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	

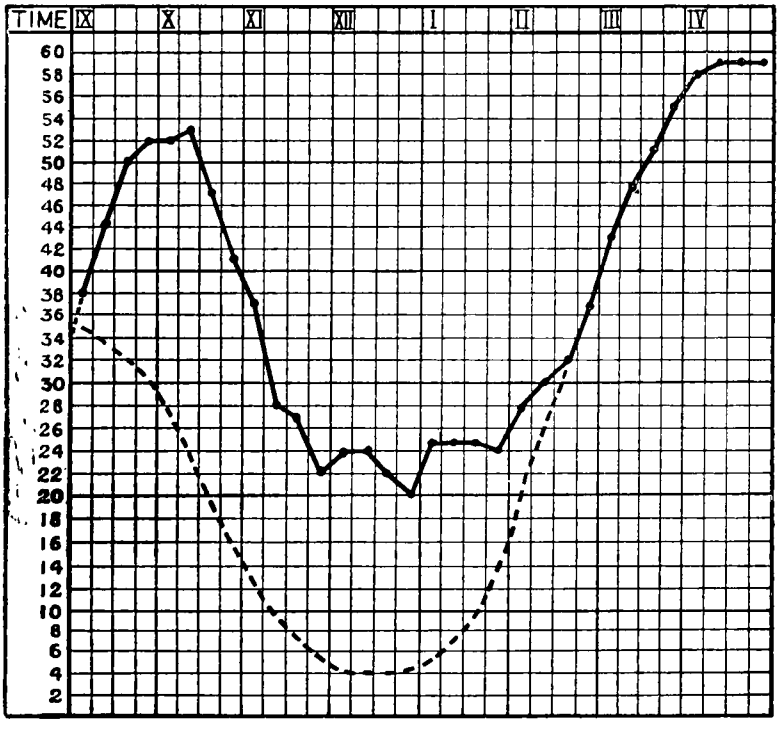
The tables show that November, December and January are pre-eminently the dark months, although November is a good deal behind the other two.

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.

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 × 8½. Pp. 1400.

Report of the Administration of the Meteorological Department of the Government of India in 1900-1901. By JOHN ELIOT. Size 14 × 10½. 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, 13½ × 8½. 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.

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.

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.

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.	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.	Invershin	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	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) ...	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.

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.