October 2nd, and they promise to be very interesting and to throw light on the local variations produced by the physical configuration of the land. Rain fell on twenty-nine days in October, and the following verse proving the influence of the Moon on rainfall, though originally penned for an equatorial station, may be adapted to this valley by merely altering the name:—

"Now the weather depends on the Moon as a rule,
And I've found that the saying is true.
In Glen Nevis it rains when the Moon's at the "full,"
And it rains when the Moon's at the "new."
When the Moon's at the "quarter," then down comes the rain;
At the "half" it's no better, I ween;
When the Moon's at "three-quarters" it's at it again,
And it rains besides mostly between."

## THE STUDY OF LONDON FOG.

In consequence of a demand for special fog forecasts by the electric lighting companies in London, the Meteorological Council has decided to undertake a new investigation into the occurrence and distribution of London fogs, and has approached the County Council with a view to securing its co-operation. The result is that the Meteorological Council, which is maintained by a direct grant from the Government, has secured a further subvention for this special purpose from the London County Council, which at its meeting on October 22nd adopted the following resolutions :—

(1) That a gentleman of suitable scientific qualifications be engaged by the Meteorological Council for a limited period, to formulate instructions and a scheme of observations, and to conduct the investigation ; (2) that the observations be taken at the various Fire Brigade stations, and by men of the Fire Brigade ; and also, if it can be so arranged, at other institutions of the London County Council ; (3) that the returns be sent from the various stations, and from any other institutions selected, direct to the Meteorological Office ; (4) that the Meteorological Council do arrange with the police authorities for observations to be taken at selected positions outside the County of London ; (5) that all responsibility as to the conduct of the investigation and any published results of such investigation do rest with the Meteorological Council ; (6) that a copy of the complete returns and 12 copies of a report thereon by the Meteorological Council be supplied to the London County Council, and that the London County Council do contribute a sum of £250 for the investigation.

Mr. W. N. Shaw, F.R.S., writing on the subject in *Nature* for October 31st, points out that the main object of the research will be statistical ; but he also expresses the hope that physical investigations may also be arranged to supplement the fairly complete knowledge already possessed as to the nature of fogs. Of these he recognises three types which he calls "steaming water fogs," "cold-surface fogs," and "cloud fogs."

A fog of unusual intensity and duration prevailed over London from the evening of November 2nd to that of November 7th, and reports from other parts of the country show that the phenomenon was very wide-spread. The attention called to the proposed research by the overwhelming exhibition of the raw material for the work, leads us to hope that the investigation may be extended to other large towns, and in fact to the occurrence and distribution of fog in general. The action of the County Council is gratifying in showing that that body is aware of the importance of local meteorological research. We have long thought that it would be extremely desirable to have complete sets of meteorological observations, and especially rainfall observations, carried out in each of the London parks, where alone can perfect conditions of exposure and protection be obtained. The interest of such observations in open spaces surrounded by densely inhabited areas would be very great.

# METEOROLOGY AT THE BRITISH ASSOCIATION.

## GLASGOW MEETING, 1901.

(*Continued from p.* 147.)

*Meteorological Observations on Ben Nevis for 1900—Report of the Committee consisting of* Lord M'LAREN, Professor A. CRUM BROWN (*Secretary*), Sir JOHN MURRAY, Professor R. COPELAND, *and* Dr. ALEXANDER BUCHAN. *Drawn up by* Dr. BUCHAN. (Presented to Section A).

THE Committee is appointed for the purpose of co-operating with the Scottish Meteorological Society in making meteorological observations at the two Ben Nevis Observatories. . . . .

At Fort William the mean atmospheric pressure was 29·831 inches, or 0·026 inch under the average. The mean at the top was 25·275 inches, or 0·031 under the average. The mean difference for the two observatories was 4·556 inches. At the top the absolutely highest pressure for the year was 25·974 inches in March, this being the highest hitherto recorded in March, and the lowest 23·972 inches in December; and at Fort William the highest was 30·687 inches, and the lowest 28·411 inches in the same months, the differences being respectively 2·002 inches and 2·276 inches. . . . .

February was the coldest month, the temperature at both observatories being 5°·0 under the average. In this month south-westerly winds were six days short of their average prevalence, and northerly winds four days in excess. Hence the unusually low temperature which was equally felt both at the foot and top of Ben Nevis. On the other hand, temperature was above the average in the four months from June to September, the excess 1°·6 at the top of Ben Nevis, but only 0°·6 at Fort William, the difference being due to the frequent occurrence of the anticyclonic type of weather during the summer of 1900. The absolutely highest temperature for the year at Fort William was 79°·0 on June 13, and at the top 55°·2 on June 12; and the lowest at Fort William 10°·0 on February 10 and 12, and at the top 6°·0 on February 7.

Of the relative humidities the lowest, 16, occurred on March 4 with a dew-point of −12°·9. The lowest dew-point, −19°·7, occurred on February 11, the dry bulb being 12°·9 and the wet bulb 9°·2. A marked feature is the singularly high minimum humidities in April, May, June, July and December.

The rainfall for the year at the top was 210·34 inches, being 52·61 inches, or 33 per cent., above the average. This large rainfall has been exceeded only by that of 1898, which amounted to 240·05 inches. The December amount, 48·34 inches, is the largest monthly fall yet recorded at the Ben Nevis Observatory.

Taking Scotland as a whole, the year 1900 was one of the wettest yet recorded, and has only been exceeded by the rainfall of 1872. Exceptionally heavy daily rainfalls were of frequent occurrence, the two heaviest being 6·81 inches on January 22, and 5·41 inches on December 8. At Fort William the annual rainfall was 82·19 inches, being 5·28 inches, or 7 per cent., above the average. The largest monthly amount was 20·85 inches accompanying the extraordinary prevalence of south-westerly winds during December.

At the top of Ben Nevis the number of rainy days was 276, and at Fort William 246. At the top the maximum monthly was 30 days in January and December, and at Fort William 31 days in December and 28 days in January. In March there were only 15 rainy days at the top and 10 days at Fort William. During the year the number of days on which 1 inch of rain or more

fell at the top was 69, whereas at Fort William the number of days was only 15.

The sunshine recorder on Ben Nevis showed 718 hours out of a possible 4,470 hours, or 16 per cent. of the possible sunshine. The average of the past 17 years being 747 hours, the sunshine of 1900 was 29 hours under the average. The two maximum months are June, 139 hours, and March, 103 hours, and the two minimum months January and December, with 4 hours each. At Fort William the number of hours was 1,040. This is lower than any recorded since these observations began, except in 1896, when the number was 1,036 hours.

At the Ben Nevis Observatory the mean percentage of cloud was 84, and at Fort William 73, both being very nearly the average. At the top the high mean percentages of 97 in December and 96 in January were observed; and at Fort William 88 per cent. in July and 86 in December.

Mr. Omond's time during the past year has been chiefly directed to the utilisation of the observations made at the High Level observatories of Europe viewed in connection with the Ben Nevis observations and their bearing on weather changes. In connection with this work the observations at the following High Level observatories are being utilised.

*In France*—Barcelonette, 3,714 feet; Servance, 3,990 feet; Gavarnie, 4,452 feet; Puy-de-Dôme, 4,813 feet; Aigoual, 5,099 feet; Mont Ventoux, 6,234 feet; and Pic du Midi, 9,380 feet. *In Germany*—Brocken, 3,766 feet; and Schneekoppe, 5,259 feet. *In Austria*—Semmering, 3,297 feet; Crkvice, 3,599 feet; St. Anton, 4,285 feet; Marienberg, 4,341 feet; Schneeberg, 4,810 feet; Schafberg, 5,827 feet; Rathhausberg, 6,283 feet; Schnittenhöhe, 6,349 feet; Obirgipfel, 6,706 feet; and Sonnblick, 10,154 feet. *In Italy*—Monte Cave, 3,166 feet; and Monteversine, 4,518 feet. *In Switzerland*—Chaumont, 3,701 feet; Rigi Kulm, 5,873 feet; Säntis, 8,094 feet; and Great St. Bernard, 8,130 feet. *In Algeria*—Teniet-el-Haal, 3,738 feet; and Aflou, 4,679 feet. . .

After the above Report had been read by Dr. Buchan, Mr. Rotch, the American meteorologist, said that the observations made on Ben Nevis were unique (1) in being made hourly, (2) in the situation of the mountain in the track of cyclones crossing the Atlantic, and (3) in the close relation of the high-level and low-level stations, which though 4,400 feet apart vertically are within four miles of each other. He was very glad to hear that the observations were to be discussed and published *in extenso* under the able supervision of Dr. Buchan, and that the Observatory would be maintained for special research two years longer.

Mr. W. N. Shaw, F.R.S., Secretary of the Meteorological Council, emphasised the value of the work done and that which remained to be done. The great need now is for more knowledge of the high-level phenomena in relation to the low-level phenomena, for we are nearly at the end of the possibility of further improvement in the methods of forecasting from low-level observations alone. In his reply Dr. Buchan spoke in feeling terms of the great loss sustained in the death of Professor Tait.

In the course of his Address as President of Section E, on "Research in Geographical Science," Dr. H. R. Mill said:—

"With regard to Meteorology, the distribution of temperature and pressure over the British Islands for the year and for the separate months has been

worked out by the experienced hand of Dr. Buchan, and published both in separate memoirs and in the *Meteorological Atlas*, edited by Dr. Buchan and Dr. Herbertson. But such observations as the degree of cloud or of sunshine can as yet be treated only in a superficial and generalised way for want of data. Perhaps the most important and certainly the most difficult of all the atmospheric conditions to discuss fully is precipitation. It depends on so many varying conditions, such as the form and exposure of the land, the altitude above sea-level, the direction and force of the wind, the relative frequency of thunderstorms, the distance from the sea, the direction of the average paths of cyclonic storms, &c., that far more numerous and more long-continued observations are required to establish the normal condition of the country than in the case of either temperature or pressure. When we reflect that the whole water-supply of the country depends directly on rainfall, and when we remember that the value of water-power made available by differences of level promises to be greater in the future than it has been in the past, we can see that a study of rainfall in conjunction with configuration may prove as valuable for the localisation of the manufacturing centres of the future as the geological survey was for those of the present.

"Thanks to the remarkable foresight and the untiring exertions of the late Mr. Symons, the volunteer rainfall observers of this country have been encouraged to organise their efforts, and by working on a common plan have accumulated within the last forty years a mass of observations unrivalled for number and completeness in any other land. But as yet the difficulties in the way of constructing a map of normal rainfall on an adequate scale have not been overcome, and much experimental work will probably be necessary before it can be accomplished. To this task it is my ambition to devote myself. I may be permitted to state that Scotland is far behind England or Wales in the number of rainfall stations per square mile. Thus there is, roughly, one rain-observing station for every 20 square miles of England, one for every 30 square miles of Wales, but only one for every 67 square miles of Scotland, and one for every 170 square miles of Ireland.

"Rainfall observations only tell the amount of available water; the configuration of the stream-beds must be considered in determining water-power. The only country I know where the horse-power of the rivers has been measured and mapped is Finland, but of course individual rivers, such as the Mississippi, Rhine, Seine, and Thames, have been thoroughly studied. Before many decades have passed it will be a necessary element in the surveys of all countries, though at present the available data are few and scattered.

* * * * * * * *

"The utilisation of wind- and water-power must increase in importance as mineral fuel diminishes in amount or increases in price. Wind- and water-power will never fail as long as the sun shines and the land remains higher than the sea; but what may fail unless timely precautions are taken is the power of utilising them for the benefit of the community at large. Are the existing laws as to water-rights, and the absence of laws as to the utilisation of wind desirable and satisfactory? The usual answer to such questions is, 'Why trouble about that just now? These matters are not urgent, other things are.' That argument is answerable for many disasters. The inevitable is in many if not in most cases simply another name for the unforeseen. It is inevitable that the country will be impoverished if the utilisation of wind- and water-power and the transport of that power by electricity are not wisely safeguarded and provided for; but when a survey of our resources, the circulation

of the air over our islands, and the effects produced by the interposition of the mountains, plateaus, and valleys upon it, plainly points to the possibility of such a trouble, it only becomes inevitable as a result of culpable negligence.

"It is of the utmost importance, also, to investigate and evaluate the resources of the surrounding seas. The recent International Conference for the exploration of the sea held at Christiania formulated a scheme of research which has been taken up enthusiastically by Belgium, Holland, Germany, Denmark, Russia, Sweden and Norway. Its object is to place the fisheries of Northern Europe on a scientific basis, and to make for that purpose a comprehensive survey of the sea, which will prove of high value to meteorology, and through it to agriculture as well. The recent work by Mr. H. N. Dickson on the circulation of the surface waters of the North Atlantic in conjunction with similar work by Professor Pettersson, in Sweden, shows how hopeful such researches are from the purely scientific standpoint, and their practical importance is no less. It remains with our Government to show that this country is not indifferent to an opportunity, such as has never presented itself before, of placing one of our great national industries on a basis of scientific knowledge. This is in my belief one of the cases in which the expenditure of thousands now will mean the saving of millions a few years hence.

"It is magnificent to send out polar expeditions, and they speak volumes for the greatness of the human mind that can give itself to the advancement of knowledge for the sake of knowledge, knowing that it will bring no material gain; and I trust that such a spirit will continue to manifest itself until no spot of Earth, no land however cold or hot, no depth of sea, no farthest limit of the atmosphere remains unsearched and its lesson unlearnt. But I insist that the full study of our own country is on a totally different footing. Magnificent it may be, too, but sternly practical, since it is absolutely essential for our future well-being, and even for the continuance of the nation as a Power amongst the states of the world. Still, there is every probability that such work will be neglected until the events which it should avert are upon us, and then it will be too late to make provisions which now could be done cheaply, easily and effectively."

Papers were read to Section A by Mr. A. Lawrence Rotch on Meteorological Observations by means of kites at sea (see his letter on the following page) and by Mr. F. Napier Denison on the Seismograph as a sensitive Barometer. Descriptions of instruments for determining terrestrial magnetism were given by Captain E. W. Creak, F.R.S., and Mr. R. T. Glazebrook, F.R.S. The old-established Committee on Underground Temperatures also reported once more. In Section B, Mr. W. Ackroyd read two interesting papers on the Inverse Relation of Chlorine to Rainfall, and on the Distribution of Chlorine over Yorkshire, the subject being largely that of purification of air by rain. In Section G the only paper likely to interest meteorologists was one by Mr. Killingworth Hedges on the protection of buildings from lightning.

A joint meeting of the Geological, Zoological and Geographical sections discussed a scheme for the Complete Survey of the Lakes of the British Islands put forward by Sir John Murray, F.R.S., and Mr. Laurence Pullar. The new survey (the whole expense of which will be borne by Mr. Pullar) will include meteorological observations.

# Correspondence.

## KITE FLYING AT SEA.

*To the Editor of Symons's Meteorological Magazine.*

IN your article, "Meteorology on the British Antarctic Expedition," in the September Magazine, you mention that a trial of the kites intended for meteorological observations was made, without the instruments being attached, during the voyage of the "Discovery" to Madeira. The German Antarctic vessel, "Gauss," was likewise equipped with kites and meteorographs, but it is to be feared that, as both these ships are proceeding chiefly under sail, the opportunities for flying kites on the voyage southward will be limited, and, since the importance of their use may not be appreciated, it seems likely that but scanty observations in the upper air will be obtained.

Until last summer it does not appear that kites bearing aloft meteorological instruments have ever been flown from a moving vessel, for I find that the observations of temperature above the Arctic Ocean, referred to in this Magazine, Vol. **30**, p. 10, and Vol. **32**, p. 34, were made with kites sent up from ice-fields. In order to raise the kite-meteorograph, employed at the Observatory on Blue Hill, during the calms that accompany our anticyclones, it occurred to me to make use of the artificial wind created by a small steamboat that could be manœuvred at will, and this experiment, so far as I know the first of its kind, which was successfully performed in Massachusetts Bay last August, is described in *Nature*, Vol. **64**, p. 453. With the aid of an assistant, a trial of the kites was then made upon an eastward-bound transatlantic steamer, and the first records of barometric pressure, air temperature, relative humidity, and wind velocity, obtained a quarter of a mile above the mid-Atlantic, were shown to Section E of the British Association at its recent meeting in Glasgow. Although calm weather prevailed during most of the voyage, the wind created by the motion of the vessel enabled the kites to be flown on five days of the eight, and had it been possible to alter the course of the steamer, as was done in the first experiment, and so increase or diminish the resultant wind, the kites could have been flown every day. However, the records that were obtained show abnormal changes of temperature and humidity with height above the sea, as compared with the changes usually observed over the land. Incidentally, the difficulty of observing accurately temperature and wind on board ship was illustrated. For instance, with a light wind and the meteorograph hung several feet above the upper after-deck and apparently well exposed, a temperature was recorded several degrees higher than when the instrument was held by the kites at the same height clear of the ship. The measurement of wind velocity was also difficult, because in most exposed places, and notably on the bridge, the wind is deflected upward and so its horizontal velocity is diminished.

Under the bridge, on the contrary, too high a velocity was generally recorded, owing to the compression, and consequent acceleration, of the stream of air flowing through the passage.

But the chief value of my experiments is to show that kites carrying meteorological instruments can be flown almost always on ship-board. Observations up to a height of two or three miles can thus be obtained in our latitudes under weather conditions that would prevent the use of kites for the purpose on land; and in this way, also, the general conditions prevailing at equal altitudes above ocean and continent can be compared. In the tropics, kites flown from steamships will furnish information about the upper atmosphere that it has been impossible to obtain hitherto and yet which is of the greatest importance for our knowledge of the circulation of the atmosphere. For example, the source of the trade winds and of the anti-trades has never been satisfactorily demonstrated, but Dr. Hildebrandsson believes now that observations with kites, and with small free balloons to show the direction of the upper currents, continued during three months around the high pressure area of the North Atlantic and across the doldrums to the south-east trades, would solve this most important problem. For this purpose a steamer under the control of the meteorologist—preferably a large yacht—is required, and should any of your readers be willing to put such a vessel at my disposal, I will gladly furnish the apparatus and *personnel* necessary to carry out the investigation.

A. LAWRENCE ROTCH.

*Blue Hill Meteorological Observatory, U.S.A.,*
*October 15th, 1901.*

## THE MOON AND RAINFALL.

*To the Editor of Symons's Meteorological Magazine.*

IN a recent enquiry into the average distribution of days with rain beyond a certain limit (·40 in. or ·50 in.), in the period of a lunar synodical revolution, there appeared to be a conspicuously wet time (maximum of wetness), as regards the number of such wet days, about the time of new moon, and a conspicuously dry time (minimum of wetness) shortly before the last quarter. The inquiry covered the last 24 years. (See *Nature*, August 29th, 1901).

The following is another aspect of the matter, which may be worth considering.

Limiting our attention to the three days about full moon on the one hand, and the third, fourth and fifth days after full moon, on the other, we calculate, in each of the last 12 years, the average rainfall in those two sets of three days groups (each set having 12 or 13 groups). Calling the average of the groups about new moon *a*, and that of the other *b*, we have the following table.

The uniformity of excess in *a*. seems remarkable. It appears that in those 12 years at least, not only is the number of wet days with ·40 in., or more, consideraly greater about new moon, than about the

middle of the time between full moon and last quarter, but the average rainfall (as above reckoned) is regularly greater.

| | *a.* in. | *b.* in. | Relation of *a* to *b.* in. | | *a.* in. | *b.* in. | Relation of *a* to *b.* in. |
|---|---|---|---|---|---|---|---|
| 1889 | ·19 | ·09 | +·10 | 1897 | ·22 | ·14 | +·08 |
| 1890 | ·30 | ·20 | +·10 | 1898 | ·13 | ·10 | +·03 |
| 1891 | ·19 | ·13 | +·06 | 1899 | ·30 | ·05 | +·25 |
| 1892 | ·28 | ·15 | +·13 | 1900 | ·14 | ·11 | +·03 |
| 1893 | ·28 | ·08 | +·20 | | — | — | — |
| 1894 | ·17 | ·15 | +·02 | Av. | ·24 | ·14 | +·10 |
| 1895 | ·32 | ·27 | +·05 | | — | — | — |
| 1896 | ·36 | ·17 | +·19 | | | | |

I hope at some future time to extend this branch of the inquiry further back, but happen to be debarred from doing so at present.

ALEX. B. MACDOWALL.

We cannot let this letter appear without expressing our opinion of the method of research which Mr. MacDowall has been employing with infinite labour, and with a perseverance in itself most exemplary, and we are sorry that the opinion is unfavourable. One is struck first by the fact that the place where the rainfall was measured is not stated; but we assume from the reference to *Nature* that the data are those of Greenwich Observatory. It is well-known that a rainy spell in one part of the British Islands very often coincides with a dry spell in another; hence, in order to prove that the moon exerts any real influence, it would be necessary to consider several stations in different climatic regions, and to discover a parallelism in their curves of variation, which would point to the action of a common cause external to the atmosphere. Indeed, if the phases of the moon coincide with appreciable variations in weather, we should be able to trace simultaneous coincidences in all parts of the world, and especially in the tropics. Again, to be complete, the study of the phenomena at each station would require to be carried out in two ways, (*a.*) by classifying the wet days occurring about certain phases of the moon, and (*b.*) by classifying the lunar phases occurring about all groups of wet days. Six days out of each 28 are discussed in the foregoing table, but what about the wet days which occurred amongst the remaining 22?

Mr. MacDowall points out coincidences which it may be are worthy of careful study; but amongst all his writings we have never seen any of the questions he raises adequately discussed. He finds various successions, coincidences and alternations that remind us of the interesting symmetries that an idle eye can create in the pattern of a common-place wall-paper. He suggests numerous ideas, some, perhaps, contradictory of others, but he deals only in fragments which do not seem to us to be worth the labour bestowed upon them, if their object is to demonstrate a physical influence of the moon on the atmosphere. We should be glad to hear the opinion of our readers on the subject.—[ED. *S.M.M.*]

## CLIMATE OF THE BRITISH EMPIRE, 1900.

THE following Table is a summary of the monthly values printed in the *Magazine*, and so far as the stations concerned are representative it conveys an idea of the varieties of climate experienced in the British Empire during the last year of the nineteenth century. It is true that neither the hottest, the coldest, the wettest nor the driest points in the Empire are dealt with, and the reader is warned, as on each previous occasion of presenting this annual summary, not to take the figures as meaning more than they profess to convey.

The maximum temperatures at London and Toronto are the highest noted for these stations since the imperial tables were commenced in 1877. On the other hand the maximum at Malta is lower than has been reported before. The average maximum temperature and the mean temperature for the year at Calcutta and Colombo were slightly higher than in any previous year of our record, and for Calcutta the year also showed the highest rainfall. At Mauritius, on the other hand, a minimum temperature of 53°.0 was recorded, showing a night colder by half a degree than the coldest previously noticed.

With regard to the Australasian stations, the only noticeable "records" are in Adelaide, where a relative humidity averaging 66 per cent. has been recorded, showing the dampest year for that dry city; and in Wellington and Auckland, where relative humidities of 70 and 69 per cent. respectively show the driest years yet figuring in our record for these New Zealand towns.

### SUMMARY.

| | |
|---|---|
| *Highest Temp. in shade* ..... | 112°·2 at Adelaide on January 1st. |
| *Lowest* ,, ,, ..... | —34°·8 at Winnipeg on Feb. 9th. |
| *Greatest Range in year* ..... | 135°·3 at Winnipeg. |
| *Least* ,, ,, ..... | 25°·5 at Grenada. |
| *Greatest Mean Daily Range* ... | 24°·6 at Winnipeg. |
| *Least* ,, ,, ,, ... | 9°·8 at Grenada. |
| *Highest Mean Temp.* ..... | 82°·3 at Colombo. |
| *Lowest* ,, ,, .. ..... | 36°·9 at Winnipeg. |
| *Driest Station* ..... | Adelaide, Fredericton, } mean humidity, 66. |
| *Dampest Station* ..... .. | Ceylon, Colombo, ,, ,, 81. |
| *Highest Temp. in Sun*..... | 170°·5 at Adelaide. |
| *Lowest Temp. on Grass**..... | —14°·0 at Toronto. |
| *Greatest Rainfall* ..... | 89.32 in. at Calcutta. |
| *Least* ,, ..... | 16·10 in. at Malta. |
| *Most Cloudy Station* ..... | Victoria, B.C., average amount 6·4. |
| *Least* ,, ,, ..... | Malta, average amount, 2·7. |

* The min. on grass is not recorded at the other Canadian stations.

# CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE FOR 1900.

| STATIONS. *Those in Italics are South of the Equator.* | ABSOLUTE. Maximum. Temp. | Maximum. Date. | Minimum. Temp. | Minimum. Date. | AVERAGE. Max. | Min. | Mean. | Dew Point. | Humidity. | ABSOLUTE. Max. in Sun. | Min. on Grass. | TOTAL RAIN. Depth. | Days. | AVERAGE. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | ° | | ° | ° | in. | | 0—10 |
| England, London ... | 95·2 | July 16 | 17·7 | February 9 | 59·6 | 43·9 | 51·8 | 44·1 | 78 | 137·1 | 13·0 | 23·28 | 174 | 6·1 |
| Malta ..... | 94·0 | June 27 | 41·2 | January 14 | 73·0 | 59·6 | 66·3 | 57·6 | 77 | 149·0 | 36·1 | 16·10 | 70 | 2·7 |
| *Cape of Good Hope.* | 94·9 | January 18 | 35·1 | August 7 | 70·9 | 54·3 | 62·6 | 53·9 | 75 | ... | ... | 21·25 | 99 | 4·3 |
| *Mauritius* ..... | 87·2 | December 29 | 53·0 | June 29 & 30 | 79·5 | 68·5 | 74·0 | 64·7 | 75 | 156·7 | 43·3 | 31·28 | 173 | 5·6 |
| Calcutta .. .... ..... | 103·6 | April 2 | 50·8 | January 14 | 88·6 | 71·6 | 80·1 | 69·9 | 73 | 159·0 | 41·5 | 89·32 | 99 | 4·2 |
| Bombay ..... | 93·4 | June 8 | 61·0 | January 25 | 86·3 | 75·4 | 80·9 | 72·0 | 75 | 144·5 | 51·9 | 69·12 | 91 | 3·6 |
| Colombo, Ceylon ... | 95·5 | March 27 | 68·5 | January 2 & 3 | 88·9 | 75·8 | 82·3 | 73·9 | 81 | 157·0 | 65·5 | 83·66 | 170 | 4·5 |
| *Melbourne* ..... | 106·9 | January 28 | 30·2 | July 3 | 66·4 | 49·3 | 57·8 | 47·6 | 73 | 161·1 | 24·0 | 28·09 | 139 | 6·1 |
| *Adelaide*..... | 112·2 | January 1 | 35·4 | July 19 | 72·0 | 52·8 | 62·4 | 47·8 | 66 | 170·5 | 28·3 | 21·70 | 137 | 5·1 |
| *Sydney* .. ..... . | 104·1 | December 17 | 39·3 | July 17 | 69·6 | 56·4 | 63·0 | 52·2 | 73 | 153·0 | 30·0 | 66·54 | 170 | (5·0) |
| *Wellington* ..... | 79·0 | February 1 | 34·0 | July 13,19,20 | 61·2 | 48·9 | 55·1 | 45·1 | 70 | 137·0 | 23·0 | 51·01 | 182 | 4·7 |
| *Auckland* ..... | 78·5 | February 2 / March 9 | 40·0 | July 10 | 65·6 | 53·8 | 59·7 | 49·3 | 69 | 144·0 | 36·0 | 39·15 | 197 | 5·6 |
| Jamaica, Halfway Tree..... | ... | ..... | ... | ..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Trinidad ..... . | 98·0 | October 8 | 61·0 | September 24 | 87·9 | 70·8 | 79·4 | 72·3 | 80 | 168·0 | 47·0 | 67·36 | 194 | ... |
| Grenada ..... | 91·5 | October 4 | 66·0 | June 27 | 83·6 | 73·8 | 78·7 | 71·2 | 74 | 162·8 | ... | 63·45 | 251 | 3·8 |
| Toronto ..... ..... | 98·0 | August 6 | — 9·6 | February 26 | 56·3 | 38·9 | 47·6 | 40·6 | 76 | 126·5 | —14·0 | 29·62 | 141 | 5·7 |
| New Brunswick, Fredericton..... | 92·7 | August 26 | —29·0 | February 3 | 51·8 | 29·8 | 40·8 | 38·4 | 66 | ... | ... | 50·99 | 124 | 5·6 |
| Manitoba, Winnipeg | 100·5 | June 23 | —34·8 | February 9 | 49·2 | 24·6 | 36·9 | ... | ... | ... | ... | 18·58 | 100 | 5·1 |
| British Columbia, Victoria ..... | 79·6 | July 31 | 18·0 | February 14 | 56·4 | 45·1 | 50·7 | ... | ... | ... | ... | 24·73 | 169 | 6·4 |

## REVIEWS.

*Nedböriagttagelser i Norge. Udgivet af det Norske Meteorologiske Institut.* [By H. MOHN.] Aargang **6**, 1900. Kristiania, 1901. Size 16 × 11½. Pp. xviii. + 124. *Plates.*

THE short account of the Norwegian rainfall system kindly communicated by Professor Mohn to the June number of this Magazine, makes it unnecessary to devote more than a paragraph to this admirable report. The daily values of rain and snow are given for a large number of stations, and a map shows the rainfall of the whole of Norway by the ingenious device of printing the lines of equal rainfall on transparent paper, which may be laid over any map of the country on the same scale, and so enable the distribution of rainfall to be compared with the physical, political, or any other divisions.

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*Annales de l'Observatoire météorologique, physique et glaciaire du Mont Blanc.* Publiées sous la direction de J. VALLOT. Tomes **4** et **5**. Paris. G. Steinheil, 1900. Size 11 × 9. Pp. 190 and 60 *plates.*

THIS report contains a paper by Dr. M. Andesen on the influence of barometric pressure on the chemical action of light, and some valuable memoirs on the movements of glaciers and mountain torrents.

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*Annales du Bureau Central Météorologique de France*, publiées par E. MASCART. Année 1898. Paris. Gauthier-Villars, 1900. 3 parts. Size 12½ × 10. *Plates.*

THE first part includes a number of memoirs on the meteorological and magnetic phenomena of the year 1898 in France, with numerous plates and maps, including small sketch maps showing the daily progress of all the important storms of the year. The other two parts contain the figures of the actual observations at the stations of the French Meteorological Service.

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*Deutsche Ueberseeische Meteorologische Beobachtungen gesammelt und herausgegeben von der Deutschen Seewarte. Heft X. Meteorologische Beobachtungen in Deutsch-Ost-Afrika.* Von DR. HANS MAURER. [No place, publisher nor date]. Size 13 × 10. Pp. 182. *Plates.*

A SPLENDID record of thorough organisation and persevering work in unfavourable conditions. The German Colonial authorities are very wisely testing the climate of their African possessions by the use of self-recording instruments, some beautiful traces from those at Dar-es-Salam being reproduced as illustrations to the text and tables which summarise the climate of eight stations in German East Africa, some of them extending from 1895 to 1899.

*Report of the Chief of the Weather Bureau, 1899-1900. U.S. Department of Agriculture.* Washington: 1901. Size 12 × 9. Pp. 436.

THE Chief of the Weather Bureau refers first to the meteorological protectorate which the United States extended over the British West Indies in 1898 and over Mexico in 1899. However we may object on patriotic grounds to see another country undertaking public duties in British territory, we cannot but rejoice on scientific grounds that no dog-in-the-manger policy was permitted to prevent the work being carried out. The total number of stations with paid observers under the Weather Bureau in 1899 was 592, in addition to which about 2500 voluntary stations reported to the Bureau. In addition to the tables of observed values for the various stations, the Report contains an elaborate discussion of the Meteorological work done in Franz Josef Land, in the Arctic regions, in 1898-99, by Mr. Evelyn B. Baldwin, who is at the present time leading a new expedition in that region—the most elaborate, we believe, that has ever attempted to reach the North Pole.

## BOOKS RECEIVED.

Results of Meteorological Observations taken in Chester during 1900. By the Rev. J. Cairns Mitchell, B.D. Reprinted from the Proceedings of the Chester Society of Natural Science, &c., for the year 1900–01. Size 8½ × 5½. Pp. 8.

The Croydon Microscopical and Natural History Club. Report of the Meteorological Sub-Committee for 1900. Prepared by the Hon. Sec., F. Campbell Bayard, F.R.Met.Soc. Reprinted from the Transactions of the Club. 1901. Size 9½ × 5½. Pp. [60].

La Tempête du 13-14 Février, 1900, par Albert Lancaster. Extrait des Bulletins de l'Académie royale de Belgique. 1900. Size 8½ × 6. Pp. 20, *Plate.* [This description of the storm of February 13–14, 1900, is kindly forwarded, together with other pamphlets on the meteorology of Belgium. by the author, M. Lancaster, Director of the Belgian Meteorological Service.]

Annuario publicado pelo Observatorio do Rio de Janeiro para o anno de 1901. Anno XVII, Rio de Janeiro, 1901. Size 7 × 5. Pp. 300.

Report on the Kodaikanal and Madras Observatories for 1900-1901 [by C. Michie Smith.] Size 13 × 8½. Pp. 18.

Results of the Magnetical and Meteorological Observations made at the Royal Alfred Observatory, Mauritius, in the year 1899, under the direction of T. F. Claxton. Mauritius, 1900. Size 13 × 8½. Pp. xiv.+98.

Rainfall of South Australia and the Northern Territory during 1898, with weather characteristics of each month, by Charles Todd, K.C.M.G., F.R.S. Adelaide, 1901. Size 13½ × 8½. Pp. 82. Maps. [This includes a finely executed rainfall map in colours].

Rousdon Observatory, Devon. Volume XVII. Meteorological Observations for the year 1900, made under the superintendence of the late Sir Cuthbert E. Peek, Bart. London, 1901. Size 11 × 9. Pp. 58. *Plates.*
[This volume was prepared by Mr. W. Marriott, at the request of the late Sir Cuthbert Peek, whose portrait forms the frontispiece].

Aus dem Archiv der Deutschen Seewarte XXIII., Jahrgang 1900. Hamburg, 1901. Size 11½ × 9.
[Contains a number of seperately-paged memoirs on the Climate of Hamburg and of the German coasts, on the accuracy of measurements with a mercurial barometer, and on the meteorological causes of floods in mountainous districts].

## METEOROLOGICAL NEWS AND NOTES.

CLIMATIC DISCIPLINE is claimed by Professor Alleyne Ireland, of Chicago University, in a paper read to the British Association, as the cause of the superiority of the races of the temperate zone to all others. He says :—

"Briefly the question resolves itself into one of climatic discipline. In Europe the extreme range of temperature demands variety of clothing, and to this necessity we may attribute the growth of industry in early times. A winter season, during which the food cannot be obtained directly from the soil, involved an excess of labour above the daily need during the season of crops, and from this we adduce the development of thrift and foresight. To these two factors, and to their innumerable and far-reaching corollaries, must be attributed the general character of European civilisation. In the development of the tropical man neither of these great agencies has been at work, nor, except in a few special instances, can it be foreseen that they will come into operation.

MATHEMATICAL METEOROLOGY is too little studied in this country, but in the *Monthly Weather Review* Professor Abbé continues to translate important papers by foreign physicists, among which an important place must be given to Prof. E. Pockel's "Theory of the formation of Precipitation on Mountain Slopes," in the numbers for April and July, published in June and October. It discusses the influence of a mountain slope on the amount of the precipitation from air rising from sea-level, and moving towards the slope.

RAINGAUGES ON MOUNTAINS are much at the mercy of their exposure for giving correct readings. Dr. Herman Stade, in a recent number of *Das Wetter*, describes the results of nearly three years' observations on the summit of the Brocken (3,766 ft.), in the Harz Mountains, Germany. He had three large rain gauges, with a special rim for snow, placed at 65 ft. distance from the north, east and south walls of the hotel, which stands on the summit of the hill, so that at least one was exposed to the wind, and at least one sheltered from it, on every occasion. The result was that for rain when the wind-force was between 1 and 2, all gauges caught the same amount; but when the wind force was 3 to 4, the exposed gauge caught only three-quarters, and when the wind-force was 9 to 11, scarcely more than half as much as the sheltered gauge. For snow, in wind-force 1–2 the exposed gauge caught only three-quarters, in force 3–4 only a half, and in force 9–11 less than one-quarter of the amount caught in the sheltered gauge.

THE METEOROLOGICAL SOCIETY OF MAURITIUS has just published Vol. I. of a new series of Proceedings and Transactions, the first since the appearance of Vol. VI. of the old series in 1864. No meeting was held between 1894 and 1896, when the members came together to bid farewell to the late Dr. Meldrum. The Society has since met frequently, and the volume now published by the Secretary, Mr. T. F. Claxton, contains several papers on the weather of Mauritius, and a valuable series of descriptions of cyclones in the Indian Ocean.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MAY, 1901.

| STATIONS. (*Those in italics are South of the Equator.*) | Absolute. Maximum. Temp. | Absolute. Maximum. Date. | Absolute. Minimum. Temp | Absolute. Minimum. Date. | Average. Max. | Average. Min. | Average. Dew Point. | Average. Humidity. | Absolute. Max. in Sun. | Absolute. Min. on Grass. | TotalRain. Depth. | TotalRain. Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0-100 | ° | ° | inches | | |
| London, CamdenSquare | 83·8 | 29 | 36·8 | 18 | 67·0 | 44·6 | 43·9 | 68 | 125·8 | 30·7 | ·85 | 6 | 4·3 |
| Malta | 77·8 | 30 | 50·6 | 13 | 71·2 | 57·2 | 55·0 | 78 | 139·4 | 46·0 | 1·54 | 6 | 2·8 |
| Lagos | 92·0 | 4, 7 | 70·0 | 9, 25 | 87·9 | 76·4 | 76·2 | 80 | 148·0 | 56·0 | 13·05 | 20 | ... |
| *Cape Town* | 82·0 | 6 | 41·8 | 18 | 66·2 | 51·4 | 50·2 | 73 | ... | ... | 6·52 | 14 | 5·1 |
| *Mauritius* | 84·1 | 4 | 62·9 | 7 | 80·2 | 68·5 | 65·8 | 76 | 139·2 | 54·1 | 1·94 | 12 | 5·3 |
| Calcutta | 104·0 | 9 | 70·2 | 19 | 96·3 | 77·0 | 73·8 | 68 | 157·0 | 66·8 | 6·22 | 6 | 3·4 |
| Bombay | 93·3 | 14 | 80·0 | 10 | 91·4 | 82·4 | 76·3 | 72 | 143·2 | 74·7 | ·01 | 1 | 2·9 |
| Colombo, Ceylon | 92·7 | 12 | 73·5 | 11*a* | 90·5 | 77·4 | 76·2 | 84 | 150·0 | 70·0 | 6·28 | 19 | 5·9 |
| *Melbourne* | 73·0 | 3 | 36·9 | 30 | 62·6 | 48·1 | 46·2 | 72 | 130·3 | 29·9 | ·45 | 8 | 6·6 |
| *Adelaide* | 82·2 | 6 | 42·7 | 23 | 69·5 | 51·1 | 45·0 | 59 | 141·0 | 31·6 | 1·18 | 8 | 5·6 |
| *Sydney* | 75·5 | 20 | 43·9 | 23 | 66·0 | 52·0 | 48·2 | 81 | 120·2 | 32·7 | 1·96 | 13 | 3·9 |
| *Wellington* | 66·0 | 19 | 36·0 | 26 | 60·2 | 47·2 | 42·6 | 65 | 111·0 | 29·0 | 1·94 | 10 | 4·3 |
| *Auckland* | 66·5 | 22 | 42·0 | 26 | 61·5 | 49·0 | 48·4 | 78 | 125·0 | 38·0 | ·98 | 18 | 5·5 |
| Jamaica, Halfway Tree | 91·0 | 31 | 69·0 | 6 | 87·4 | 71·5 | 69·2 | 71 | ... | ... | ·40 | 5 | 3·1 |
| Trinidad | 96·0 | 11 | 62·0 | 14 | 89·9 | 70·9 | 72·7 | 79 | 165·0 | 58·0 | 6·45 | 12 | ... |
| Grenada | 88·0 | 12 | 73·8 | 10*b* | 84·8 | 75·2 | 69·8 | 72 | 148·2 | ... | 4·87 | 17 | 3·1 |
| Toronto | 79·2 | 5 | 33·0 | 15 | 63·9 | 45·9 | 46·3 | 75 | 96·5 | 28·4 | 3·54 | 18 | 6·9 |
| Fredericton, N.B. | 85·7 | 22 | 30·0 | 6 | 64·3 | 42·1 | 40·8 | 60 | ... | ... | 2·88 | 14 | 6·6 |
| Winnipeg, Manitoba | 91·5 | 17 | 28·0 | 8 | 73·1 | 43·4 | ... | ... | ... | ... | ·36 | 7 | 3·3 |
| Victoria, B.C. | 76·6 | 25 | 37·6 | 6 | 58·9 | 46·3 | .. | ... | ... | ... | ·98 | 13 | 6·5 |

*a*—and 18. *b*—and 11.

### REMARKS.

MALTA.—Mean temp. of air 62°·8, or 1°·4 below the average. Mean hourly velocity of wind 9·6 miles or 0·5 below average. Mean temp. of sea 65°·8. TSS on 13th and 14th. L on 19th. H on 12th J. F. DOBSON.

*Mauritius.*—Mean temp. of air 1°·5, of dew point 1°·0, above, and R 2·19 in. below their respective averages. Mean hourly velocity of wind 11·9 miles, or 1·6 above average; extremes, 30·1 on 24th and 1·9 on 31st; prevailing direction S.E. by E. to E. by S. T. F. CLAXTON.

COLOMBO, CEYLON.—Mean temp. of air average, dew point 1°·1 above, and R 5·76 in. below, their respective averages. Mean hourly velocity of wind 8·6 miles; prevailing direction S.W. TSS occurred on 9 days. L was seen on 7 days. W. C. S. INGLES.

*Adelaide.*—Mean temp. of air 2°·9 above the average. The mean max. temp. was 4°·6 above the average, and is a record for May. On 10 days max. in shade was over 75°; while on the average it is only two days. Very dry over State, but drought partially relieved later by good coastal rains. C. TODD, F.R.S.

*Sydney.*—Mean temp. of air 0°·6 above, R 3·39 in. below, their respective averages. H. C. RUSSELL, F.R.S.

*Wellington.*—Mean temp. of air 1°·7 above, and R 2·95 in. below, their respective averages. Fine weather on the whole. Prevailing winds N.W. and stormy at times. R. B. GORE.

*Auckland.*—Mean temp. 2°·0 below the average. Cool and cloudy through most of the month, with numerous slight showers, but total R small, and not quarter of the average for the previous 33 years. T. F. CHEESEMAN.

TRINIDAD.—R 2·80 in. above the 30 years' average. J. H. HART.

# SUPPLEMENTARY TABLE OF RAINFALL, OCTOBER, 1901.

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| I. | Uxbridge, Harefield Pk.. | 1·86 | XI. | Castle Malgwyn ..... | 4·25 |
| II. | Dorking, Abinger Hall . | 2·50 | ,, | Builth, Abergwesyn Vic. | 5·06 |
| ,, | Sheppey, Leysdown ..... | 1·42 | ,, | Rhayader, Nantgwillt ... | 3·81 |
| ,, | Hailsham ..... | 3·22 | ,, | Lake Vyrnwy ..... | 4·04 |
| ,, | Crowborough..... | 3·07 | ,, | Corwen, Rhug ..... | ... |
| ,, | Ryde, Beldornie Tower.. | 2·82 | ,, | Criccieth, Talarvor ..... | 4·33 |
| ,, | Emsworth, Redlands ... | 2·15 | ,, | I. of Anglesey, Lligwy.. | 5·15 |
| ,, | Alton, Ashdell ..... | 3·37 | ,, | Douglas, Woodville..... | 6·40 |
| ,, | Newbury, Welford Park | 1·39 | XII. | Stoneykirk, Ardwell Ho. | 5·28 |
| III. | Oxford, Magdalen Coll.. | 1·19 | ,, | New Galloway, Glenlee | 7·49 |
| ,, | Banbury, Bloxham ..... | 1·47 | ,, | Moniaive, Maxwelton Ho. | 6·11 |
| ,, | Pitsford, Sedgebrook ... | 1·51 | ,, | Lilliesleaf, Riddell ..... | 2·50 |
| ,, | Huntingdon, Brampton. | 1·78 | XIII. | N. Esk Res. [Penicuick] | 2·80 |
| ,, | Wisbech, Bank House... | 1·51 | XIV. | Glasgow, Queen's Park.. | 3·88 |
| IV. | Southend ..... ..... | 1·53 | XV. | Inveraray, Newtown ... | 8·86 |
| ,, | Colchester, Lexden ..... | 1·35 | ,, | Ballachulish, Ardsheal... | 8·32 |
| ,, | Saffron Waldon, Newport | 1·96 | ,, | Islay, Eallabus..... | 5·22 |
| ,, | Rendlesham Hall ..... | 1·80 | XVI. | Dollar..... | 4·03 |
| ,, | Swaffham ..... | 2·65 | ,, | Balquhidder, Stronvar... | 7·11 |
| V. | Salisbury, Alderbury ... | 2·53 | ,, | Coupar Angus Station... | 2·00 |
| ,, | Bishop's Cannings ..... | 1·62 | ,, | Blair Atholl ... ..... | 3·79 |
| ,, | Blandford, Whatcombe . | 2·61 | XVII. | Keith H.R.S..... | 3·39 |
| ,, | Ashburton, Druid House | 2·51 | ,, | Forres H.R.S. ... ..... | ... |
| ,, | Okehampton, Oaklands. | 3·28 | XVIII. | Fearn, Lower Pitkerrie.. | 2·52 |
| ,, | Hartland Abbey ..... | 3·96 | ,, | S. Uist, Askernish ..... | 6·39 |
| ,, | Lynton, Glenthorne ... | ... | ,, | Invergarry..... | 5·88 |
| ,, | Probus, Lamellyn ..... | 3·19 | ,, | Aviemore, Alvie Manse. | 2·84 |
| ,, | Wellington, The Avenue | 2·11 | ,, | Loch Ness, Drumnadrochit | 2·52 |
| ,, | North Cadbury Rectory | 1·91 | XIX. | Invershin ..... | 4·03 |
| ,, | Clifton, Pembroke Road | 1·57 | ,, | Durness..... | ... |
| VI. | Ross, The Graig ..... | 1·23 | ,, | Watten H.R.S..... | 2·76 |
| ,, | Wem, Clive Vicarage ... | 2·42 | XX. | Dunmanway, Coolkelure | 4·81 |
| ,, | Wolverhampton, Tettenhall | ... | ,, | Cork, Wellesley Terrace | 2·82 |
| ,, | Cheadle, The Heath Ho. | 2·86 | ,, | Killarney, District Asyl. | 5·21 |
| ,, | Coventry, Priory Row... | 1·49 | ,, | Caher, Duneske ..... | 2·46 |
| VII. | Market Overton ..... | 1·75 | ,, | Ballingarry, Hazelfort... | 2·40 |
| ,, | Grantham, Stainby ..... | 1·63 | ,, | Limerick, Kilcornan ... | ... |
| ,, | Horncastle, Bucknall ... | 2·55 | ,, | Miltown Malbay ..... | 5·36 |
| ,, | Worksop, Hodsck Priory | 1·54 | XXI. | Gorey, Courtown House | 3·45 |
| VIII. | Neston, Hinderton ..... | 2·97 | ,, | Moynalty, Westland ... | 3·45 |
| ,, | Southport, Hesketh Park | 2·92 | ,, | Athlone, Twyford ..... | 3·39 |
| ,, | Chatburn, Middlewood. | 3·73 | ,, | Mullingar, Belvedere ... | 3·44 |
| ,, | Duddon Val., Seathwaite Vic. | 9·38 | XXII. | Woodlawn ..... | 3·81 |
| IX. | Baldersby ..... | 1·65 | ,, | Crossmolina, Enniscoe .. | 5·40 |
| ,, | Scalby, Silverdale ..... | 1·69 | ,, | Collooney, Markree Obs. | 4·81 |
| ,, | Ingleby Greenhow Vic.. | 2·00 | XXIII. | Enniskillen, Model Sch. | 3·48 |
| ,, | Middleton, Mickleton ... | 2·29 | ,, | Warrenpoint..... | 3·58 |
| X. | Haltwhistle, Unthank H. | ... | ,, | Miltown, Banbridge..... | 2·59 |
| ,, | Bamburgh ..... | 1·61 | ,, | Belfast, Springfield ..... | 4·73 |
| ,, | Keswick, The Bank ..... | 5·60 | ,, | Bushmills, Dundarave.. | 4·07 |
| XI. | Llanfrechfa Grange ..... | 1·88 | ,, | Stewartstown ..... | 5·00 |
| ,, | Treherbert, Tyn-y-waun | 5·11 | ,, | Killybegs ..... | ... |
| ,, | Llandovery ..... | 3·67 | ,, | Horn Head ..... | 4·73 |

# OCTOBER, 1901.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1890-9. | Greatest Fall in 24 hours. Dpth | Date | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date | Min. Deg. | Date. | No. of Nights below 32°. In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches. | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | 1·92 | — ·67 | ·41 | 16 | 15 | 74·4 | 1 | 33·1 | 27 | 0 | 3 |
| II. | | Tenterden ..... | 2·11 | — ·88 | ·47 | 15 | 12 | 72·5 | 1 | 32·0 | 26 | 1 | 8 |
| ,, | | Hartley Wintney ..... | 3·16 | + ·27 | ·95 | 16 | 14 | 72·0 | 1, 2 | 26·0 | 27 | 4 | 8 |
| III. | | Hitchin ..... | 1·81 | — ·76 | ·41 | 16 | 15 | 70·0 | 1, 2 | 29·0 | 25 | 3 | ... |
| ,, | | Winslow (Addington) ..... | 1·65 | — 1·04 | ·45 | 17 | 15 | 73·0 | 1 | 26·0 | 26 | 4 | 6 |
| IV. | | Bury St. Edmunds (Westley) | 2·43 | — ·23 | ·50 | 18 | 15 | 74·0 | 1 | 31·5 | 26 | ... | ... |
| ,, | | Norwich (Brundall) ..... | 2·07 | ... | ·46 | 6 | 15 | 75·5 | 1 | 28·6 | 27 | 1 | 6 |
| V. | | Winterbourne Steepleton ... | 4·52 | ... | 1·00 | 3 | 14 | 67·0 | 1 | 29·6 | 27 | 4 | 11 |
| ,, | | Torquay (Cary Green) ... ..... | 1·50 | ... | ·43 | 17 | 15 | 65·9 | 2 | 40·5 | 27 | 0 | 0 |
| ,, | | Polapit Tamar [Launceston].. | 3·51 | — 1·03 | ·80 | 1 | 15 | 64·0 | 1 | 29·0 | 27 | 3 | 4 |
| VI. | | Stroud (Upfield) ..... | 1·09 | — 1·69 | ·20 | 3 | 18 | 67·0 | 1 | 35·0 | 22 | 0 | ... |
| ,, | | Church Stretton (Woolstaston) | 2·34 | — 1·16 | ·39 | 3 | 19 | 62·0 | 1, 4 | 38·0 | 26 | 0 | 6 |
| ,, | | Worcester (Diglis Lock) ..... | 1·38 | — 1·27 | ·31 | 3 | 16 | ... | ... | ... | ... | ... | ... |
| VII. | | Boston ..... | 2·13 | — ·14 | ·83 | 1 | 10 | 70·0 | 1 | 30·0 | 26 | ... | ... |
| ,, | | Hesley Hall [Tickhill]..... | 1·69 | — ·88 | ·38 | 6 | 17 | 66·0 | 1, 2 | 27·0 | 26 | 2 | ... |
| ,, | | Derby (Midland Railway)..... | 1·62 | — ·92 | ·30 | 3 | 16 | 67·0 | 2 | 29·0 | 26*b* | 2 | ... |
| VIII. | | Manchester (Plymouth Grove) | 2·82 | — ·65 | ·70 | 4 | 15 | 65·0 | 1, 3 | 34·0 | 20 | 0 | ... |
| IX. | | Wetherby (Ribston Hall) ... | 2·08 | — ·72 | ·35 | 18 | 13 | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) ..... | 4·07 | — 2·57 | ·67 | 5 | 19 | ... | ... | ... | ... | ... | ... |
| ,, | | Hull (Pearson Park)..... ..... | 1·91 | — 1·13 | ·38 | 16 | 13 | 64·0 | 1, 3 | 27·0 | 26 | 4 | 16 |
| X. | | Newcastle (Town Moor) ..... | 2·11 | — ·61 | ·37 | 21 | 17 | ... | ... | ... | ... | ... | ... |
| ,, | | Borrowdale (Seathwaite)..... | 15·97 | + 2·55 | 2·47 | 27 | 24 | 63·0 | 2 | 34·5 | 26 | 0 | ... |
| XI. | WALES. | Cardiff (Ely)..... | 2·53 | — 1·90 | ·41 | 1 | 24 | ... | ... | ... | ... | ... | ... |
| ,, | | Haverfordwest ..... | 5·45 | + ·37 | ·85 | 15 | 24 | 63·9 | 1 | 35·2 | 23 | 0 | 4 |
| ,, | | Aberystwith (Gogerddan) ... | 4·79 | — ·77 | ·59 | 3 | 22 | 65·0 | 3 | 30·0 | 25 | 4 | ... |
| ,, | | Llandudno..... | 3·17 | — ·83 | ·43 | 3 | 23 | 68·0 | 1 | 39·2 | 26 | 0 | ... |
| XII. | SCOTLAND. | Cargen [Dumfries] ..... | 5·60 | + 1·17 | ·86 | 17 | 22 | 65·0 | 2 | 30·0 | 20 | 5 | ... |
| XIII. | | Edinburgh (Royal Observatory) | 1·52 | ... | ·57 | 28 | 17 | 63·6 | 2 | 37·6 | 26 | 0 | 1 |
| XIV. | | Colmonell ..... | 5·64 | + 1·30 | ·71 | 16 | 19 | 64·0 | 21 | 30·0 | 12 | ... | ... |
| XV. | | Tighnabruaich ..... | 7·93 | ... | 1·36 | 1 | 23 | 57·0 | 2 | 33·0 | 15 | 0 | ... |
| ,, | | Mull (Quinish)..... | 9·82 | + 4·25 | 1·43 | 17 | 26 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Leven Sluices ..... | 2·45 | — 1·12 | ·52 | 29 | 18 | ... | ... | ... | ... | ... | ... |
| ,, | | Dundee (Eastern Necropolis) | 2·20 | — ·56 | ·75 | 28 | 17 | 63·3 | 2 | 31·1 | 26 | 2 | ... |
| XVII. | | Braemar ..... .. | 3·04 | — ·84 | ·46 | 18 | 23 | 58·8 | 2 | 23·3 | 26 | 8 | 12 |
| ,, | | Aberdeen (Cranford) ... ..... | 3·06 | — ·30 | ·60 | 3 | 21 | 63·0 | 1, 2 | 28·0 | 20*c* | 11 | ... |
| ,, | | Cawdor (Budgate) ..... | 2·74 | — ·20 | 1·00 | 28 | 15 | ... | ... | ... | ... | ... | ... |
| XVIII | | Strathconan [Beauly] ..... | 3·50 | — 2·15 | ·95 | 7 | 11 | ... | ... | ... | ... | ... | ... |
| ,, | | Glencarron Lodge..... | 8·92 | — ·37 | 1·58 | 28 | 25 | 62·5 | 1 | 29·2 | 31 | 2 | ... |
| XIX. | | Dunrobin ..... | 3·52 | + ·24 | ·62 | 5 | 18 | 61·5 | 27*a* | 32·0 | 26 | 1 | ... |
| ,, | | S. Ronaldshay (Roeberry) ... | 3·03 | — 1·15 | ·42 | 18 | 20 | 57·0 | 27 | 36·0 | 29 | 0 | ... |
| XX. | IRELAND. | Darrynane Abbey..... | 2·88 | — 2·33 | ·48 | 13 | 25 | ... | ... | ... | ... | ... | ... |
| ,, | | Waterford (Brook Lodge) ... | 4·93 | + 1·03 | 1·55 | 17 | 19 | 63·0 | 2 | 30·0 | 13 | 1 | ... |
| ,, | | Broadford (Hurdlestown) ... | 3·08 | — ·02 | ·51 | 7 | 24 | 62·0 | 3 | 32·0 | 21 | 1 | ... |
| XXI. | | Carlow (Browne's Hill) ..... | 2·90 | — ·50 | ·39 | 3 | 21 | ... | ... | ... | ... | ... | ... |
| ,, | | Dublin (Fitz William Square) | 2·40 | — ·63 | ·57 | 29 | 21 | 61·9 | 10*a* | 35·7 | 22 | 0 | 3 |
| XXII. | | Ballinasloe ..... ..... | 3·82 | + ·42 | ·85 | 28 | 25 | 63·0 | 28 | 28·0 | 16 | 4 | ... |
| ,, | | Clifden (Kylemore) ..... . | 5·56 | — 2·38 | 1·07 | 28 | 24 | ... | ... | ... | ... | ... | ... |
| XXIII | | Seaforde..... | 2·53 | — 1·06 | ·38 | 3 | 21 | 62·0 | 2*a* | 32·0 | 10 | 1 | 8 |
| ,, | | Londonderry (Creggan Res.). | 4·18 | + ·10 | ·64 | 29 | 27 | ... | ... | ... | ... | ... | ... |
| ,, | | Omagh (Edenfel) ..... | 4·73 | + ·82 | ·62 | 28 | 29 | 60·0 | 1 | 27·0 | 15 | 3 | 8 |

+ Shows that the fall was above the average ; — that it was below it.

*a*—and 28. *b*—and 27. *c*—and 25.

# METEOROLOGICAL NOTES ON OCTOBER, 1901.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

LONDON, CAMDEN SQUARE.—The first week was somewhat unsettled, with a fair amount of bright sunshine but much R. Damp and unpleasant weather, relieved by a few brilliant days, characterised the remainder of the month. Dense white fogs on the mornings of 20th, 21st, 22nd and 26th. Mean temp. 50°·3 or 0°·5 above the average.

TENTERDEN.—Another dry month, except for the 4 days 15th to 18th when 1·46 in. of R fell. Not quite so warm as the last two Octobers. Duration of sunshine 107·5 hours. W. to N.W. gale on 6th.

HARTLEY WINTNEY.—The first week was very wet, the remainder drier. Foggy mornings from 20th to the end. L on 1st and 6th, TS on 2nd, Westerly gale on 6th. A very mild month and owing to the absence of much frost forest trees were still wearing luxuriant foliage at the end. Swallows last seen on 14th.

WINSLOW, ADDINGTON.—R much below the average of the last ten years, less having been only once registered in October. A good deal of fog. Flowers remained untouched by frost till the morning of 26th when a min. of 26° was registered. A very beautiful autumn, the trees being full of foliage and richly tinted.

BURY ST. EDMUNDS, WESTLEY.—A mild month with little frost. Great want of water, springs being dry which had never been known to fail before.

NORWICH, BRUNDALL.—At the close the R for the year was 7·23 in. deficient. L on 2nd and 7th; T and L on 6th.

WINTERBOURNE STEEPLETON.—The temp. was well maintained except the night minima between 20th and 27th. A thorough growing month, so that all meadows were well covered and grass was abundant. Heavy T on 1st.

TORQUAY, CARY GREEN.—Duration of sunshine 6·1 hours above the average. R 2·55 in. below the average and mean temp. 2°·0 above the average. Mean amount of ozone 4·5, highest 9·0 on 8th with S.W. wind and lowest 1·0 on 13th with N.E. wind.

POLAPIT TAMAR [LAUNCESTON].—Comparatively dry; however, the total for the 10 months was only ·10 in less than the average. Violent TS on 1st.

## WALES.

HAVERFORDWEST.—Wet and mild with only three bright days and with R on 24 days. Temp. was high. Large quantities of corn still in the fields were ruined and potato crops suffered great damage. Hours of bright sunshine 89·3. TS of considerable magnitude on 21st lasting from 7 p.m. to 4 a.m., L very vivid, but T mostly distant.

ABERYSTWITH, GOGERDDAN.—Another wet month with very little sun. Dull and showery throughout with very unsettled bar. Boisterous wind on 6th and 7th.

## SCOTLAND.

CARGEN [DUMFRIES].—Dull, damp and sunless; difference between dry and wet bulb only 1°. T and L on 1st, L on 21st, T on 22nd.

CLACHANTON, COLMONELL.—Mean temp 47°·1 or 0°·6 above the average of 25 years. L on 16th, 21st and 22nd; T on 14th.

TIGHNABRUAICH, CRAIGANDARAICH.—Similar to October, 1900 in number of wet days. Most of the R fell during the night and generally the wind changed twice in 24 hours.

ABERDEEN, CRANFORD.—On the whole a very fine month; everything safely gathered in.

S. RONALDSHAY, ROEBERRY.—A very good month upon the whole. Mean temp. 46°·1 or 0°·6 below the average.

## IRELAND.

DARRYNANE ABBEY.—A month of frequent R but few really wet days.

BROADFORD, HURDLESTOWN.—A wet October. Much hay was still in the fields at the close, as it could not be got dry enough to put it in. The tobacco crop was also very late in cutting from the same cause. Potato crop very good.

DUBLIN, FITZWILLIAM SQUARE.—As in October, 1900, the weather was changeable, rainy and damp. Atmospheric pressure was in very unstable equilibrium. Cold till 27th when it became remarkably warm. A good deal of T and L occurred on 21st and 22nd. Mean temp. 49°·8 or 0°·1 above the average. High winds on 11 days attaining the force of a gale on 6th and 8th. More or less foggy on 8 days. Duration of sunshine 115·3 hours.

OMAGH, EDENFEL.—In the 36 years during which a record has been kept there has never before been recorded so prolonged or persistent a wet period as that which commencing on 16th September continued without intermission till 29th October; a fall of 8·21 in. on 44 rainy days. The amount of R has been surpassed but not the persistence of it for so long a period, yet things are very little the worse for it. The temp. was above the average and the "fall of the leaf" the latest known.

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## NOTE ON THE CLIMATOLOGICAL TABLE.

WE are indebted to His Excellency Sir William MacGregor, Governor of Lagos, for the addition of Lagos to the stations representing the climates of the British Empire in our monthly tables. The new station at Lagos Hospital is situated almost in the same latitude as Colombo, Ceylon, with the record of which its returns are sure to be compared with much interest. The small difference between the climatic conditions of the two regions seems to indicate that the notoriously unhealthy nature of the Niger Delta is not due to the direct effects of climate.

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## ERRATUM.

In October number, p. 153, Supplementary Table of Rainfall, *for* AUGUST *read* SEPTEMBER.

SYMONS'S

METEOROLOGICAL MAGAZINE.

No. CCCCXXXI.] DECEMBER, 1901. VOL. XXXVI.

## HANN'S TEXT-BOOK OF METEOROLOGY.*

WE do not as a rule give much space to the reviews of books in foreign languages, as we think it better to devote these pages mainly to the progress of British meteorology, and to notices of books which are accessible to the majority of our readers. But when so eminent a student of the atmosphere as Professor Hann sums up the experience and the reading of a lifetime in a text-book of meteorology, which must, from the fact of its authorship, at once become an ultimate court of appeal for all matters connected with our science, we feel that an exception must be made.

Dr. Hann's book, though published in ten parts, forms a single volume, a volume that commands respect on account of the mass of information it contains, and wins admiration by the clear and logical way in which it is presented. The large page and small type—too small as regards the innumerable foot-notes—allow its 820 pages to include as much printed matter as five annual volumes of this magazine; and in addition to a certain number of diagrams in the text there are many plates, in the form of maps, or reproductions of photographs of meteorological phenomena. No space is wasted on the description of instruments, and very little is taken up with methods of observation; the aim of the book is to state the fundamental principles of the science of meteorology, and to present in a condensed form the actual data on which these are based. The great department of Climatology is passed over briefly, having been fully discussed in an earlier work by the same author, and the application of meteorology to forecasting the weather is not dealt with in detail on acconnt of the sufficiency of the works of von Bebber, Börnstein, Scott, and Abercromby.

Dr. Hann thus expresses himself in the preface:—

"I endeavoured to bring forward as abundantly as possible the securely established results of observations, for these are permanent, forming the foundation for wider inductions and preparing the way for future theories . . .

* Lehrbuch der Meteorologie von Dr. Julius Hann, Leipzig, C. H. Tauchnitz, 1901. Pp. xiv. + 806.

One cannot expect the student of theory to find the time or take the trouble to look through all the rich and very scattered literature of meteorology in order to hunt out what appears important and serviceable for his purpose. A convenient conspectus of the facts may on this account save many students the trouble of forming speculations and undertaking calculations that can lead to no result. I endeavour also to direct attention to those observational results which correspond with none of the prevailing theories, and so to stimulate further researches as to their relations with established phenomena."

The aim was thus to produce a summary of the facts and theories of meteorology as they were accepted at the end of the nineteenth century, in order to forward the development of the science in the twentieth.

The work is divided into five "books," preceded by a short general introduction, and followed by a valuable appendix on some of the more important mathematico-physical theories of meteorology, such as the calculation of periodical phenomena and the measurement of heights with the barometer.

Book I. treats of Temperature, dealing with the thermal conditions of the Earth's surface affecting land, water and air. Its five chapters discuss solar and terrestrial radiation, the daily and annual march of temperature in land, water and air, irregular variations of temperature, and the temperature conditions of the atmosphere considered vertically from the ground to the upper limits. Professor Hann revives the use of "isopleth" diagrams for displaying graphically the combined result of annual and diurnal changes at a place. By means of such diagrams the hour at which a given temperature occurs on any day in the year may be seen at a glance, and the relative duration of high or low temperatures is very effectively shown.

Book II., dealing with atmospheric pressure and its periodic and irregular changes, is very short. The obscure question of the diurnal variations of the barometer is treated in some detail, but the difficulty of explaining the fact seems rather heightened than diminished. Professor Hann points out that the problem must be attacked by analysing the diurnal oscillation into one component with a whole-day period, which varies with season and place on the Earth's surface, and another component with a half-day period which is found to be independent of season and place, but to vary with the Earth's position in its orbit, thereby suggesting the action of some unknown cosmical influence. The fact that the atmospheric "tides" have no relation to the moon proves that this influence, whatever it may be, is not gravitational.

Book III. treats comprehensively of the Water Vapour of the Atmosphere and the phenomena to which it gives rise. It discusses evaporation, the measurement, variations and distribution of water vapour in the atmosphere, the phenomena of condensation, the nature of fog, cloud, rain, snow and hail, the measurement of rainfall, and its diurnal and annual periodicity. Many observations on the density of freshly fallen snow are cited, and the result

indicates that 10 or 12 inches of snow correspond, on the average, to 1 inch of rain, a result identical with the familiar relationship of a foot of snow to an inch of rain. Professor Hann recognises the authority of *British Rainfall* and *Symons's Meteorological Magazine* as "the chief sources of information on all questions relating to the measurement of rain." With regard to heavy falls in short periods the following definitions are given:—"Heavy rain (*Platzregen*) is a fall of at least five minutes' duration, with an intensity of at least ·80 in. per hour; if 2·00 in. or more falls in half-an-hour one usually begins to speak of a cloud burst." Much importance is attached to the proportion which the absolute and average maximum daily falls bears to the annual total, in different regions and climates.

Book IV. is devoted to the phenomena of the movements of the air, including the great currents of atmospheric circulation and the normal winds of the globe. Professor Hann says that he regards Ferrel as the founder of the modern theory of general atmospheric circulation, because the independent statement of the theory by James Thomson was not based upon a mathematical foundation.

The longest division of the work is Book V., on Atmospheric Disturbances. "Weather," we are told, "is not an average atmospheric condition, but the total impression, or total effect, at a particular hour of the atmospheric phenomena actually in operation during a definite short interval of time, to put it more strongly, at a given moment." The German language is fortunate in containing a word, *Witterung*, which has no English equivalent; it indicates something intermediate between *Wetter*, the weather of an hour or a day, and *Klima*, the climate or average condition of a series of years. It is thus used for comparing the phenomena of one month or of one year with another. In the absence of a definite term we are obliged to use some such expression as the "general weather" of a month or a particular year, as distinguished from the climate of the average month or year. The treatment of barometric maxima and minima, and of storms, is especially masterly, and stands out as admirable even in a work every page of which bears testimony to the colossal knowledge, industry, and scientific method of its author.

## RAINFALL AND STORMS IN NOVEMBER.

THE record of rainfall at Camden Square, for November, was the lowest since 1858, and has only once been approached in the intervening 44 years, the average for that period being 2·28 in. The following are the records of less than ·75 in. for the month:—

| | | | |
|---|---|---|---|
| November, 1858 | ... | ... | ·53 in. on 8 days. |
| November, 1871 | ... | ... | ·60 in. on 8 days. |
| November, 1879 | ... | ... | ·73 in. on 8 days. |
| November, 1901 | ... | ... | ·59 in. on 7 days. |

Similar low readings are reported from the greater part of southern England; a considerable number of stations recorded less than half-an-inch, the lowest being ·36 in. at Ryde, Isle of Wight. Less than

one inch was reported everywhere south and east of a line drawn from Harwich to Leicester, thence to Hereford and through Bristol to Torquay, except along the higher part of the Cotswolds where there was a trifle more rain. More than 4 inches fell in the middle of Ireland, in North Wales, Lancashire, the West and North Ridings, Durham, Northumberland, the Lake District and the west of Scotland. The heaviest fall was at The Stye, where over 30 inches were recorded. In the north, therefore, the average was, in most cases, greatly exceeded, and the danger of a water famine which at the beginning of the month was very serious has, for the time, passed away. This is largely on account of the very heavy rain accompanying a deep cyclone, the centre of which passed from the south of Ireland across Wales and central England on the 12th and 13th by a gale of exceptional severity, which caused many shipwrecks all round the coast. Serious floods occurred on the 12th in Ireland as the result of 36 hours of torrential rain and damage is reported from almost all parts of that country. Floods were reported in both North and South Wales. In Lancashire, Yorkshire and Westmorland towns were flooded and railways damaged, especially in the valley of the Calder. At Todmorden the flood is said to have been almost as serious as the memorable disaster of 1866, and to be comparable with nothing that has occurred more recently. At Leeds in the Fewston reservoir, which had been nearly dry, the water rose 13 ft. 6 in. in twelve hours; and the Leeds and Liverpool Canal was put into working order for through traffic by the rain, after having been closed for lack of water since July. Bradford, Halifax, Huddersfield and other towns experienced a similar relief as to their water-supply, and all suffered to some extent from the fury of the storm. It appears that a rainfall exceeding 3 inches fell in the twenty-four hours up to 9 a.m. of the 13th, over a large part of the North of England.

A second spell of very wet weather with a good deal of snow occurred in the Lake District from the 18th to the 20th, and for this period of three days the fall at eight stations exceeded 6 inches, the heaviest fall on one day being 5·66 in. at Dungeon Ghyll on the 19th.

The following are notes from our correspondence:—

Mrs. BACKHOUSE of Hurworth Grange, Croft, Darlington, writes—"After ten days without recorded rain it began to rain heavily on Monday the 11th at 10 p.m., and from that time to 9 a.m. on the 13th we have had 3·32 in. of which 2·53 in. fell in twenty-four hours ending at 9 a.m. on the 13th."

The Rev. J. G. B. KNIGHT of Eastgate, Co. Durham, writes—"We have had a terrific gale from N.E. and the rainfall in the twenty-four hours from 9 a.m. on the 12th to 9 a.m. on the 13th has been 3·86 in., a larger amount than I ever remember."

Mr. AMOS MITCHELL writes from Wolsingham, Co. Durham—"The amount of rain registered for the twenty-four hours ending at 9 a.m. on November 13th was 4·21 in."

As to the West Riding of Yorkshire, Mr. C. L. BROOK of Harewood Lodge, Meltham, says—"Rain commenced at 8.30 p.m. on November 11th.

| | |
|---|---|
| From 8.30 p.m. November 11th to 9 a.m. on 12th. | 1·58 in. |
| From 9 a.m. November 12th to 11 a.m. on 12th. | ·67 in. |
| From 11 a.m. November 12th to 0·30 p.m. on 12th. | ·81 in. |
| Total in 16 hours | 3·06 in. |

This is very much in excess of anything registered in 21 years."

Mr. A. WILSON, Ilkley, says—"The rain here began at 9 p.m. on Monday, 11th November. It fell very gradually at first but heavily later.

| | |
|---|---|
| November 11th, 9 p.m. to November 12th, 8 a.m. | 1·03 in. |
| November 12th, 8 a.m. to November 12th, 3.15 p.m. | 1·97 in. |
| November 12th, 3.15 p.m. to November 12th, 8.30 p.m. | ·03 in. |
| November 12th, 8.30 p.m. to November 12th, 10.30 p.m. | ·37 in. |
| November 12th, 10.30 p.m. to November 13th, 8 a.m. | ·16 in. |
| Total in 35 hours | 3·56 in. |

This is, I believe, the heaviest *Cyclonic* rain that has occurred in the West Riding of Yorkshire since the great rain of October 13th—15th, 1892."

## ROYAL METEOROLOGICAL SOCIETY.

THE Opening Meeting of this Society for the session was held on November 20th, at the Institution of Civil Engineers, Great George Street, Westminster, Mr. W. H. Dines, B.A., President, in the chair.

The following gentlemen were elected Fellows :—Rev. J. M. Bacon, F.R.A.S, Mr. J. Y. Buchanan, F.R.S., Major H. A. Cummins, M.D., Mr. F. H. Grinlinton, F.R.G.S., Mr. F. E. Hardcastle, Rai Sahib Kali Krishna Mukerju, B.A., Mr. J. Smith, and Mr. J. R. Twentyman.

A paper by Mr. A. Lawrence Rotch on "The Exploration of the Atmosphere at Sea by means of Kites," was read by the Secretary. The readers of the *Meteorological Magazine* are aware that the author has for some years past devoted his attention to the use of kites to obtain meteorological observations at the Blue Hill Observatory, Mass., U.S.A. He has successfully carried on the work of exploring the air there to a height of three miles, by several hundred kite flights, executed in varied weather conditions whenever the velocity of the wind exceeded twelve miles an hour. Certain types of weather, however, such as anticyclones, accompanied by light winds, can rarely be studied. The systematic exploration of the atmosphere above the continent of Europe has been in progress for several years, under the direction of an International Committee, of which Mr. Rotch is the American member. Ascents of manned balloons and of balloons carrying only recording instruments to still greater heights, are now made each month in France, Germany, Austria, and Russia, and kites are used to supplement the obser-

vations at the highest altitudes. It frequently happens, however, that on the day of the balloon ascension, the wind at the ground is insufficient to raise the kites. Since the balloons drift with the upper currents to considerable distances, the comparison of the data obtained from them, with observations made at any station on the ground, is more or less uncertain.

Mr. Rotch now proposes the employment of kites, carrying meteorographs, on steamships; especially on vessels cruising in tropical oceans. This method will obviate the necessity of waiting for windy weather to fly the kites, and will render it possible to obtain at almost all times information about the upper air, and in regions hitherto inaccessible. Mr. Rotch has demonstrated the practicability of this scheme, as on August 22nd last he raised a kite to an elevation of half-a-mile, from a tow-boat in Massachusetts Bay, when the velocity of the wind at sea-level varied from 6 to 10 miles an hour. At the end of August, when crossing the North Atlantic from Boston to Liverpool, on the Dominion line steamer *Commonwealth*, he was able to raise kites carrying a meteorograph to an altitude of 1,800 feet, on five days out of the eight. The chief feature of these records was the rapid change of temperature with height.

Mr. W. N. Shaw thought that the extension of the investigation of the upper air from land stations to the sea was likely to prove very interesting. He was much interested at present in the determination of the variation of temperature with height, because of its influence upon the persistence or disappearance of floating cloud. He had lately come to the conclusion that it depended upon the temperature gradient whether a cloud became thicker or thinner in consequence of the communication or abstraction of heat, as by the sun shining upon it, or by radiation at night.

Dr. H. R. Mill stated that while accompanying the *Discovery* as far as Madeira, on her voyage to the Antarctic regions, he had assisted in several experiments in kite flying, while the vessel was under both sail and steam; and no doubt further experiments would be made during the progress of the voyage. The use of kites for exploring the upper air was originated in this country, and he hoped the work would still be carried on here.

The President, Mr. F. C. Bayard, Mr. R. Bentley, Captain A. Carpenter, Mr. R. H. Curtis, Mr. C. Harding and Captain D. Wilson-Barker, also took part in the discussion, the last-named suggesting that telegraph ships might be able to afford opportunities for such researches.

A paper by Professor John Milne, F.R.S., on "Meteorological Phenomena in relation to changes in the Vertical," was also read by the Secretary. All who are familiar with Horizontal Pendulums are aware that these instruments can without difficulty be so adjusted that they accurately follow changes in the vertical through angles considerably less than one second of arc, and however carefully they may be installed they indicate that such changes are almost con-

tinually in progress. When resident in Japan some years ago the author carried on numerous observations by seismographs, with the object of determining how far these movements were influenced by local conditions. The more important displacements recorded were of three types, viz. :—"long," "intermediate," and "short-period" wanderings. During the last five years Professor Milne has had continuous photographic records of a horizontal pendulum at his residence at Shide, Isle of Wight, and in this paper he gives a comparison of these records with the weather conditions prevailing during the first six months of 1901. He says that "assuming that a locality can be chosen where the diurnal wave and effects due to rain and dessication are small, which his observations indicate as possible, records of what appear to be the effects due to barometrical gradients may be obtained. When these are large and appear suddenly, the movements of the pendulum may be marked. At Shide the westerly displacement of a pendulum has for several yeaas past been regarded as indicating the approach of bad weather."

Mr. W. N. Shaw, Mr. R. H. Curtis, Mr. R. Bentley, and the President, took part in the discussion, their opinion being that the horizontal pendulum cannot be regarded as a meteorological instrument until the students of dynamics have sorted out and differentiated the causes upon which its indications depend.

## Correspondence.

### IRIDESCENT CLOUDS.

*To the Editor of Symons's Meteorological Magazine.*

The iridescence in clouds of which Miss Fry writes in the September number of your Magazine, is not an uncommon phenomenon, although it is seldom seen on account of its proximity to the sun. It is observed in conjunction with high stratus clouds of the mackerel-sky type, and is probably caused by the splitting up of the sun's rays by ice crystals. All the colours visible at times in the high stratus clouds which precede or accompany bad weather produce a most beautiful and impressive effect.

D. WILSON-BARKER.

*H. M.S. "Worcester," off Greenhithe, Kent, November 7th, 1901.*

### THE MOON AND RAINFALL.

*To the Editor of Symons's Meteorological Magazine.*

Criticizing in the November number the results of a research by Mr. A. B. MacDowall on the possible influence of the moon on the rainfall at Greenwich, you rightly ask for a similar study in other parts of the world, and especially in the tropics.

Without taking part in the controversy, I can quote, on behalf of the persevering labours of your distinguished correspondent, the results of an old enough investigation of mine on that very subject

—not precisely in the tropics, but near their northern border, in lat. 31° N. This was in 1875, in China, at the well-known Zi-ka-Wei Observatory, of which I had just undertaken the direction.

The following are the results of that single year's (1875) observations as they were published in the "Annuaire de la Société météorologique de France, tome **24** (1877)."

*Mean amount of Cloud for each Quarter of the Moon.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| From the— | | | | | | | |
| 1st day | to the | 7th | Amount of Cloud | 6·76 ; | Departure from the Mean | | +0·71 |
| 8th ,, | ,, | 14th | ,, | 6·43 | ,, | ,, | +0·38 |
| 15th ,, | ,, | 22nd | ,, | 5·27 | ,, | ,, | —0·78 |
| 23rd ,, | ,, | 30th | ,, | 5·86 | ,, | ,, | —0·19 |

Clouds seem to have been, in that year, more frequent during the first than during the second half of the synodic revolution of the moon. The maximum came three or four days after the new moon ; the mininum was almost coincident with the full moon.

*Rainfall for each Quarter of the Moon.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | in. | | | |
| From the 1st | to the | 7th ..... | Total | 16·59 ; | days 35 ; | days for a month | 2·92 |
| ,, 8th | ,, | 14th ..... | ,, | 14·41 | ,, 29 | ,, ,, | 2·42 |
| ,, 15th | ,, | 22nd ..... | ,, | 10·93 | ,, 21 | ,, ,, | 1·75 |
| ,, 23rd | ,, | 30th ..... | ,, | 19·81 | ,, 27 | ,, ,, | 2·25 |

The first part of the lunar month was wetter (64 days in the year) than the second (48 days) ; wettest indeed about the new moon, least wet at the full moon. I may add that 57 days of rain were found for the half of the orbit which contained the Perigee, and 48 only for the half with the Apogee.

REV. MARC DECHEVRENS, S.J.,
*Director of St. Louis Observatory.*

*Jersey, 17th November, 1901.*

## WEATHER AND THE HORNS OF THE MOON.

*To the Editor of Symons's Meteorological Magazine.*

A PROPOS of the popular superstition of the weather being affected by the changes of the moon, which is so amusingly referred to in this month's Magazine, could you find room to note, and, if you can, to explain, the popular Italian idea that the greater the supposed inclination to the horizon of a line joining the points of the horns the greater the probability of rain ?

D. C. P.

*18th November, 1901.*

[The superstition referred to by our correspondent is widespread and is dealt with by Mr. A. K. Bartlett in the October number of the American journal, "Popular Astronomy," his article being translated and commented upon in the Belgian fortnightly, "Ciel et Terre," for November 16th. The fact is pointed out that the appearance of the moon "lying on its back," and the less marked changes

in the inclination of the line joining the horns are astronomical phenomena due to the position of the ecliptic with regard to the horizon. At all times, it is pointed out, the line joining the horns of the moon is at right angles to the line joining the positions of the moon and sun. We cannot explain the superstition, but we are pretty certain that it is not a generalisation of experience.]—ED. *S. M. M.*

## METEOROLOGICAL NEWS AND NOTES.

DR. ALEXANDER BUCHAN, F.R.S., has been designated by the Council of the Royal Meteorological Society as the first recipient of the Symons Gold Medal, in recognition of the valuable which work he has done in connection with meteorological science. Our readers are aware that this Medal has recently been founded in memory of the late Mr. G. J. Symons, F.R.S., the originator of this Magazine and of the British Rainfall Organization. The Medal will be presented to Dr. Buchan at the Annual General Meeting of the Society on January 15th.

CAPTAIN ALFRED CARPENTER, R.N., has been entrusted by the Meteorological Council with the superintendence of the special researches into the occurrence and distribution of London fogs, for which the County Council has given a grant of money. The object of the study is to find data from which it may be possible to forecast the occurrence of fogs sufficiently far in advance to enable warning to be given to the electric lighting companies of exceptional demands on their resources during the hours that should enjoy daylight.

METEOROLOGY AT THE CHANGE OF THE CENTURY was dealt with by the distinguished German meteorologist, Dr. Wilhelm von Bezold, (whose portrait graces the October number of *Terrestrial Magnetism*), at the meeting of the German Meteorological Society at Stuttgart, in April, and his address appears in the *Meteorologische Zeitschrift* for October. He points to the study of the upper air as the characteristic feature of the period, referring with pardonable pride to the simultaneous balloon ascents inaugurated in Germany, but perhaps hardly doing justice to the kite-work in America. The most important part of the address was the suggestion as to the developments in meteorology which may be expected as the outcome of recognising the close relation which exists between magnetic, electric, solar and atmospheric phenomena, and he points out the importance of paying increased attention to the physics of the atmosphere rather than to details of climatology.

PROFESSOR LUIGI PALAZZO has been appointed by the Italian Government as Director of the Central Meteorological Institute in Rome, in succession to the late Professor Pietro Tacchini.

PARTICULARS OF THE CLIMATE OF DAWSON in the Yukon district of northern Canada will be given henceforth in our Climatological Table of the British Empire, the interest of which we hope to increase still further next year.

THE "KNOWLEDGE DIARY FOR 1902" contains a quantity of information useful to scientific observers especially as regards astronomical and meteorological matters. We note, however, that the amateur meteorologist is advised to correct the readings of his instruments before recording them; this is a mistake, the actual readings should always be recorded. The importance of every student of nature keeping systematic notes of his observations need not be insisted upon, but for amateur observers a diary is often more useful than a note-book.

NATURE AND THE WEATHER were the theme of two journalists a few weeks ago. "Unluckily," said one, commenting on the dryness of November in the south, "Nature never fails to restore the balance for the year; and we may expect a rainy season in the winter that is now upon us." "Fortunately," says the other, speaking of the heavy rains of the middle of November that filled the reservoirs in the north, "Nature in this island, although capricious, is not wholly unkind. She has come to the rescue none too soon—and in doing so has interrupted communication and inflicted peril on those at sea. Her benevolence is not without a discount." After which we may be permitted to cite from Dickens a judicial summing up, pronounced in course of a conversation with Mr. Squeers of Dotheboys Hall—"She's a rum un is Natur'!"

## BOOKS RECEIVED.

Results of Observations in Meteorology and Terrestrial Magnetism made at the Melbourne Observatory and other localities in the state of Victoria, Australia, from the 1st of July to the 31st of December, 1900, under the direction of Pietro Baracchi. Melbourne, 1901. Size 9½ × 16½. Pp. 48.

Returns of Rainfall, &c., in Dorset in 1900, by Henry Storks Eaton. [From "Proceedings" Dorset Natural History and Antiquarian Field Club, Vol. 22, 1901.] Size 8½ × 6. Pp. 14.

Report on the Meteorology of Scotland for the year ending 30th September, 1900. By R. C. Mossman, F.R.S.E. [From the *Transactions* of the Royal Scottish Aboricultural Society.] 1901. Size 9 × 6. Pp. 10.

Results of Meteorological Observations taken in Edinburgh during 1900. By R. C. Mossman, F.R.S.E. [From the *Proceedings* of the Royal Society of Edinburgh. Vol. 14.] 1901. Size 8½ × 6. Pp. 8.

Colony of Mauritius. Annual Report of the Director of the Royal Alfred Observatory for 1900, Mauritius, 1901. Size 13½ × 8½. Pp. 24.

Report of the Meteorological Service of Canada, by R. F. Stupart, Director, for the year ended December 31st, 1898. Ottawa, 1901. Size 11½ × 9. Pp. 312.

Ceylon. Administration Reports, 1900. Part II. Scientific, Meteorology. Report of Mr. F. H. Grinlinton, F.R.G.S., Surveyor-General. [Colombo, 1901]. Size 13 × 8½. Pp. 40. Maps.

[The compiler of this report is to be congratulated on the promptness with which it appears, and on the interesting coloured maps of rainfall which illustrate it.]

Borough of Margate. Annual Report on the Meteorology of Margate, by the Borough Meteorologist [John Stokes, F.R.Met.Soc.] For the year 1900. Margate [1901]. Size 10 × 6½. Pp. 8.

# METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858–97.

## MAXIMUM TEMPERATURE IN SUN.

| Months. | BLACK BULB IN VACUO.* | | | | | | | | BRIGHT BULB IN VACUO.† | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MONTHLY MEANS. | | | EXTREMES. | | | | | MONTHLY MEANS. | | | EXTREMES. | | | | |
| | Mean 28 years. | Highest. | Lowest. | Absolute Highest. | Lowest Highest. | Highest Lowest. | Absolute Lowest. | Mean of all Highest. | Mean 20 years. | Highest. | Lowest. | Absolute Highest. | Lowest Highest. | Highest Lowest. | Absolute Lowest. | Mean of all Highest. |
| | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° |
| January | 53·7 | 61·8 | 44·1 | 87·3 | 63·5 | 44·2 | 26·5 | 75·5 | 43·9 | 52·1 | 35·4 | 60·3 | 46·3 | 38·8 | 22·5 | 55·5 |
| February | 63·2 | 74·1 | 51·9 | 102·4 | 73·8 | 53·0 | 29·8 | 89·0 | 49·2 | 54·2 | 41·2 | 69·8 | 51·8 | 42·6 | 30·0 | 62·4 |
| March | 81·3 | 91·3 | 70·6 | 112·6 | 92·8 | 69·0 | 36·4 | 103·6 | 58·2 | 64·6 | 52·1 | 78·4 | 66·2 | 54·8 | 33·2 | 72·3 |
| April | 95·5 | 106·0 | 87·6 | 122·0 | 104·4 | 82·8 | 49·8 | 114·8 | 67·2 | 76·1 | 61·6 | 88·4 | 72·4 | 57·7 | 45·0 | 80·5 |
| May | 106·1 | 114·0 | 94·8 | 131·5 | 115·8 | 87·1 | 58·0 | 124·0 | 75·6 | 81·8 | 68·7 | 98·7 | 78·9 | 66·1 | 50·6 | 90·5 |
| June | 113·2 | 120·4 | 106·9 | 136·8 | 120·6 | 99·0 | 64·7 | 129·5 | 82·2 | 87·8 | 76·9 | 104·3 | 84·9 | 72·4 | 57·9 | 95·1 |
| July | 116·2 | 123·4 | 105·9 | 137·7 | 120·2 | 111·3 | 65·1 | 130·6 | 84·6 | 91·4 | 75·6 | 105·4 | 87·0 | 82·4 | 58·4 | 96·3 |
| August | 113·6 | 120·2 | 105·4 | 134·0 | 122·7 | 95·1 | 62·9 | 127·9 | 82·8 | 88·8 | 77·2 | 104·2 | 89·6 | 72·8 | 60·5 | 94·8 |
| September | 102·0 | 108·7 | 93·6 | 131·8 | 113·6 | 83·2 | 55·6 | 120·4 | 75·7 | 82·6 | 71·6 | 93·3 | 81·6 | 68·8 | 56·2 | 86·8 |
| October | 81·3 | 89·1 | 75·5 | 116·9 | 96·8 | 61·1 | 46·0 | 107·4 | 62·3 | 67·0 | 58·3 | 86·8 | 70·6 | 54·9 | 42·0 | 76·5 |
| November | 63·6 | 70·5 | 57·7 | 98·1 | 78·9 | 52·4 | 31·4 | 88·0 | 52·0 | 57·5 | 47·1 | 73·8 | 56·1 | 45·0 | 29·1 | 64·4 |
| December | 51·8 | 59·1 | 36·9 | 87·0 | 49·3 | 41·2 | 24·8 | 71·3 | 44·9 | 48·3 | 34·8 | 62·0 | 44·8 | 39·9 | 26·8 | 56·8 |
| Mean | 86·8 | 94·9 | 77·6 | 116·5 | 96·0 | 73·3 | 45·9 | 106·8 | 64·9 | 71·0 | 58·3 | 85·5 | 69·2 | 58·0 | 42·7 | 77·7 |
| Highest | 116·2 | 123·4 | 106·9 | 137·7 | 122·7 | 111·3 | 65·1 | 130·6 | 84·6 | 91·4 | 77·2 | 105·4 | 89·6 | 82·4 | 60·5 | 96·3 |
| Lowest | 51·8 | 59·1 | 36·9 | 87·0 | 49·3 | 41·2 | 24·8 | 71·3 | 43·9 | 48·3 | 34·8 | 60·3 | 44·8 | 37·9 | 22·5 | 55·5 |

* Black Bulb readings for 28 years commencing 1870. † Bright Bulb readings for 20 years commencing 1878.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JUNE, 1901.

| STATIONS. (*Those in italics are South of the Equator.*) | Absolute. Maximum. Temp. | Date. | Minimum. Temp | Date. | Average. Max. | Min. | Dew Point. | Humidity. | Absolute. Max. in Sun. | Min. on Grass. | Total Rain. Depth. | Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0-100 | ° | ° | inches | | |
| London, Camden Square | 82·8 | 9 | 40·9 | 19 | 72·8 | 50·5 | 48·1 | 66 | 125·7 | 35·1 | 1·25 | 9 | 5·5 |
| Malta | 91·8 | 30 | 60·5 | 23 | 81·6 | 65·2 | 61·8 | 70 | 140·0 | 56·2 | ·21 | 1 | 1·3 |
| Lagos, W. Africa | 90·0 | 9 | 69·0 | 1 | 86·0 | 73·9 | 75·3 | 85 | 148·0 | 55·0 | 17·37 | 17 | 4·8 |
| *Cape Town* | 84·8 | 25 | 37·1 | 18 | 65·9 | 47·1 | 48·2 | 73 | ... | ... | 1·37 | 7 | 4·7 |
| *Mauritius* | 80·5 | 4 | 58·7 | 14 | 75·7 | 63·8 | 60·8 | 75 | 134·2 | 49·4 | 1·90 | 14 | 5·6 |
| Calcutta | 108·4 | 11 | 73·2 | 19 | 94·6 | 79·3 | 78·1 | 77 | 152·8 | 71·6 | 8·85 | 9 | 6·4 |
| Bombay | 98·4 | 9 | 75·1 | 13 | 87·9 | 79·4 | 77·5 | 82 | 151·5 | 72·8 | 25·36 | 24 | 7·2 |
| Colombo, Ceylon | 89·1 | 15 | 73·0 | 8 | 86·6 | 76·5 | 73·7 | 83 | 145·0 | 70·0 | 5·93 | 20 | 5·4 |
| *Melbourne* | 59·9 | 7 | 30·9 | 29 | 53·4 | 40·7 | 39·6 | 76 | 117·9 | 23·1 | 1·98 | 12 | 6·8 |
| *Adelaide* | 66·1 | 8 | 35·9 | 30 | 59·0 | 44·4 | 43·0 | 76 | 121·5 | 25·9 | 4·91 | 19 | 5·9 |
| *Sydney* | 66·0 | 5 | 38·4 | 16 | 57·8 | 44·7 | 39·2 | 72 | 109·0 | 31·3 | 1·03 | 10 | 3·3 |
| *Wellington* | 68·0 | 10 | 32·0 | 27 | 56·6 | 46·3 | 43·1 | 74 | 103·0 | 25·0 | 4·47 | 17 | 4·9 |
| *Auckland* | 64·0 | 20 | 37·0 | 23*b* | 59·6 | 51·8 | 47·5 | 78 | 115·0 | 33·0 | 2·75 | 18 | 6·3 |
| Jamaica, Halfway Tree | 93·0 | 30 | 69·0 | 16 | 87·5 | 72·1 | 71·0 | 79 | ... | ... | 12·71 | 22 | 5·2 |
| Trinidad | 90·0 | sev. | 62·0 | 24 | 86·3 | 72·0 | 72·2 | 76 | 168·0 | 57·0 | 9·21 | 20 | ... |
| Grenada | 85·0 | 24*a* | 71·4 | 2 | 82·7 | 74·3 | 71·3 | 78 | 147·2 | ... | 8·28 | 24 | 3·9 |
| Toronto | 97·1 | 27 | 40·5 | 10 | 77·0 | 55·0 | 56·9 | 73 | 113·2 | 36·6 | 2 07 | 9 | 4·8 |
| Fredericton, N.B. | 90·2 | 27 | 34·0 | 16 | 74·1 | 50·6 | 51·8 | 60 | ... | ... | 3·66 | 10 | 4 9 |
| Winnipeg, Manitoba | 88·8 | 26 | 28·5 | 7 | 71·7 | 48·7 | ... | ... | ... | ... | 10·07 | 16 | 6·4 |
| Victoria, B.C. | 74·0 | 17 | 43·7 | 4 | 60·9 | 48·4 | | ... | ... | ... | 1·06 | 12 | 6·5 |
| Dawson, Yukon | 81·8 | 19 | 35·8 | 15 | ... | ... | ... | ... | ... | ... | ·94 | 2 | ... |

*a*—and 30. *b*—and 25.

REMARKS.

MALTA.—Mean temp. of air 72°·2, or 0°·6 above the average. Mean hourly velocity of wind 8·7 miles, the average. Mean temp. of sea 72°·2. L on 11th and 13th.
J. F. DOBSON.

*Mauritius*.—Mean temp. of air 0°·3, of dew point 0°·2, above, and R 0·04 in. below their respective averages. Mean hourly velocity of wind 11·3 miles, the average; extremes, 28·3 on 30th and 1·7 on 17th; prevailing direction S.E. to E.S.E.
T. F. CLAXTON.

COLOMBO, CEYLON.—Mean temp. of air 80°·4, or 0°·7 below the average, dew point 0°·5 below, R 2·42 in. below, their respective averages. Mean hourly velocity of wind 11 miles: prevailing direction S.W. TSS on the 2nd, 8th and 9th. L on 5 days.
J. HAMPTON.

*Adelaide*.—Mean temp. of air 1°·8 below the average. Very wet generally near the coast; at Adelaide R was 2·09 in. over the average.
C. TODD, F.R.S.

*Sydney*.—Mean temp. of air 3°·1 below, R 4·78 in. above, and humidity 6·8 below, their respective averages.
H. C. RUSSELL, F.R.S.

*Wellington*.—Mean temp. of air 2°·4 above, and R 0·63 in. below, their respective averages. The early part of the month was generally fine, with moderate N.W. wind; the latter part cold and showery, with prevailing S. wind. Slight earthquake on 6th at 1·25 p.m.
R. B. GORE.

*Auckland*.—Mean temp. of air slightly above the average; a cloudy and showery month, but the total R considerably under the average.
T. F. CHEESEMAN.

TRINIDAD.—R 0·93 in. above the 30 years' average.
J. H. HART.

WINNIPEG.—Six inches of rain fell in thunderstorm of 26th.
R. F. STUPART.

# SUPPLEMENTARY TABLE OF RAINFALL, NOVEMBER, 1901.

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| I. | Uxbridge, Harefield Pk.. | ·51 | XI. | Castle Malgwyn ..... | 2·90 |
| II. | Dorking, Abinger Hall . | ·89 | ,, | Builth, Abergwesyn Vic. | 5·01 |
| ,, | Sheppey, Leysdown ..... | ·79 | ,, | Rhayader, Nantgwillt ... | 4·37 |
| ,, | Hailsham ..... | ·45 | ,, | Lake Vyrnwy ..... | 5·15 |
| ,, | Crowborough..... | ·88 | ,, | Corwen, Rhug ..... | ... |
| ,, | Ryde, Beldornie Tower.. | ·36 | ,, | Criccieth, Talarvor ..... | 4·92 |
| ,, | Emsworth, Redlands ... | ·49 | ,, | I. of Anglesey, Lligwy.. | 5·90 |
| ,, | Alton, Ashdell ..... | ·92 | ,, | Douglas, Woodville..... | 5·44 |
| ,, | Newbury, Welford Park | ·85 | XII. | Stoneykirk, Ardwell Ho. | 4·22 |
| III. | Oxford, Magdalen Coll.. | ·41 | ,, | New Galloway, Glenlee | ... |
| ,, | Banbury, Bloxham ..... | ·74 | ,, | Moniaive, Maxwelton Ho. | ... |
| ,, | Pitsford, Sedgebrook ... | ·77 | ,, | Lilliesleaf, Riddell ..... | 3·40 |
| ,, | Huntingdon, Brampton. | 1·22 | XIII. | N. Esk Res. [Penicuick] | 4·40 |
| ,, | Wisbech, Bank House... | 1·39 | XIV. | Glasgow, Queen's Park.. | 3·27 |
| IV. | Southend ..... ..... | ·55 | XV. | Inveraray, Newtown ... | 5·36 |
| ,, | Colchester, Lexden ..... | ·77 | ,, | Ballachulish, Ardsheal... | 5·95 |
| ,, | Saffron Waldon, Newport | 1·03 | ,, | Islay, Eallabus..... ... | 5·35 |
| ,, | Rendlesham Hall ..... | 1·22 | XVI. | Dollar..... | 3·09 |
| ,, | Swaffham ..... | 1·93 | ,, | Balquhidder, Stronvar... | 4·75 |
| V. | Salisbury, Alderbury ... | ·54 | ,, | Coupar Angus Station... | 1·56 |
| ,, | Bishop's Cannings ..... | ·71 | ,, | Blair Atholl ... ..... | 1·51 |
| ,, | Blandford, Whatcombe . | ·82 | XVII. | Keith H.R.S..... | 3·59 |
| ,, | Ashburton, Druid House | 1·35 | ,, | Forres H.R.S. ... ..... | ... |
| ,, | Okehampton, Oaklands. | 1·65 | XVIII. | Fearn, Lower Pitkerrie.. | 1·67 |
| ,, | Hartland Abbey ..... | 1·48 | ,, | S. Uist, Askernish ..... | ... |
| ,, | Lynton, Glenthorne ... | ... | ,, | Invergarry..... | 1·92 |
| ,, | Probus, Lamellyn ..... | ·98 | ,, | Aviemore, Alvie Manse. | 4·20 |
| ,, | Wellington, The Avenue | 1·07 | ,, | Loch Ness, Drumnadrochit | 2·25 |
| ,, | North Cadbury Rectory | ·61 | XIX. | Invershin ..... | 3·07 |
| VI. | Clifton, Pembroke Road | ·50 | ,, | Durness..... | ... |
| ,, | Ross, The Graig ..... | ·87 | ,, | Watten H.R.S..... | 2·88 |
| ,, | Wem, Clive Vicarage ... | 1·91 | XX. | Dunmanway, Coolkelure | 3·51 |
| ,, | Codsall ..... | 1·36 | ,, | Cork, Wellesley Terrace | 1·52 |
| ,, | Cheadle, The Heath Ho. | 2·66 | ,, | Killarney, District Asyl. | 2·44 |
| ,, | Coventry, Priory Row .. | ·82 | ,, | Caher, Duneske ..... | 1·64 |
| VII. | Market Overton ..... | ... | ,, | Ballingarry, Hazelfort... | 3·79 |
| ,, | Grantham, Stainby ..... | 1·15 | ,, | Limerick, Kilcornan ... | ... |
| ,, | Horncastle, Bucknall ... | ... | ,, | Miltown Malbay ..... | 6·04 |
| ,, | Worksop, Hodsck Priory | 2·43 | XXI. | Gorey, Courtown House | 2·34 |
| VIII. | Neston, Hinderton ..... | 3·30 | ,, | Moynalty, Westland ... | 3·23 |
| ,, | Southport, Hesketh Park | 4·29 | ,, | Athlone, Twyford ..... | 3·24 |
| ,, | Chatburn, Middlewood. | 8·19 | ,, | Mullingar, Belvedere ... | 3·41 |
| ,, | Duddon Val., Seathwaite Vic. | 12·69 | XXII. | Woodlawn ..... | 4·64 |
| IX. | Baldersby ..... | 3·92 | ,, | Crossmolina, Enniscoe .. | 4·78 |
| ,, | Scalby, Silverdale ..... | 3·96 | ,, | Collooney, Markree Obs. | 4·39 |
| ,, | Ingleby Greenhow Vic.. | 4·84 | XXIII. | Enniskillen, Model Sch. | 4·45 |
| ,, | Middleton, Mickleton ... | 5·59 | ,, | Warrenpoint..... | 4·02 |
| X. | Haltwhistle, Unthank H. | ... | ,, | Miltown, Banbridge..... | 3·93 |
| ,, | Bamburgh ..... | 3·90 | ,, | Belfast, Springfield ..... | 4·11 |
| ,, | Keswick, The Bank ..... | ... | ,, | Bushmills, Dundarave.. | 5·13 |
| XI. | Llanfrechfa Grange ..... | 1·11 | ,, | Stewartstown ..... | 3·67 |
| ,, | Treherbert, Tyn-y-waun | 4·25 | ,, | Killybegs ..... ..... | 8·79 |
| ,, | Llandovery ..... | 2·19 | ,, | Horn Head ..... | 6·12 |

# NOVEMBER, 1901.

| Div. | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1890-9. | Greatest Fall in 24 hours. Dpth | Date | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Max. Date | Min. Deg. | Min. Date. | No. of Nights below 32°. In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | inches. | inches. | in. | | | | | | | | |
| I. | London (Camden Square) ... | ·59 | — 1·63 | ·37 | 13 | 7 | 54·7 | 11 | 24·0 | 16 | 12 | 16 |
| II. | Tenterden ..... | ·59 | — 1·98 | ·14 | 13 | 13 | 57·0 | 11 | 22·0 | 17 | 13 | 20 |
| ,, | Hartley Wintney ..... | ·54 | — 1·94 | ·25 | 13 | 8 | 55·0 | 11 | 17·0 | 17 | 15 | 19 |
| III. | Hitchin ..... | 1·13 | — 1·29 | ·74 | 13 | 10 | 55·0 | 11 | 21·0 | 24 | 16 | ... |
| ,, | Winslow (Addington) ..... | ·71 | — 1·76 | ·23 | 12*a* | 10 | 55·0 | 11 | 15·0 | 25 | 13 | 19 |
| IV. | Bury St. Edmunds (Westley) | 1·29 | — 1·21 | ·48 | 13 | 9 | 57·0 | 2 | 22·0 | 17 | 15 | ... |
| ,, | Norwich (Brundall) ..... | 2·38 | ... | 1·17 | 13 | 19 | 58·0 | 3 | 25·2 | 17 | 11 | 18 |
| V. | Winterborne Steepleton ..... | ·64 | ... | ·20 | 13 | 9 | 55·7 | 3 | 19·8 | 17 | 14 | 16 |
| ,, | Torquay (Cary Green) ... ..... | ·53 | ... | ·16 | 12 | 6 | 58·4 | 20 | 29·3 | 16 | ... | ... |
| ,, | Polapit Tamar [Launceston].. | ·88 | — 3·00 | ·35 | 21 | 10 | 58·9 | 2 | 17·6 | 16*f* | 14 | 15 |
| VI. | Stroud (Upfield) ..... | 1·38 | — 1·31 | ·73 | 13 | 8 | 55·0 | 11 | 22·0 | 16*g* | 17 | ... |
| ,, | Church Stretton (Woolstaston) | 1·68 | — 1·10 | ·51 | 11 | 12 | 55·5 | 10 | 22·0 | 16 | 11 | 18 |
| ,, | Worcester (Diglis Lock) ..... | ·78 | — 1·32 | ·31 | 12 | 8 | ... | ... | ... | ... | ... | ... |
| VII. | Boston ..... | 1·67 | — ·18 | ·60 | 11 | 6 | 55·0 | 21 | 24·0 | 30 | 15 | ... |
| ,, | Hesley Hall [Tickhill]..... | 2·60 | + ·66 | 1·30 | 11 | 11 | 59·0 | 1 | 20·0 | 25 | 12 | ... |
| ,, | Derby (Midland Railway)..... | 1·74 | — ·19 | ·82 | 11 | 14 | 55·0 | 1*b* | 19·0 | 17*h* | 13 | ... |
| VIII. | Manchester (Plymouth Grove) | 3·84 | + 1·17 | 1·50 | 11 | 10 | 58·0 | 10 | 21·0 | 15 | 13 | 16 |
| IX. | Wetherby (Ribston Hall) ... | 4·56 | + 2·60 | 2·36 | 12 | 8 | ... | ... | ... | ... | ... | ... |
| ,, | Skipton (Arncliffe) ..... | 9·30 | + 3·23 | 1·93 | 12 | 11 | ... | ... | ... | ... | ... | ... |
| ,, | Hull (Pearson Park). ... ..... | 3·65 | + 1·36 | 1·89 | 12 | 15 | 56·0 | 10 | 21·0 | 16 | 15 | 19 |
| X. | Newcastle (Town Moor) ..... | 5·61 | + 3·15 | 2·53 | 12 | 15 | ... | ... | .. | ... | ... | ... |
| ,, | Borrowdale (Seathwaite)..... | 15·57 | + 1·59 | 4·27 | 19 | 13 | 56·5 | 1 | 19·4 | 16 | 11 | ... |
| XI. | Cardiff (Ely)..... | 1·54 | — 2·42 | ·39 | 11 | 9 | ... | ... | ... | ... | ... | ... |
| ,, | Haverfordwest ..... | 2·29 | — 2·57 | 1·02 | 11 | 8 | 56·6 | 11 | 21·3 | 17 | 10 | 18 |
| ,, | Aberystwith (Gogerddan) ... | 4·91 | — ·04 | 1·23 | 11 | 9 | 57·0 | 2 | 17·0 | 24 | 14 | ... |
| ,, | Llandudno..... | 4·16 | + ·82 | 1·82 | 11 | 17 | 56·5 | 12 | 27·5 | 16 | 4 | ... |
| XII. | Cargen [Dumfries] ..... | 3·47 | — 1·07 | ·73 | 20 | 9 | 54·0 | 12 | 19·0 | 16 | 12 | ... |
| XIII. | Edinburgh (Royal Observatory) | 3·47 | ... | 1·41 | 11 | 8 | 54·3 | 5 | 25·1 | 16 | 7 | 10 |
| XIV. | Colmonell ..... ..... | 4·82 | + ·18 | 1·09 | 9 | 13 | 55·0 | 1 | 17·0 | 15 | ... | ... |
| XV. | Tighnabruaich ..... | 6·75 | ... | 2·05 | 18 | 16 | 50·0 | 3 | 24·0 | 15 | 6 | ... |
| ,, | Mull (Quinish)..... | 5·85 | — ·12 | 1·16 | 18 | 19 | ... | ... | ... | ... | ... | ... |
| XVI. | Loch Leven Sluices ..... | 2·59 | — 1·06 | ·83 | 10 | 9 | ... | ... | ... | ... | ... | ... |
| ,, | Dundee (Eastern Necropolis) | 1·80 | — 1·01 | ·70 | 9 | 12 | 56·0 | 19 | 21·0 | 24 | 10 | ... |
| XVII. | Braemar ..... .. | 2·10 | — 1·67 | ·37 | 14 | 15 | 56·2 | 10 | 6·0 | 16 | 12 | 20 |
| ,, | Aberdeen (Cranford) ... ..... | 2·27 | — 1·09 | ·56 | 20 | 17 | 56·0 | 6*c* | 18·0 | 23 | 10 | ... |
| ,, | Cawdor (Budgate) ..... | 3·37 | + ·63 | ·83 | 19 | 16 | ... | ... | ... | ... | ... | ... |
| XVIII | Strathconan [Beauly] ..... | 4·26 | — 1·39 | ·93 | 22 | 9 | ... | ... | ... | ... | ... | ... |
| ,, | Glencarron Lodge..... | 9·33 | — ·59 | 2·33 | 18 | 20 | 53·9 | 1 | 20·1 | 16 | 6 | ... |
| XIX. | Dunrobin ..... | 3·05 | — ·24 | ·48 | 9 | 15 | 54·0 | 6 | 28·0 | 16*i* | ... | ... |
| ,, | S. Ronaldshay (Roeberry) ... | 2·45 | — 1·62 | ·49 | 8 | 21 | 51·0 | 6 | 27·0 | 14 | 8 | ... |
| XX. | Darrynane Abbey..... | 1·65 | — 3·30 | ·75 | 11 | 15 | ... | ... | ... | ... | ... | ... |
| ,, | Waterford (Brook Lodge) ... | 2·24 | — 1·28 | 1·65 | 11 | 10 | 57·0 | 10 | 22·0 | 17 | 7 | ... |
| ,, | Broadford (Hurdlestown) ... | 3·40 | + ·15 | 2·05 | 11 | 18 | 54·0 | 10*d* | 24·0 | 16 | 7 | ... |
| XXI. | Carlow (Browne's Hill) ..... | 2·72 | — ·35 | 2·10 | 11 | 9 | ... | ... | ... | ... | ... | ... |
| ,, | Dublin (Fitz William Square) | 3·62 | + 1·06 | 2·04 | 11 | 11 | 56·7 | 10 | 28·3 | 17 | 4 | 11 |
| XXII. | Ballinasloe ..... ..... | 4·46 | + ·89 | 2·30 | 11 | 16 | 60·0 | 19*e* | 20·0 | 16*f* | 9 | ... |
| ,, | Clifden (Kylemore) ..... .. | 4·21 | — 3·73 | 2·20 | 11 | 13 | ... | ... | ... | ... | ... | ... |
| XXIII | Seaforde..... | 4·64 | + ·94 | 1·88 | 12 | 12 | 53·0 | 3, 9 | 25·0 | 15 | 8 | 8 |
| ,, | Londonderry (Creggan Res.). | 4·86 | + ·99 | ·97 | 19 | 19 | ... | ... | ... | ... | ... | ... |
| ,, | Omagh (Edenfel) ..... | 3·83 | + ·12 | ·93 | 12 | 15 | 55·0 | 3 | 21·0 | 15 | 7 | 9 |

ENGLAND. WALES. SCOTLAND. IRELAND.

+ Shows that the fall was above the average ; — that it was below it.

*a*—and 13. *b*—and 2, 10. *c*—and 10, 19. *d*—and 11. *e*—and 20, 21. *f*—and 17. *g*—and 24. *h*—and 25. *i*—and 23.

# METEOROLOGICAL NOTES ON NOVEMBER, 1901.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

LONDON, CAMDEN SQUARE.—The driest November since 1858. From 3rd to 7th dense fogs prevailed, followed by a week of dull and milder weather with one day of heavy R. From 14th to the end was variable in temperature but persistently dry. Mean temp. 40°·6 or 2°·4 below the average. Slight S fell on 14th.

TENTERDEN.—The driest November during 39 years except 1871, when only ·58 in. fell. Also the smallest fall for the three months September to November, 3·56 in., and for the 11 months, January to November, 17·22 in. From March 1st, 1900, there were only 35 inches in 21 months, a deficiency of 14 inches. November was very cold from 5th to 7th and from 15th to 17th. Strong winds from 12th to 14th and 18th to 21st. Duration of sunshine 86 hours.

HARTLEY WINTNEY.—A "mensis mirabilis." Fog for the first five days. The driest November observed here, only half-an-inch of R fell and half of that was on one day, the 13th. R 6 inches below the average for the year so far, and water-carts are busy on the uplands. Sharp snaps of frost from 14th to 18th and from 23rd to 27th. A prevalence of very light N. breezes and many calm days. Ozone on 11 days with a mean of 4·0.

WINSLOW, ADDINGTON.—The driest November for 30 years. Weather very variable; frequent dense fogs and two periods of intense frost separated by mild interval. The aggregate number of degrees of frost registered was greater than in any November since 1871.

BURY ST. EDMUNDS, WESTLEY.—A cold month with 15 days of frost. The first week was very foggy. Want of water still continued in W. Suffolk.

NORWICH, BRUNDALL.—The coldest November since 1896, although the mean temp. was about the average. R for the year 7·64 in. deficient. Fog on 3 days. Great N. gale and heavy downpour on 13th and gale from N. with floods on 28th. S storm on 15th.

WINTERBORNE STEEPLETON.—Both dry and cold. Between 3rd and 7th, 14th and 18th and from 23rd to the end there were frosts nearly every night. Mean daily temp. only 40°·9 being 4°·5 below the average of 7 Novembers, 1896 only having been colder.

TORQUAY, CARY GREEN.—The driest November recorded since 1892. R 3·37 in below the average. Duration of sunshine 3·5 hours above the average, with 9 sunless days. Mean temp. 45°·7 or 1°·7 below the average. Mean amount of ozone 3·2.

POLAPIT TAMAR [LAUNCESTON].—Cold, calm and very dry. The smallest R for November in 21 years. The total for 11 months was 5·68 in. below the average. Morning fogs daily from 4th to 8th. S on 14th and 15th.

SKIPTON, ARNCLIFFE VIC.—An unusually heavy R for so few wet days; between 11th and 20th, 5 days had each a fall of upwards of an inch.

HULL, PEARSON PARK,—Fogs more or less dense characterised the weather during the first part. Afterwards a wet period with much cloud and heavy R set in with N.E. and N.W. winds, often cold and sometimes stormy. It became much finer and warmer towards the end.

## WALES.

HAVERFORDWEST.—Dry, cold and fine with a fair number of sunny days but at times very foggy. The early part was cold and stormy. Disastrous gale on 11th and 12th when the bar. fell a full inch in less than 24 hours. The min. on grass of 17°·1 on 17th was the lowest recorded for November in 50 years. Duration of sunshine 69·4 hours. S on 14th. Prevailing winds during the frosty period E S.E. and E.

ABERYSTWITH, GOGERDDAN.—High winds, R, frost and S with variable bar. Wind variable but chiefly N. and N.W.

## SCOTLAND.

CARGEN [DUMFRIES].—Cold and sunless. Mean temp. 40°·8, being 1°·1 below the average of 42 years, and the lowest since 1887.

TIGHNABRUAICH, CRAIGANDARAICH.—Remarkable for heavy R; three days with more than one inch, and on 18th 2·05 in. fell. On 11th and 18th the wind had the force of a gale.

S. RONALDSHAY, ROEBERRY.—A cold, dry month. Mean temp. 41°·0, or 2°·4 below the average of 11 years.

## IRELAND.

DARRYNANE ABBEY.—A very fine month, having the lowest fall registered in November since 1879. H shower on 15th lasting about an hour.

BROADFORD, HURDLESTOWN.—The R on 11th was remarkable as being the the third largest fall in 24 hours on record.

DUBLIN, FITZWILLIAM SQUARE.—A month of paradoxes. Fine, yet the R exceeded the average. The mean temp., 44°·9, was 0°·2 above the average, yet the grass minimum was 21°·5 on 17th, and S lay on the ground from 14th to 17th. The most memorable episode in the month's weather was a great R storm on 11th and 12th, during which 2·91 in. of R fell, accompanied in its later stages by a gale of exceptional violence from N.N.E. Duration of sunshine 75 hours. High winds on 8 days, attaining the force of a gale on 4. Fog on 7 days. S, sleet and H on 13th, 14th and 16th. L on 10th and 12th.

OMAGH, EDENFEL.—For the first 8 days the weather was anti-cyclonic and practically rainless, but the cyclonic disturbance that followed from 9th to 12th was of very marked character and culminated on 11th and 12th in a gale of great violence from the N.E., usually the sheltered quarter of this neighbourhood. A very cold spell followed until 16th, after which the remainder was mostly dull and seasonable.

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## GENERAL WEATHER IN GLEN NEVIS, NOVEMBER, 1901.

MR. R. C. MOSSMAN sends us the following interesting table comparing the meteorological conditions at his new valley station in Glen Nevis with those at Ben Nevis and Fort William, the returns from the two latter stations being taken from the reports published in the daily papers:—

| | *Ben Nevis.* | *Achariach.* | *Fort William.* |
|---|---|---|---|
| Height | 4407 feet. | 150 feet | 42 feet |
| Rainfall | 15·09 ins. | 5·42 in. | 4·63 in. |
| No. of days | 23 | 22 | 21 |
| Max. fall in 24 hours | 2·96 in., 19th | 1·66 in., 18th | 1·42 in., 18th |
| Highest temp. in shade | 39°·0, 3rd | 54°·6, 19th | 53°·5, 19th |
| Lowest ,, ,, | 13°·6, 22nd | 17°·3, 16th | 20°·9, 16th, 23rd |
| Mean temp. | 28°·4 | 42°·4 | 41°·8 |
| Temp. in shade at or below 32° | on 27 nights | 7 nights | 9 nights |
| Below 32° on grass | ? | 13 | 15 |
| Bright sunshine | 44 hours | 3·5 hours* | 40 hours |
| Sunless days | 19 | 27 | 12 |
| Mean relative humidity | 92 | 81 | 85 |
| Mean amount of cloud | 8·0 | 7·6 | 7·2 |

* No possible sunshine after 6th.

Rainfall at head of Glen Nevis, 2 miles above Achariach, and 357 feet above the sea, 5·92 in.

SYMONS'S

# METEOROLOGICAL MAGAZINE.

No. CCCCXXXII.] JANUARY, 1902. VOL. XXXVI.

## EDITORIAL.

THIS number concludes the first volume of *Symons's Meteorological Magazine* under its present editor, and we are indebted to the courtesy of the Royal Meteorological Society for the appropriate frontispiece now presented. It represents the Symons Memorial Medal, bearing on one side a portrait of the founder of this Magazine, and on the other a representation of the Tower of the Winds at Athens. The medal was presented for the first time at the meeting of the Royal Meteorological Society on January 15th, the recipient being Dr. Alexander Buchan, F.R.S.

In concluding the volume, we wish to thank those readers who have helped us by contributions to our pages or by friendly criticism and suggestions. We have not been able to accept some of the contributions and many of the suggestions for the simple reason that our pages are few and our circulation, though slowly increasing, is still too small to justify permanent enlargement.

With the new volume we hope to introduce some small improvements, the earnest of greater things if the wishes of those interested in the science of the air tend in that direction. We feel that in dealing with weather and climate this Magazine should be devoted mainly to the British Islands, and in less detail to the climatic conditions of the British Empire. It is true that the air knows no political boundaries, and storm and sunshine strike on land or sea irrespective of frontiers; but space demands that the line between inclusion and exclusion be drawn somewhere, and convenience suggests that here it may be drawn. Prominent advances in theory and in methods in all parts of the world, important books and remarkable occurrences will be referred to, as has been the case in past years, and brief and pointed correspondence will be welcomed from all serious workers.

For the convenience of those readers who may wish to introduce new subscribers, a form is inserted on p v. of the cover.

## DAY DARKNESS IN THE CITY.

By J. EDMUND CLARK, B.Sc., F.R.Met.Soc.

AT 112, Wool Exchange, E.C., I have made notes, since September, 1897, of the date and number of hours during which artificial light has been used before a time reasonably near sunset. My desk is central in a room measuring about 20 feet by 15 feet. The west side is mostly windows, looking out on the Guildhall buildings. There is practically no obstruction above an altitude of 30°, so that the natural lighting is very good.

Office hours are from 9 to 5, and to 1 o'clock on Saturdays. Thus no observations are made on Saturday afternoons or on Sunday, so that the returns are incomplete in the ratio of 3 to 14. Accordingly, the addition of 3/11 to Tables I. and II. below would more correctly express the actual number of quarter hours and of days per month that were dark.

The daily variation, shown in the diagram, has been corrected by adding 1/5 to the number of quarter hours recorded after 1 p.m., to allow for the Saturday.

The middle months, November to January, include hours after sunset. As the lesser evil these are counted "dark," when the electric light, having been on earlier, was still on at sunset.

As I was absent, on the average, about a week at the end of December, the values for that month have been adjusted by allowing, in that month, for the number of days of absence.

These limitations lessen the value of the results. The period, also, is too short to give more than an approximate mean. In spite of these drawbacks, the results are not without interest.

The causes of darkness are of three main types—namely, ordinary low fog, high fog, and storms. Smoke plays a main part in all three.

The values recorded (with the December corrections) are as follows :—

| | I.—*Quarter Hours.* | | | | | | II.—*Days.* | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1897, 1898 | 1898, 1899 | 1899, 1900 | 1900, 1901 | Mean. | 1901, 1902 | 1897, 1898 | 1898, 1899 | 1899, 1900 | 1900, 1901 | Mean. | 1901, 1902 |
| Oct. ... | 14 | 10 | 0 | 32 | 14 | 34 | 4 | 1 | 0 | 5 | 2½ | 4 |
| Nov. ... | 71 | 25 | 56 | 76 | 57 | 130 | 3 | 4 | 4 | 9 | 5 | 10 |
| Dec. ... | 18 | 16 | 250 | 71 | 89 | 206 | 2 | 3 | 13 | 5 | 5¾ | 17 |
| Jan. ... | 66 | 22 | 92 | 184 | 91 | | 6 | 2 | 8 | 12 | 7 | |
| Feb. ... | 0 | 17 | 27 | 79 | 31 | | 0 | 3 | 4 | 7 | 3½ | |
| March... | 9 | 54 | 6 | 10 | 20 | | 2 | 4 | 2 | 3 | 2¾ | |
| Total ..... | 178 | 144 | 431 | 452 | 301 | | 17 | 17 | 31 | 41 | 26½ | |

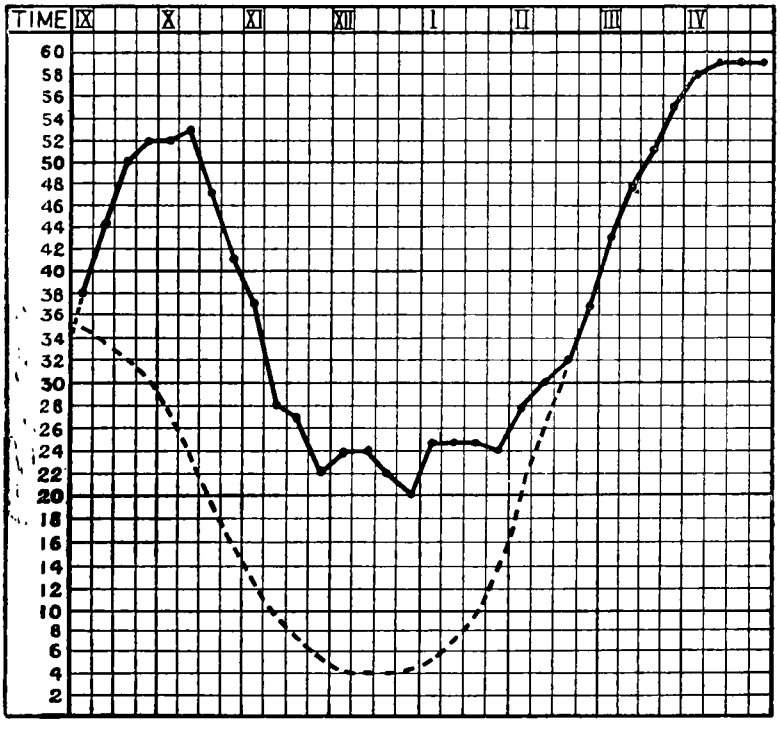
The tables show that November, December and January are pre-eminently the dark months, although November is a good deal behind the other two.

The first and second of the four complete seasons were certainly fog-free beyond the average. Even in the other two, December, 1899, and January, 1901, were the only bad months, and the only two to compare with November and December of this season.

The diagram shows the distribution through the day of dark quarter hours. The corrections and limitations are as already noted. The vertical values give the actual number of days on which records were made for a given quarter hour. Thus light was required at the start (or at any rate before 9.10) on 38 days in the four years. It was used between a quarter and half-past ten on 53 days, and from 4.15 to the close on 59 days, having been turned on well before sunset. Had records been made for all cases when light was required before actual sunset, this part of the curve would probably continue to rise steeply.

The curve differs from one referring to unpolluted low land or sea fog, first by the rapid rise from 9 to 10.15, and secondly by rising again just before noon, to re-descend to its minimum an hour later.

The first anomaly may naturally be associated with the lighting of office fires. The rise at noon would seem to follow luncheon preparations in the restaurants and that an hour later the time when lunching reaches full swing.




DIURNAL DISTRIBUTION OF DAY DARKNESS IN THE CITY OF LONDON.

It would be interesting to get for comparison the normal fog-curve treated in the same way. In default, one can only appeal to general experience. There is certainly no such increase after 9 o'clock. When once dissipated, country fog rarely re-appears until towards sundown. In other words, we should expect the curve to descend regularly from soon after sunrise until about noon, remaining near the minimum until 2 or 3 o'clock and then rising.

If the excess of smoke due to lighting fires and lunch preparations were abolished, we should expect a curve similar in shape to, but lying above that for, country fog. It would, presumably, run down from 9 a.m. until about noon and then rise, approximating to the present actual curve from about 2.30. (Dotted line in diagram.)

A comparison of the actual curve with a hypothetical curve based on the above presumption implies that the latter might well stand for only half the amount of darkness. The actual curve between these hours represents 185 hours of darkness, or 46 hours each year. The time may seem small at first glance. It happens, however, to be nearly the same as the total office-hour time during winter between sunset and 5 p.m. In other words, half of our expenses for lighting are due to "day darkness," and half of this is probably necessitated by the causes already stated.

## RAINFALL OF DECEMBER.

THE last month of 1901 was a typical December as far as concerns the distribution of rain over the British Islands—the high land of the west being everywhere very wet compared with the lower land of the east and south. But though the distribution was normal, the amount of rain recorded in the month exceeded the average everywhere—in some places, as the Table on page 206 shows, very greatly. A narrow area including Essex and the estuary of the Thames, a similar stretch between the Forth and the Tay, and a small portion of Durham, were the only parts of the country from which less than three inches of rain were reported. The whole of the Cornwall-Devon peninsula, all Wales except the extreme north, the Pennine chain from Derby northwards, the Lake District, and the western half of Scotland, all had more than six inches, a value which was only attained in Ireland at the tips of the western peninsulas. At special points in these wet areas the fall exceeded ten inches—*e.g.*, Ben Nevis 25·43, Achariach 11·80, Seathwaite 16·01, Builth 10·33, Treherbert, South Wales, 13·63, and Ashburton 10·36.

The most notable features of the month were the severe storms, which brought a heavy snowfall, followed by much rain, to most parts of the country between the 10th and 21st. They were the result of cyclones of the usual winter type, the deepest and best marked being that of the 12th to 14th, the centre of which skirted the south coast of England and brought three days of north-easterly wind to the whole of our islands. On the 12th the maximum fall

for the year was observed at many stations, and several correspondents have called our attention to the heavy falls of wet snow and rain on that day. The snow clung to telegraph and telephone wires, and the severe north-easterly gale which accompanied it produced disastrous effects, blowing down wires all over the country, isolating many parts of the North from telegraphic communication with London, and causing a remarkable congestion of railway traffic for several days, especially on the lines converging at Crewe, as the block-signalling had to be suspended on long sections of the lines. The damage to wires was apparently most serious in the Midlands. Birmingham kept in touch with the metropolis only by means of the underground cable recently completed; but other places, less fortunate, were cut off for several days. As a result, among other inconveniences, it was impossible for the Meteorological Office to receive information from northern stations on the 13th and 14th, or to issue storm warnings for a large part of the country. The Manchester newspapers complained bitterly of the breakdown of the telegraph system, from which Lancashire suffered badly, and we are happy to observe that Chambers of Commerce and other public bodies in all parts of the country have been led to make strong representations as to the necessity of having trunk lines of telegraph laid underground, so as to ensure at least the great centres from complete isolation in stormy weather.

Much loss was caused to sheep farmers by the snow, which drifted in Wales, in the Peak district and elsewhere to over 10 feet in depth; on the Cheviots and Lammermoors the storm is said to have been the most destructive for half-a-century. The thaw which followed caused serious floods in many places. Intense frost with renewed falls of snow occurred about the 18th all over the country, the snow being most severe in the north of England. In East Durham a farm-house was nearly buried in a snow-drift and the people had to escape by an upper window. The cessation of the frost again introduced a period of floods which caused much damage and some loss of life in several places, and continued into the first week of January.

There was not, so far as we can see, anything unprecedented in the run of bad weather; but the amount of destruction and disorganization brought about across the whole face of Britain affords some evidence that it might on the whole be cheaper as well as wiser to adapt our means of communication to withstand even the worst of our winter storms.

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## ROYAL METEOROLOGICAL SOCIETY.

THE Monthly Meeting of this Society was held on December 18th, at the Institution of Civil Engineers, Westminster, Mr. W. H. Dines, B.A., President, in the chair.

The following gentlemen were elected Fellows: A. Brown,

M.Inst.C.E., C. H. Clarke, LL.D., A. W. J. Debnam, E. W. Dixon, M.Inst.C.E., F. J. Dixon, Assoc.M.Inst.C.E., J. P. Greenwood, W. S. Jackson, G. B. de B. Kershaw, F. W. Mager, T. Overbury, Dr. J. B. Power, W. J. Press, A. Warren, Dr. J. T. Wilson and P. A. Whittome.

The Hon. F. A. Rollo Russell read a paper entitled "Further Observations and conclusions in relation to Atmospheric Transparency." In previous papers on the subject of haze the author has given the results of observations which he has made at Haslemere, Surrey, and elsewhere, on the causes of opacity and transparency in the atmosphere. The present paper deals with the period February, 1895 to September, 1901. Mr. Russell stated that the mean distance of view in miles on fine days with each direction of the wind is as follows :—

| N. | N.E. | E. | S.E. | S. | S.W. | W. | N.W. | Calm. | Variable. |
|---|---|---|---|---|---|---|---|---|---|
| 15·1 | 13·9 | 15·4 | 17·7 | 21·7 | 25·7 | 26·9 | 27·8 | 13·9 | 11·5 |

The following are some of the conclusions which he derives from the whole series of observations :—

Haze and fog are commonly caused by the mixture of currents at different temperatures. These currents may be local or general, high or low. Thick haze or fog not dependent on differing currents is rare, but differing currents frequently come into contact without producing haze or fog, and fairly clear weather under opposite currents is not uncommon. A fog may generally be taken *ipso facto* as evidence of the existence in the neighbourhood of a conflict of currents, and prevalent fog or haze commonly signifies that a different wind exists at a high level from that on the surface or at a slight elevation. The production of fog or haze by mixing currents depends chiefly on differences in their temperature. The rapid increase of haze in the evening, and the slow dissipation of haze under the morning sun, testify to the proximity to their dew-point, even in the dry air of an east wind, of small particles, which have been called atmospheric dust, and it is certain that the hygrometer does not correctly represent the relative humidity affecting a small particle in mid-air. Particles of salt are hygroscopic, and particles of carbon are excellent radiators, and easily become nuclei for aqueous deposition. Broadly-extended westerly winds, with westerly upper currents, are the clearest, and visibility may reach the highest figures during their prevalence, whether they are dry or nearly saturated. Easterly and north winds are the haziest, owing to the ordinary upper current from the west being seldom displaced by them, and to the mixture of these masses of air of different temperatures. When, as an exception, east and north winds are clear it may be presumed, without direct evidence, that the upper current nearly coincides with them in direction. In winter, therefore, unusual clearness in these winds often signifies a long spell of frost.

In the discussion which followed the reading of this paper the President, Mr. F. C. Bayard, Mr. R. Bentley, Mr. R. H. Curtis,

Mr. F. Druce, Mr. C. Harding, Capt. M. W. C. Hepworth, Mr. W. Marriott, Dr. H. R. Mill, Mr. T. P. Newman, Rev. Dr. J. D. Parker and Capt. D. Wilson-Barker took part. Nearly all the speakers referred to the question of the smoke produced in the neighbourhood of London and other large towns or manufacturing districts, affecting visibility. The President said it was astonishing to what a distance smoke would travel. He had noticed that on the north Yorkshire coast no wind from any westerly point was really clear. This was also true of the mouth of the Tyne, excepting that there the south-east winds were hazy and the north-west clear. In both places the north-east winds were clear, and there could be no reasonable doubt that the haziness of the westerly winds was produced by smoke from the coal fields and manufacturing districts inland. The same peculiarity was observable on the west coast of Scotland, which he knew well. The air on that coast was remarkably clear, and mountains 30 miles distant could usually be seen unless the wind blew from the neighbourhood of the coalfields around Glasgow. The effect was traceable as far north as Oban, and as far west and south-west as the Irish coast.

Two other papers were read by the Secretary, in the absence of the authors, viz. "Remarkable Phosphorescent Phenomenon observed in the Persian Gulf, April 4th and 9th, 1901," by Mr. W. S. Hoseason; and "The Mechanical Principle of Atmospheric Circulation," by Capt. R. A. Edwin, R.N.

During the evening Capt. D. Wilson-Barker showed a number of cloud pictures taken with a Panoram camera, the special features of which were the large angle included in the picture and the facility with which the horizontal or vertical appearance of the clouds could be reproduced.

## Correspondence.

### A WARM DECEMBER DAY.

*To the Editor of Symons's Meteorological Magazine.*

Surely such a reading of the thermometer as that of last Monday (December 30th) is unheard of. The figures were, minimum, 49°; maximum, 56°. I have looked back to 1849 and can find nothing like it. The mean was 52°, and a week before we had a mean of 28°.

W. LUCAS.

*Hitchin, January 2nd, 1902.*

[The normal December temperature is about 1° higher at London than at Hitchin; but it may be noted that on December 30th the minimum at Camden Square was 40°·1, while on the 8th and 31st it was 51°·2, a figure which in turn was equalled or exceeded in 15 previous Decembers since 1858, the highest having been 52°·8. The maximum on the 30th was 55°·3, which was exceeded by 55°·7 on the 7th, and equalled or exceeded in 18 previous Decembers since 1858.—ED. *S.M.M.*]

## WEATHER AND THE HORNS OF THE MOON.

*To the Editor of Symons's Meteorological Magazine.*

Owing to the sun's southern declination the moon "lies on her back" (as seen in the northern hemisphere) to a much greater extent during the winter months than at other times. Inasmuch as the winter months are the rainy period of the Mediterranean, may not the origin of the Italian idea referred to by your correspondent "D. C. P." be possibly found in this connection?

H. D. GARDNER, F.R.Met.Soc.

*December 28th, 1901.*

## REVIEWS.

*Rainfall of India. Tenth Year.* 1900. Published by the various Provincial Governments and issued under the authority of the Government of India. Calcutta, 1901. Size $13 \times 8\frac{1}{2}$. Pp. 1400.

*Report of the Administration of the Meteorological Department of the Government of India in 1900-1901.* By JOHN ELIOT. Size $14 \times 10\frac{1}{2}$. Pp. 62.

*Memorandum on the Snowfall of the Mountain Districts bordering Northern India and the abnormal features of the Weather of India during the past year, with a forecast of the probable character of the South-west Monsoon Rains of 1901.* [By JOHN ELIOT.] Simla, 1901. Size, $13\frac{1}{2} \times 8\frac{1}{2}$. Pp. 44.

THE three Indian reports may be noticed together. The first is a prodigious mass of pure statistics of which the Indian Government may well be proud, as its 1400 pages contain the daily readings of rainfall for something only a little under 2500 stations. We are glad to learn that the Indian Meteorological Department is considering the advisability of issuing a small volume, giving only the monthly totals of the stations, a summary of the most important element of the climate of India which will be convenient and most valuable. In passing we may note that for the purpose of enumerating rainy days the minimum rainfall constituting a rainy day is taken at one-tenth of an inch, instead of one-hundredth as is the almost invariable practice in this country.

The Report on Indian Meteorology for 1900-01 is of special importance, for Mr. Eliot, who states that this is probably the last report which he will submit to the Government, has taken the opportunity of making it largely historical, and presents an account of official meteorological work in India during the nineteenth century. He divides the century into three periods. The first, or Period of Unsystematized Observations, lasted up to 1864 or 1865. Except the indigo and tea planters, there are practically no private observers of rainfall in India and the work has consequently been almost entirely official. Even in the case of old records, the years of the Mutiny (1857 to 1860) are blank for the greater part of

India, and, curiously enough, a large part of the meteorological records of the Medical and Revenue Departments are now in Germany, and have never been published, while no copy of them has been kept in India. These records were made over to the Brothers von Schlagintweit, who were engaged in Himalayan exploration in the years 1861—63. Continuous records have been made at the Madras Observatory since 1796. At the Colaba Observatory, in Bombay, meteorological observations commenced in 1841, and at that in Calcutta in 1853, while observations were also started at Dodabetta, Trivandrum and Simla before 1850.

The second period—that of Provincial Systems of Meteorological Observations—lasted from 1865 to 1875. It was inaugurated by the report of a Committee of the Asiatic Society of Bengal. the presentation of which was impressed upon the Government by the memorable cyclone of October, 1864. In the end, five different meteorological systems were organized in as many provinces; but between them they covered only one-third of the total area of India, and the want of unity deprived them of any great practical value. The Meteorological Council was consulted and submitted a scheme in 1874 which led to the inauguration of the third period, or that of the Imperial System, in 1875. Mr. H. F. Blanford was appointed the first Imperial Reporter, and his organization was approved and carried into effect, giving to India a system of meteorological observations and weather forecasts. Improvements were introduced from time to time as the result of experience. Mr. Eliot was asked in 1878 to issue a forecast of the monsoon of that year, and this forecast was successful. In the same year a system of daily telegraphic reports to the central office was established and the publication of a daily weather report commenced. On the advice of the Madras Famine Commission Mr. Blanford drew up an extended scheme of meteorological work, which was adopted in 1881 and led to the inclusion of observations by vessels at sea, the study of the solar surface, and the issue of weather charts. This work was gradually extended and the old observations were worked up and discussed, affording a secure foundation for the monsoon forecasts, which were commenced systematically in 1885. Mr. Blanford retired and was succeeded as Imperial Reporter in 1886 by Mr. Eliot. At that time there was no unity in the system of recording rainfall; it was measured in different places at no less than 21 different hours, and the rain gauges were of different types. Reforms followed, which secured simultaneous observations at 8 a.m. and a more complete communication of all the data to the central government. Various improvements were also brought about in the methods of storm and flood warnings, and a daily weather report and map of the Indian monsoon area were commenced in 1893. Various local weather reports were also established, and the meteorological system of India now appears to be in a state of efficiency not exceeded by those in Europe.

*Die Meteorologie von Wien, 1852—1900, von* JULIUS HANN. [Reprinted from vol. 73 of the *Denkschriften der math.-wiss. Classe der k. Akademie der Wissenschaften*]. Vienna, 1901. Size 12 × 9½. Pp. 62.

PROFESSOR HANN discusses the climate of Vienna on the basis of the observations made by the Central Meteorological Institute from 1852 to 1872 in the Wieden suburb in the south-east of the town, and from 1872 to 1900 in a more open situation north of the town. Each element of the climate is discussed in detail and the results set forth in tables, from which the following little conspectus is compiled :—

*Mean Monthly Climate of Vienna, 1851—1900.*

| | Jan. | Feb. | Mar. | Apr. | May. | June | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MeanTemp | 28°6 | 32°4 | 39°0 | 48°9 | 57°2 | 63°9 | 67°3 | 65°8 | 59°4 | 49°6 | 38°3 | 30°9 | 48°5 |
| Mean Max. | 49·1 | 51·8 | 63·5 | 73·0 | 81·0 | 85·5 | 90·0 | 88·5 | 81·5 | 72·0 | 58·3 | 50·2 | 91·8 |
| Mean Min. | 10·2 | 14·4 | 19·8 | 30·0 | 37·6 | 47·8 | 51·3 | 49·5 | 41·0 | 32·2 | 19·2 | 12·2 | 5·7 |
| Absol. Max | 58·1 | 63·5 | 74·5 | 83·3 | 91·6 | 93·9 | 97·7 | 97·2 | 90·5 | 82·0 | 70·7 | 67·2 | 97·7 |
| Absol. Min | —8·0 | —4·0 | 2·7 | 17·8 | 27·5 | 39·7 | 45·1 | 42·1 | 30·9 | 21·6 | 5·2 | —4·4 | —8·0 |
| MeanCloud | 7·1 | 6·6 | 6·0 | 5·5 | 5·4 | 5·1 | 4·7 | 4·5 | 4·6 | 5·8 | 7·3 | 7·4 | 5·84 |
| Rainfall *in.* | 1·46 | 1·30 | 1·85 | 1·97 | 2·84 | 2·76 | 2·80 | 2·68 | 1·73 | 1·85 | 1·64 | 1·64 | 24·52 |
| No. of Rainy days | 13·0 | 11·2 | 12·8 | 12·3 | 13·6 | 13·7 | 14·0 | 12·3 | 10·5 | 12·5 | 13·3 | 13·8 | 153·0 |

The discussion is particularly valuable on account of the example it gives of the scientific treatment of observations extending over a long period.

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*Some Economic Aspects of the Heat and Drought of July, 1901. in the United States.* By ROBERT DE C. WARD. Reprinted from the "Bulletin" of the American Geographical Society, October, 1901. Size 9½ × 6. Pp. 10.

A STUDY of the fluctuation of trade in the United States during the remarkable heat and drought of last summer. The author shows that disturbances, traceable directly or indirectly to the abnormal weather, made themselves felt in almost every branch of trade over the whole country.

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*The Climate and Weather of Sevenoaks.* By W. W. WAGSTAFFE, B.A., F.R.C.S. [1901]. Size 7½ × 5. Pp. 4 and charts.

THE author gives diagrams showing the mean monthly results of observations during the ten years 1890—99 of average and extreme temperature and rainfall. While we agree that the diagrammatic form is the best for displaying the conditions of climate, we should have been glad if Mr. Wagstaffe had also given the monthly figures from which his curves were drawn.

## METEOROLOGICAL NEWS AND NOTES.

THE SCOTTISH ANTARCTIC EXPEDITION, which has been organized by Mr. W. S. Bruce and will sail next summer under his command, has now taken definite shape. A Norwegian whaler has been purchased and is being brought to the Clyde, where she will be refitted and equipped for scientific work. The expedition under Mr. Bruce will be of special interest for several reasons; for one thing the leader is a scientific man of both Antarctic and Arctic experience; for another the place selected for entering the Polar area, Weddell Sea, south of the Falkland Islands, is a region which many authorities look upon as the most promising for obtaining high latitudes. But meteorologists have a special cause for congratulation in the successful inauguration of the new expedition, because the question of the atmospheric conditions, probably the most important scientific problem the South Polar region offers for solution, is to be studied by the well-known Edinburgh meteorologist, Mr. R. C. Mossman, who will, we are happy to learn from the *Scotsman*, probably accompany Mr. Bruce.

INTERNATIONAL BALLOON ASCENTS for scientific observations in the first weeks of September, October and November took place only in Austria, France, Germany and Russia. In France M. Teisserenc de Bort's unmanned balloon reached a height of 46,500 feet, temperature —67°·4 F. in September; 47,600 feet, temperature —72°·4 F. in October; and 43,300 feet, temperature —79°·6 F. in November. The Berlin balloon in November reached a height of 39,400 feet, where a temperature of —73°·1 F. was registered. *Nature* for January 9th, which supplies this information, also contains an interesting illustrated article by Mr. W. N. Shaw, F.R.S., on "Scientific Ballooning," in which he points out in mitigation of the apparent neglect of researches on the upper air in this country that the insularity of the British Isles introduces a very serious difficulty in the way of high ballooning not experienced on a continent.

MARCONI'S WIRELESS TELEGRAMS across the Atlantic promise results of extraordinary importance to meteorologists. There seems to be no reason to doubt that before long every large liner will remain in continuous communication with the shore during the whole of the trans-Atlantic passage. The path of atmospheric disturbances to the west of our islands should thus be capable of being ascertained with a great degree of accuracy, and the basis of our weather forecasts should be notably strengthened thereby. Practical results of great importance locally will follow when storm-warnings can be issued for the west coasts of Ireland and Scotland a reasonable time in advance of the storm. The long-talked of scheme for a cable to Iceland will possibly be dropped in favour of a wireless installation.

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ERRATUM.—P. 165, line 9 from bottom, *for* "about full moon," *read* "about new moon."

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JULY, 1901.

| STATIONS. (*Those in italics are South of the Equator.*) | Absolute. Maximum. Temp. | Date. | Absolute. Minimum. Temp | Date. | Average. Max. | Min. | Dew Point. | Humidity. | Absolute. Max. in Sun. | Min. on Grass. | Total Rain. Depth. | Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0-100 | ° | ° | inches | | |
| London, Camden Square | 89·9 | 19 | 48·4 | 8 | 78·4 | 55·9 | ... | ... | 139·8 | 44·8 | 5·04 | 8 | 4·4 |
| Malta | 103·0 | 3 | 64·3 | 8 | 89·2 | 71·0 | 66·6 | 64 | 162·9 | 60·3 | ·00 | 0 | 0·6 |
| Lagos, W. Africa | 86·0 | 6*a* | ... | ... | 82·2 | ... | 73·5 | 85 | 144·0 | 59·0 | 29·92 | 22 | 6·2 |
| *Cape Town* | 77·8 | 24 | 38·6 | 18 | 62·2 | 48·3 | 49·2 | 81 | ... | ... | 5·10 | 13 | 5·7 |
| *Mauritius* | 78·1 | 25 | 56·2 | 16 | 75·5 | 62·9 | 61·0 | 77 | 131·1 | 48·0 | 1·91 | 20 | 5·4 |
| Calcutta | 94·0 | 5 | 74·3 | 14 | 89·7 | 78·7 | 78·1 | 85 | 153·4 | 73·1 | 12·99 | 18 | 8·4 |
| Bombay | 88·1 | 15 | 74·2 | 8 | 84·9 | 77·7 | 77·0 | 87 | 136·4 | 73·4 | 32·70 | 30 | 9·0 |
| Colombo, Ceylon | 88·9 | 26 | 72·8 | 10 | 86·4 | 76·6 | 77·1 | 86 | 149·0 | 70·0 | 4·52 | 18 | 6·3 |
| *Melbourne* | 58·7 | 7 | 30·0 | 6 | 52·2 | 39·8 | 41·5 | 87 | 115·2 | 22·9 | 1·26 | 10 | 7·2 |
| *Adelaide* | 61·0 | 4*b* | 36·6 | 2 | 57·5 | 43·7 | 43·0 | 76 | 127·1 | 27·5 | 2·07 | 19 | 7·3 |
| *Sydney* | 68·0 | 21 | 38·8 | 30 | 56·2 | 44·4 | 40·7 | 80 | 106·3 | 30·0 | 3·93 | 16 | 5·1 |
| *Wellington* | 58·0 | 11 | 30·0 | 5 | 51·5 | 40·1 | 36·2 | 70 | 98·0 | 22·0 | 5·50 | 20 | 5·0 |
| *Auckland* | 59·0 | 3*c* | 38·0 | 7 | 56·0 | 46·5 | 42·8 | 74 | 119·0 | 34·0 | 9·14 | 26 | 6·0 |
| Jamaica, Halfway Tree | 90·0 | 20 | 70·0 | 24 | 87·0 | 72·2 | 71·9 | 80 | ... | ... | 5·53 | 8 | 4·8 |
| Trinidad | 94·0 | 17 | 70·0 | sev. | 87·3 | 72·5 | 74·2 | 82 | 164·0 | 55·0 | 8·38 | 17 | ... |
| Grenada | 86·0 | 5 | 69·6 | 20 | 83·4 | 74·1 | 71·7 | 82 | 146·0 | ... | 12·58 | 23 | 3·0 |
| Toronto | 94·0 | 18 | 53·3 | 9 | 84·2 | 63·3 | 63·6 | 74 | 113·4 | 49·6 | 3·37 | 15 | 5·0 |
| Fredericton, N.B. | 92·7 | 15 | 45·5 | 25 | 77·3 | 55·4 | 55·1 | 60 | ... | ... | 3·08 | 19 | 4·2 |
| Winnipeg, Manitoba | 92·8 | 14 | 50·7 | 30 | 82·2 | 58·3 | ... | ... | ... | ... | 3·12 | 8 | 4·2 |
| Victoria, B.C. | 68·0 | 30 | 45·8 | 12 | 63·9 | 50·8 | .. | ... | ... | ... | ·19 | 3 | 5·1 |
| Dawson, Yukon | 85·0 | 26 | 41·0 | 22 | ... | ... | ... | ... | ... | ... | 1·32 | 3 | ... |

*a*—and 12, 15, 16. *b*—and 18. *c*—and 10, 19.

### REMARKS.

MALTA.—Mean temp. of air 79°·6, or 2°·2 above the average. Mean hourly velocity of wind 5·5 miles, or 2°·2 below the average. Mean temp. of sea 80°·5. L on 4 days. J. F. DOBSON.

*Mauritius.*—Mean temp. of air 0°·9, and of dew point 1°·4, above; and R ·35 in. below their respective averages. Mean hourly velocity of wind 11·3 miles, or 0·5 below the average; extremes, 24·9 on 15th and 3·2 on 12th; prevailing direction E.S.E. T. F. CLAXTON.

*Adelaide.*—Mean temp. of air 50°·6, or 0°·9; and R ·48 in. below their respective averages. Very high barometer. Max. reading 30·69, min. 29·90. Only three higher readings in July in past 44 years. C. TODD, F.R.S.

*Sydney.*—Mean temp. of air 2°·0 below, R ·55 in. below, and humidity 3·3 above their respective averages. H. C. RUSSELL, F.R.S.

*Wellington.*—Mean temp. of air 1°·8 below, and R ·84 in. below, their respective averages. A showery month with some cold weather; frequent frosts; snow on 6th and 7th; hail on 7th; fog on seven days, generally moderate winds from N.W. and S. Earthquake on 17th at 8.32 p.m., very slight. R. B. GORE.

*Auckland.*—A rainy month, the total R being very nearly double the average of the previous 32 years, and with one exception (July, 1882) the heaviest recorded for the month. T. F. CHEESEMAN.

TRINIDAD.—R 1·07 in. below the 30 years' average. J. H. HART.

# SUPPLEMENTARY TABLE OF RAINFALL, DECEMBER, 1901.

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| I. | Uxbridge, Harefield Pk.. | 3·86 | XI. | Castle Malgwyn ..... | 6·85 |
| II. | Dorking, Abinger Hall . | 5·35 | ,, | Builth, Abergwesyn Vic. | 10·33 |
| ,, | Sheppey, Leysdown ..... | 2·84 | ,, | Rhayader, Nantgwillt ... | 9·21 |
| ,, | Hailsham ..... | 5·33 | ,, | Lake Vyrnwy ..... | 9·13 |
| ,, | Crowborough..... | 6·21 | ,, | Corwen, Rhug ..... | ... |
| ,, | Ryde, Beldornie Tower.. | 3·60 | ,, | Criccieth, Talarvor ..... | 5·45 |
| ,, | Emsworth, Redlands ... | 4·12 | ,, | I. of Anglesey, Lligwy.. | 4·32 |
| ,, | Alton, Ashdell ..... | 5·44 | ,, | Douglas, Woodville..... | 5·76 |
| ,, | Newbury, Welford Park | 5·29 | XII. | Stoneykirk, Ardwell Ho. | 4·91 |
| III. | Oxford, Magdalen Coll.. | 3·28 | ,, | New Galloway, Glenlee | ... |
| ,, | Banbury, Bloxham ..... | 3·92 | ,, | Moniaive, Maxwelton Ho. | 5·59 |
| ,, | Pitsford, Sedgebrook ... | 3·39 | ,, | Lilliesleaf, Riddell ..... | 4·54 |
| ,, | Huntingdon, Brampton. | 3·01 | XIII. | N. Esk Res. [Penicuick] | 4·70 |
| ,, | Wisbech, Bank House... | 3·77 | XIV. | Glasgow, Queen's Park.. | 4·43 |
| IV. | Southend ..... ..... | 2·76 | XV. | Inveraray, Newtown ... | 7·01 |
| ,, | Colchester, Lexden ..... | 2·93 | ,, | Ballachulish, Ardsheal... | 7·83 |
| ,, | Saffron Waldon, Newport | 3·04 | ,, | Islay, Eallabus..... | 4·59 |
| ,, | Rendlesham Hall ..... | 3·55 | XVI. | Dollar..... | 4·76 |
| ,, | Swaffham ..... | 3·94 | ,, | Balquhidder, Stronvar... | 10·27 |
| V. | Salisbury, Alderbury ... | 5·07 | ,, | Coupar Angus Station... | 3·09 |
| ,, | Bishop's Cannings ..... | 5·24 | ,, | Blair Atholl ... ..... | 3·43 |
| ,, | Blandford, Whatcombe . | 5·71 | XVII. | Keith H.R.S..... | 4·14 |
| ,, | Ashburton, Druid House | 10·36 | ,, | Forres H.R.S. ... ..... | ... |
| ,, | Okehampton, Oaklands. | 8·49 | XVIII. | Fearn, Lower Pitkerrie.. | 3·62 |
| ,, | Hartland Abbey ..... | 6·57 | ,, | S. Uist, Askernish ..... | ... |
| ,, | Lynton, Glenthorne ... | ... | ,, | Invergarry..... | 4·50 |
| ,, | Probus, Lamellyn ..... | 6·96 | ,, | Aviemore, Alvie Manse. | 3·42 |
| ,, | Wellington, The Avenue | 6·32 | ,, | Loch Ness, Drumnadrochit | 6·20 |
| ,, | North Cadbury Rectory | 6·32 | XIX. | Inversbin ..... | 2·23 |
| VI. | Clifton, Pembroke Road | 5·42 | ,, | Durness..... | ... |
| ,, | Ross, The Graig ..... | 4·48 | ,, | Watten H.R.S..... | 4·22 |
| ,, | Wem, Clive Vicarage ... | 4·33 | XX. | Dunmanway, Coolkelure | 8·99 |
| ,, | Codsall ..... | 3·69 | ,, | Cork, Wellesley Terrace | 5·78 |
| ,, | Cheadle, The Heath Ho. | 4·75 | ,, | Killarney, District Asyl. | 6·40 |
| ,, | Coventry, Priory Row .. | 4·34 | ,, | Caher, Duneske ..... | 4·22 |
| VII. | Market Overton ..... | 5·27 | ,, | Ballingarry, Hazelfort... | 3·03 |
| ,, | Grantham, Stainby ..... | 4·34 | ,, | Limerick, Kilcornan ... | ... |
| ,, | Horncastle, Bucknall ... | 4·63 | ,, | Miltown Malbay ..... | 4·69 |
| ,, | Worksop, Hodsck Priory | 5·05 | XXI. | Gorey, Courtown House | 3·54 |
| VIII. | Neston, Hinderton ..... | 3·57 | ,, | Moynalty, Westland ... | 3·82 |
| ,, | Southport, Hesketh Park | 3·83 | ,, | Athlone, Twyford ..... | 3·42 |
| ,, | Chatburn, Middlewood. | 5·50 | ,, | Mullingar, Belvedere ... | 3·70 |
| ,, | Duddon Val., Seathwaite Vic. | 9·83 | XXII. | Woodlawn ..... | 3 81 |
| IX. | Baldersby ..... | 3·65 | ,, | Crossmolina, Enniscoe .. | 5·86 |
| ,, | Scalby, Silverdale ..... | 4·50 | ,, | Collooney, Markree Obs. | 5·56 |
| ,, | Ingleby Greenhow Vic.. | ... | XXIII. | Enniskillen, Model Sch. | 4·13 |
| ,, | Middleton, Mickleton ... | 2·53 | ,, | Warrenpoint..... | 3·43 |
| X. | Haltwhistle, Unthank H. | ... | ,, | Miltown, Banbridge..... | 3·20 |
| ,, | Bamburgh ..... | 5·21 | ,, | Belfast, Springfield ..... | 4·69 |
| ,, | Keswick, The Bank..... | 6·27 | ,, | Bushmills, Dundarave.. | 3·90 |
| XI. | Llanfrechfa Grange ..... | 6·40 | ,, | Stewartstown ..... | 3·08 |
| ,, | Treherbert, Tyn-y-waun | 13·63 | ,, | Killybegs ..... | 8·57 |
| ,, | Llandovery ..... | 7·23 | ,, | Horn Head ..... | 5·90 |

# DECEMBER, 1901.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1890-9. | Greatest Fall in 24 hours. Dpth | Date | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date | Min. Deg. | Date. | No. of Nights below 32°. In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches. | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | 3·07 | + 1·14 | ·64 | 12 | 17 | 55·7 | 7 | 23·3 | 20 | 14 | 21 |
| II. | | Tenterden ..... | 5·14 | + 2·91 | 1·33 | 12 | 24 | 53·0 | 2*a* | 26·0 | 17*e* | 14 | 22 |
| ,, | | Hartley Wintney ..... | 3·76 | + 1·62 | ·77 | 12 | 19 | 55·0 | 30*b* | 19·0 | 23 | 21 | 21 |
| III. | | Hitchin ..... ..... | 3·50 | + 1·56 | 1·10 | 13 | 16 | 56·0 | 30 | 22·0 | 19*f* | 20 | ... |
| ,, | | Winslow (Addington) ..... | 3·01 | + 1·00 | ·91 | 12 | 17 | 55·0 | 30 | 17·0 | 20 | 20 | 22 |
| IV. | | Bury St. Edmunds (Westley) | 3·16 | + 1·05 | 1·19 | 12 | 17 | 55·0 | 30 | 22·0 | 20 | 16 | ... |
| ,, | | Norwich (Brundall) ..... | 4·14 | ... | 1·60 | 12 | 20 | 56·0 | 7 | 24·4 | 23 | 12 | 24 |
| V. | | Winterborne Steepleton ..... | 6·86 | ... | 1·00 | 28 | 17 | 53·0 | 7 | 18·8 | 23 | 13 | 20 |
| ,, | | Torquay (Cary Green) ... ..... | 7·30 | ... | 1·24 | 28 | 19 | 55·7 | 7 | 27·8 | 20 | 8 | 17 |
| ,, | | Polapit Tamar [Launceston].. | 7·26 | + 3·60 | ·82 | 24 | 26 | 55·9 | 30 | 19·8 | 21 | 12 | 15 |
| VI. | | Stroud (Upfield) ..... | 5·19 | + 2·96 | 1·17 | 28 | 19 | 52·0 | 7*b* | 23·0 | 22 | 20 | ... |
| ,, | | Church Stretton (Woolstaston) | 4·56 | + 2·01 | ·96 | 7 | 21 | 52·5 | 7 | 17·0 | 22 | 17 | 23 |
| ,, | | Worcester (Diglis Lock) ..... | 3·54 | + 1·64 | ·91 | 28 | 18 | ... | ... | ... | ... | ... | ... |
| VII. | | Boston ..... | 4·32 | + 2·77 | 1·80 | 12 | 12 | 55·0 | 7 | 19·0 | 20 | 19 | ... |
| ,, | | Hesley Hall [Tickhill]..... | 4·60 | + 2·74 | 1·06 | 12 | 16 | 56·0 | 7 | 20·0 | 22 | 16 | ... |
| ,, | | Derby (Midland Railway)..... | 5·44 | + 3·58 | 1·45 | 12 | 23 | 53·0 | 30 | 15·0 | 19 | 18 | ... |
| VIII. | | Manchester (Plymouth Grove) | 4·61 | + 1·81 | ·90 | 7 | 22 | 54·0 | 6*c* | 18·0 | 21 | 13 | 17 |
| IX. | | Wetherby (Ribston Hall) ... | 4·96 | + 3·04 | ·75 | 12 | 17 | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) ..... | 9·49 | + 3·03 | 1·18 | 7, 13 | 22 | ... | ... | ... | ... | ... | ... |
| ,, | | Hull (Pearson Park). ... ..... | 4·18 | + 1·98 | 1·11 | 12 | 18 | 54·0 | 8 | 20·0 | 20 | 20 | 25 |
| X. | | Newcastle (Town Moor) ..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Borrowdale (Seathwaite)..... | 16·01 | + 1·08 | 2·75 | 23 | 20 | 52·5 | 6 | 11·3 | 20 | 13 | ... |
| XI. | WALES. | Cardiff (Ely)..... | 7·11 | + 3·02 | 1·00 | 7 | 19 | ... | ... | ... | ... | ... | ... |
| ,, | | Haverfordwest ..... | 6·12 | + 1·41 | ·74 | 7 | 23 | 53·8 | 8 | ... | ... | 8 | 19 |
| ,, | | Aberystwith (Gogerddan) ... | 6·37 | + 1·82 | 1·13 | 7 | 19 | 51·0 | 2*c* | 14·0 | 22 | 11 | ... |
| ,, | | Llandudno..... | 3·94 | + 1·04 | ·55 | 7 | 25 | 54·5 | 8 | 28·0 | 21*f* | 3 | ... |
| XII. | SCOTLAND. | Cargen [Dumfries] ..... | 5·38 | + ·66 | 1·19 | 23 | 14 | 52·0 | 6 | 21·0 | 16 | 14 | ... |
| XIII. | | Edinburgh (Royal Observatory) | 2·47 | ... | ·55 | 28 | 17 | 53·5 | 7 | 23·5 | 17 | 16 | 19 |
| XIV. | | Colmonell ..... | 6·89 | + 2·04 | 1·66 | 23 | 18 | 52·0 | 6 | 20·0 | 21 | ... | ... |
| XV. | | Tighnabruaich ..... | 5·69 | ... | ·70 | 23 | 23 | 49·0 | 8 | 25·0 | 21*f* | 21 | ... |
| ,, | | Mull (Quinish)..... | 6·59 | + ·34 | ·65 | 5 | 24 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Leven Sluices ..... | 2·34 | — 1·31 | ·75 | 29 | 9 | ... | ... | ... | ... | ... | ... |
| ,, | | Dundee (Eastern Necropolis) | 2·85 | + ·04 | ·45 | 23 | 16 | 54·0 | 6 | 25·5 | 28 | 18 | ... |
| XVII. | | Braemar ..... .. | 4·02 | + 1·01 | ·63 | 19 | 24 | 50·8 | 6 | 9·5 | 17 | 23 | 28 |
| ,, | | Aberdeen (Cranford) ... ..... | 3·78 | + ·80 | ·65 | 25 | 23 | 57·0 | 2 | 19·0 | 16 | 21 | ... |
| ,, | | Cawdor (Budgate) ..... | 3·55 | + ·94 | ·41 | 10 | 21 | ... | ... | ... | ... | ... | ... |
| XVIII | | Strathconan [Beauly] ..... | 6·18 | + ·23 | 1·30 | 2 | 11 | ... | ... | ... | ... | ... | ... |
| ,, | | Glencarron Lodge..... | 10·57 | + ·14 | 1·72 | 6 | 24 | ... | .. | ... | ... | ... | ... |
| XIX. | | Dunrobin ..... | 3·69 | + ·23 | ·55 | 10*h* | 18 | 53·0 | 6 | 26·5 | 17 | ... | ... |
| ,, | | S. Ronaldshay (Roeberry) ... | 4·48 | + ·50 | ·37 | 10 | 30 | 50·0 | 1 | 27·0 | 9 | 15 | ... |
| XX. | IRELAND. | Darrynane Abbey..... | 5·41 | + ·08 | 1·32 | 11 | 27 | ... | ... | ... | ... | ... | ... |
| ,, | | Waterford (Brook Lodge) ... | 4·64 | + ·77 | 1·30 | 11 | 20 | 54·0 | 2 | 19·0 | 21 | 16 | ... |
| ,, | | Broadford (Hurdlestown) ... | 3·15 | — ·11 | ·56 | 7 | 24 | 50·0 | 6, 7 | 26·0 | 16*g* | 14 | ... |
| XXI. | | Carlow (Browne's Hill) ..... | 3·31 | — ·07 | ·46 | 7 | 21 | ... | ... | ... | ... | ... | ... |
| ,, | | Dublin (Fitz William Square) | 1·99 | — ·36 | ·62 | 7 | 23 | 55·9 | 8 | 24·0 | 21 | 9 | 22 |
| XXII. | | Ballinasloe ..... ..... | 3·57 | — ·02 | ·69 | 7 | 22 | 60·0 | 6*d* | 20·0 | 13 | 21 | ... |
| ,, | | Clifden (Kylemore) ..... .. | 7·52 | — ·70 | ·80 | 27 | 27 | ... | ... | ... | ... | ... | ... |
| XXIII | | Seaforde..... | 3·48 | + ·05 | ·63 | 27 | 21 | 53·0 | 6 | 22·0 | 20*f* | 15 | 20 |
| ,, | | Londonderry (Creggan Res.). | 4·54 | + ·42 | ·56 | 15 | 26 | ... | ... | ... | ... | ... | ... |
| ,, | | Omagh (Edenfel) ..... | 4·93 | + ·99 | ·50 | 23 | 21 | 53·0 | 6 | 20·0 | 20 | 17 | 22 |

+ Shows that the fall was above the average ; — that it was below it.

*a*—and 7, 8, 30. *b*—and 31. *c*—and 30. *d*—and 30, 31. *e*—and 20. *f*—and 22. *g*—and 26. *h*—and 28.

# METEOROLOGICAL NOTES ON DECEMBER, 1901.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

LONDON, CAMDEN SQUARE.—A cloudy month, but with occasional very fine days. The second and fourth weeks were very wet. Mean temp. 39°·3, or 0°·1 above the average. Little frost of any consequence and slight S on only one day. Shower of soft H at 3·24 p.m. on 9th, some of the stones being a quarter-of-an-inch in diameter.

TENTERDEN.—Rough and wet in the second week and at the close. Frost from 15th to 23rd. Half-an-inch of S on morning of 16th. Duration of sunshine 66 hours. W.S.W. gale on 8th and S gale on 12th.

HARTLEY WINTNEY.—A wet and wintry month, with frost on 21 days and S on five. The wettest December since 1887. Dense fog from 20th to 24th; many sunny mornings. Ozone on 17 days, mean 4·8. Very wild on 8th, with distant TS in W. R for the year 2·80 in. below the average.

WINSLOW, ADDINGTON.—The wettest month of the year. Low max. temp. from 10th to 27th, when a considerable rise in the temp. occurred lasting until the end. Dense fog on 22nd and 23rd.

BURY ST. EDMUNDS, WESTLEY.—A wet month. S and R on 12th and 24th.

NORWICH, BRUNDALL.—The first and last weeks were very mild, but many winterly traits were exhibited in the middle fortnight. S fell on 9th, 14th, 15th and 22nd, the last being a heavy fall, but the heavy R on Christmas Eve quickly thawed it. A downpour of R occurred on the night of the 12th, amounting to 1·60 in. in 24 hours. L on the evenings of the 8th, 9th and 10th. R 1·80 in. above the average; that of the year being 5·84 in. below.

WINTERBORNE STEEPLETON.—A wet month, which helped towards making up the deficiency of R in the previous months. From 15th to 28th the temp. was very low, frost being registered on the grass on each day. The grass min. of 13°·5 on 23rd was the lowest of the year.

TORQUAY, CARY GREEN.—Duration of sunshine 9·8 hours above the average. Mean temp. 0°·1 below the average. Mean ozone 5·0; max., 8·0 on 24th with W. wind; min., 1·0 on 3rd with N.E. wind, and on 20th and 21st with W.N.W. wind.

POLAPIT TAMAR [LAUNCESTON].—Very wet, having the heaviest R for December during 21 years. Vivid L between 10 p.m. and midnight on 18th.

CHURCH STRETTON, WOOLSTASTON.—On the whole a very cold and severe month. On 13th the S was very close and dense and quite 18 inches deep. S on 10 days.

MANCHESTER, PLYMOUTH GROVE.—A very changeable month of storm, fog and fine weather.

SKIPTON, ARNCLIFFE VIC.—Deep S, lasting for three weeks. Thaw began on 26th.

## WALES.

HAVERFORDWEST.—Variable in the extreme, with sudden changes of temp. and pressure, which were developed with little or no warning. The Precelly range was white from 12th to 28th; S from 7 to 8 inches in depth. On the whole, cold and exceptionally stormy, especially from 12th to 14th and 23rd to 26th. Hours of bright sunshine 16·4.

ABERYSTWITH, GOGERDDAN.—The wettest month of the year. Heavy winds, R and sharp frosts, with but little sunshine.

## SCOTLAND.

CARGEN [DUMFRIES].—Alternation of frost and thaw, causing great anxiety to owners of live-stock. L and S together on 9th and 10th.

COLMONELL.—Mean temp. 38°·1, or 0°·3 above the average of 25 years. S on 6 days and H on 4; T and L on 7th.

TIGHNABRUAICH, CRAIGANDARAICH.—A cold and windy month. T and L on 8th.

ABERDEEN, CRANFORD.—Rough, wet weather. S in the country.

S. RONALDSHAY, ROEBERRY.—A very cold and wet month. Mean temp. 2°·1 below the mean of 11 years.

## IRELAND.

DARRYNANE ABBEY.—A very wet month, the middle part also very cold. Heavy fall of wet S on the night of 11th and frost for some days afterwards. H on 3 days.

WATERFORD, BROOK LODGE.—Much colder December than usual. S on 12th, H on 21st, and L on 8th.

DUBLIN, FITZWILLIAM SQUARE.—As usual, changeable, damp and dull. The westerly winds were often strong and blustering, and the R, though not large, was frequent. The month opened and closed with mild weather, but a cold period lasted from 8th to 29th. Mean temp. 40°·5, or 0°·8 below the average. Duration of sunshine 63 hours 30 mins. High winds on 16 days, reaching the force of a gale on 6. Fog on 7 days. S or sleet on 5 days and H on 6. L on 8th.

OMAGH, EDENFEL.—Raw and inclement, with heavy R and short sharp spells of frost between, and occasional strong winds and gales during the last fortnight.

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## GENERAL WEATHER IN GLEN NEVIS, DECEMBER, 1901.

By R. C. MOSSMAN, F.R.S.E.

| Deduced from observations at 9 a.m. and 9 p.m. | *Ben Nevis.* | *Achariach.* | *Fort William.* |
|---|---|---|---|
| Height | 4407 feet. | 150 feet | 42 feet |
| Rainfall | 25·43 ins. | 11·80 in. | 9·98 in. |
| No. of days | 28 | 29 | 26 |
| Max. fall in 24 hours | 3·29 in., 6th | 1·88 in., 6th | 2·45 in., 30th |
| Highest temp. in shade | 37°·5, 6th | 55°·2, 6th | 53°·0, 6th |
| Lowest ,, ,, | 11°·9, 18th | 17°·1, 22nd | 18°·2, 22nd |
| Mean temp(Mean daily max.& min.) | 23°·2 | 37°·6 | 37°·1 |
| Temp. in shade below 32° | on 31 nights | 13 nights | 15 nights |
| Below 32° on grass | ? | 20 | 21 |
| Bright sunshine | 15·2 hours | 0·0 hours* | 11·5 hours |
| Sunless days | 25 | 31 | 20 |
| Mean relative humidity | 97 | 85 | 85 |
| Mean amount of cloud | 8·6 | 7·9 | 7·6 |

* No possible sunshine; sun cut off all month by surrounding hills.
Rainfall at head of Glen Nevis, 2 miles above Achariach, and 357 feet above the sea, 11·57 in.