

SYMONS'S METEOROLOGICAL MAGAZINE.

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THE GOVERNMENT AND METEOROLOGY.

It is exactly a year since the appointment of a Treasury Committee "to inquire and report as to the administration by the Meteorological Council of the existing Parliamentary grant," and rumours have recently been heard to the effect that the Committee had agreed upon a report recommending certain changes. It is somewhat disappointing to find that this is not the case, and that we have still to wait several months before the result of the deliberations of the Committee can be known. Sir Herbert Maxwell has sent the following letter to *The Times*, where it was published on Dec. 11th :—

To the Editor of The Times.

SIR,—As I have received numerous inquiries as to when the report of the Committee on the Meteorological Grant will be presented, and some complaints on the ground of delay, perhaps you will allow me to explain the circumstances.

The evidence was closed in July; the committee reassembled in October to consider report, and made considerable progress; but the serious illness of one member and the absence of another on the Continent have obliged us to defer the final meetings till February.

I am, Sir, your obedient servant,

HERBERT MAXWELL, *Chairman.*

Monreith, Dec. 9th.

METEOROLOGY AT THE BRITISH ASSOCIATION.

SECOND ARTICLE.

THE number of meteorological papers read at the Southport meeting of the British Association was greater than usual, and the interest shown in Meteorology was more apparent than at any meeting during the last nineteen years. As frequently happens at great gatherings, however, the informal intercourse of persons interested in a special subject proved more stimulating and helpful than the regular meetings for the reading and discussion of papers. The formal meetings attracted good audiences as a rule, and we give some account of such of the papers as could be obtained in abstract or were sufficiently interesting to be reported in the daily press.

It must be confessed, however, that the local newspapers, on which one usually relies to supplement the data obtained at the meetings which it was impossible to attend personally, preferred to put on record the debates on such subjects as the Fiscal Question and Education, near enough the borderland of science to catch some reflected warmth from the forbidden fires of politics; indeed, one reporter said in his haste, "Nobody cares for meteorology."

The following are the titles of papers of meteorological interest:—

Read on Thursday, 10th September.

IN SECTION E. (Geography.)

Presidential Address, by Captain Ettrick W. Creak, C.B., F.R.S., dealing comprehensively with Terrestrial Magnetism.

Read on Friday, 11th September.

IN SECTION A. (Mathematical and Physical Science.)

"Methods of Meteorological Investigation," by Dr. W. N. Shaw, F.R.S.
[See this Magazine for October, pp. 151—159].

"On Simultaneous Solar and Terrestrial Changes," by Sir Norman Lockyer, K.C.B., F.R.S.

"On the Relation of the Rainfall of Scotland to the Sun-spot Periods 1855—98," by Dr. A. Buchan, F.R.S.—[An abstract of Dr. Buchan's results appeared in this Magazine for August, pp. 116-117].

"On Barometric Depressions," by M. Teisserenc de Bort.

"On the Origin and Forms of Hoar Frost," with lantern illustrations, by Dr. K. Grossman and Mr. J. Lomas.

IN SECTION E.

"The Influence of Ice-melting on Oceanic Circulation," by Professor Otto Pettersson.

"An Experiment on the Melting of Ice in Salt Water," by Mr. J. W. Sandstrom.

"Afforestation of Waterworks Catchment Areas, with special reference to the case of Liverpool," by Mr. J. Parry, C.E.

On Monday, 14th September.

IN SECTION A.

"On the Employment of the Hair Hygrometer in place of the Psychrometer," by Professor J. M. Pernter.

"On the General Circulation of the Atmosphere," by Professor H. H. Hildebrandsson.—[The results of the work were noticed in this Magazine for August, pp. 122-123].

"Report of the Kite Committee," by Mr. W. H. Dines [see below].

"Kite Observations at Blue Hill, 1900—02," by Mr. A. L. Rotch.

"Work of the International Aeronautical Committee," by Professor H. Hergesell.

"Phenomena accompanying the Volcanic Eruptions in the West Indies," by Mr. D. Burns.

On Tuesday, 15th September.

IN SECTION A.

"Report of the Seismological Committee," by Professor J. Milne, F.R.S.

"Radiation from a Foggy Atmosphere," by Professor A. Schuster, F.R.S.
[An abstract will be published in an early number].

- "Solar Prominences and Terrestrial Magnetism," by Rev. A. L. Cortie.
- "Comparison of the Spectrum of Nitrogen and of the Aurora," by Dr. A. Paulsen.
- "Diurnal Variation of Temperature in the Levant and its relation to Radiation," by Dr. A. Buchan, F.R.S.
- "Progress of the Magnetic Survey of the United States," by Mr. L. A. Bauer.

IN SECTION G. (Engineering.)

- "Water Supply in South-West Lancashire," by Mr. J. Parry, C.E.
 - "Rainfall on the River Bann, Co. Down," by Mr. J. Smyth, C.E.—[The paper is printed in full on pp. 198-201].
 - "Rate of Fall of Rain at Seathwaite," by Dr. H. R. Mill.
- [See this Magazine for November, p. 182].

On Wednesday, 16th September.

IN SECTION A.

- "Report of the Ben Nevis Committee," by Dr. A. Buchan, F.R.S.—[We regret that we have not yet received a copy of this report, which was read from MS.]
- "Self-recording Instruments," by Professor H. L. Callendar, F.R.S.
- "A Study of Audibility as affected by Meteorological Conditions at Blue Hill during 1901," by Mr. A. L. Rotch.
- "On some Rainfall Problems," by Dr. H. R. Mill.

Altogether an embarrassment of meteorological riches, and it is with real regret that we have to limit our notice in most cases to titles, which can only tantalize the reader who desires full information.

Investigation of the Upper Atmosphere by Means of Kites in co-operation with a Committee of the Royal Meteorological Society.—Second Report of the Committee, consisting of DR. W. N. SHAW (Chairman), MR. W. H. DINES (Secretary), MR. D. ARCHIBALD, MR. C. VERNON BOYS, DR. A. BUCHAN, DR. R. T. GLAZEBROOK, DR. H. R. MILL and PROFESSOR A. SCHUSTER. Drawn up by the Secretary.

The results of last year's work have been published; a description of the apparatus and methods employed being given in the *Quarterly Journal of the Royal Meteorological Society*, Vol. XXIX., No. 126, p. 65; and a discussion of the results obtained in a paper by Dr. Shaw and myself, which appears in the *Transactions of the Royal Society*, Series A, vol. 202, p. 123.

The apparatus used at Crinan last year was erected at Oxshott in the autumn, and it was hoped that to a limited extent the observations might be continued there; but before the end of October the wire was accidentally dropped across the main road leading from Esher to Leatherhead. Fortunately the wire rested on trees on both sides of the road; but before it could be removed many carriages and bicyclists had passed under it. This accident convinced me that it would be unwise to continue the work at Oxshott, excepting for winds between south and north-west, and the winter has been devoted to an endeavour to improve the apparatus.

This I hope has been accomplished: a new winding-gear has been constructed, which so far has given every satisfaction; and the details of the construction of the kites have been altered, so that they exert a more uniform pull and seem

to be more reliable. The apparatus was brought to Crinan at the beginning of August, and in view of the uncertainty about obtaining a vessel, was erected on the same island as last year. The apparatus in the possession of the Committee now consists of—

- I. Engine, boiler, and winding-gear used last year.
- II. New winding-gear.
- III. About 14 miles of wire, six of which have been purchased this year.
- IV. Ten kites 7 ft. 6 in. high ; three kites 9 ft. high ; materials of a kite 12 ft. high.
- V. Two self-recording instruments made by M. Teisserenc de Bort.
- VI. Spare bamboo sticks, &c., for repairs.

The old winding-gear is hardly reliable, but many of the parts will be available for making another.

Application was made to the Government Grant Committee of the Royal Society for a grant of £250 for the hire of a vessel. On the suggestion of this Committee the Admiralty were asked to lend a vessel for the purpose, and they had kindly consented to do so ; but unfortunately the vessel they proposed to place at the disposal of the Kite Committee met with an accident and became unavailable. The Royal Society, however, made a grant of £200, but great difficulty was experienced in obtaining a suitable vessel owing to the lateness of the time at which inquiries about one were instituted, and to the fact that July and August are the yachting season. A steam tug, the "Renown," has been hired for a month, and reached Crinan on August 13th. The apparatus was fitted on board by the evening of the 14th, and since then daily ascents have been made. No great height (over 6,000 feet) has been reached, for the weather has been of the most unfavourable description for kite flying ; but one very interesting trace has been obtained, namely, that of August 20th, when the kite was drawn in from a height of 4,500 feet during a sudden and unexpected thunderstorm which was accompanied by extremely violent rain and hail.

Mr. Dines stated when reading his report that the kite 12 feet high was constructed and used successfully on calm days. Although strong winds and wretched weather prevailed, he succeeded in getting 38 ascents, from 20 of which good records were obtained. This year there were only seven really good days for kite-flying during the stay at Crinan, but on that very account the contrast with the records obtained during the fine weather of last year promises to be interesting.

THE SOUTHPORT METEOROLOGICAL BREAKFAST.

By the courtesy of Mr. J. A. Kay, 211, Lord Street, Southport, we this month present our readers with a reduction of the photograph of the Meteorological Breakfast at Southport (see p. 149), to which we have added a key giving the names of those whom we are able to identify. Of the sixty-two who were at the breakfast, two at least do not appear in the photograph, either because they arrived late or were concealed from the camera by their neighbours. We understand that Mr. Kay is prepared to supply copies of the original photograph (size when mounted, 13 in. × 11 in., or unmounted 11 in. × 8 in.) at a moderate price.

THE METEOROLOGICAL EXHIBITION AT SOUTHPORT.

THE "Exhibition of Instruments, &c.," arranged in connection with the visit of the International Meteorological Committee to Southport was more elaborate and interesting than its official designation implies. The greatest novelty consisted of a complete weather-forecast office at work. The telegrams on which the Daily Weather Reports of the Meteorological Office are based were repeated to Southport each morning, a map was drawn on the spot, forecasts prepared, and a separate Daily Weather Report printed and published in Southport, independent of the London Report, though of course made from the same data. The close similarity of the two simultaneous reports proved at least that different forecasters could come to the same conclusions, and the result must be looked on as satisfactory.

The greater part of the Exhibition consisted of instruments and records, which might be divided into two classes:—*historical*, associated with the beginnings of modern meteorology; and *improved*, which will, we trust, be associated with fresh advances. There was a pleasing absence of instruments such as may be seen in any first-class instrument-maker's shop, or in most meteorological observatories. The value of these has been established and is fully recognised. Thanks to the general insistence on having certificates of accuracy with all instruments purchased and the firm rules of the leading meteorological institutions, it is no longer necessary to teach observers that good instruments are better than bad.

The catalogue contained 191 entries, but in order to gain space for the consideration of most of the more strictly meteorological, we have to pass over a number of very interesting exhibits bearing on terrestrial magnetism and other allied branches of cosmical physics.

Amongst the historic instruments which did good service in their day were Whewell's anemometer and Crossley's self-registering rain gauge, dating from 1841, and exhibited by the Astronomer Royal, who also showed one of the wooden bowls used in Campbell's first pattern of sunshine recorder with a year's sunshine burnt into its surface. Later patterns were also exhibited, showing how the principle of this beautiful instrument remained unaltered while the details of construction were being improved, until Mr. R. H. Curtis's adjustable stand (exhibited by Mr. J. J. Hicks) brought the whole into its present efficient form. The Royal Meteorological Society showed the instruments used by the late Mr. Glaisher in his balloon ascents.

Amongst the less familiar instruments, the nephoscopes, or cloud mirrors, claim somewhat special notice, for there is, perhaps, no meteorological observation so unsatisfactorily made as a rule as the estimation of the amount and direction of motion of clouds. Three different patterns were shown by the Meteorological Office and Dr. W. N. Shaw. Perhaps the most interesting was Besson's portcullis nephoscope, in which a horizontal line of vertical spikes is

turned so that it coincides with the direction of motion of a cloud. This direction can then be read off on a graduated circular disc, and the angular velocity of the cloud's movement may also be measured by noting the time intervals as it passes from spike to spike.

The Kew Observatory sent the McLeod Sunshine Recorder, and Mr. A. Lander, of Canterbury, showed a new pattern of photographic sunshine recorder made of aluminium and provided with a revolving slit actuated by clockwork, instead of a lens, through which the light is thrown on the sensitive paper, giving a very sharp trace. The trouble with all photographic recorders which have to measure intensity of light is of course the difficulty of ensuring equal sensitiveness in successive batches of paper.

Mr. J. Baxendell, the director of the Fernley Observatory at Southport, whose absence from the meeting through illness was much regretted, showed several of his ingenious improvements and inventions. The most interesting was his self-recording anemoscope, both by itself for recording the direction of the wind and in combination with the Dines' pressure-tube anemometer. A neat little contrivance by which the annular space below the funnel of a 5-inch Snowdon rain gauge is converted into a hot water chamber, by which snow collected in the funnel may be melted, struck us as of considerable practical utility.

Mr. F. L. Halliwell showed the daily and weekly patterns of his beautiful recording rain gauge, the traces of which for the deluge that greeted the British Association on its opening day, attracted much attention on account of the sharpness with which the variations in intensity of fall were brought out by the curve.

Mr. R. W. Munro exhibited the latest patterns of Dines' anemometers adapted for obtaining automatic records either with the pressure-plate or the pressure-tube vane head.

The Cambridge Scientific Instrument Company brought forward several modifications of the Calendar platinum resistance thermometers adapted for giving automatic records of meteorological phenomena. The principle of all is the same: the change of resistance in a coil of platinum wire due to change of temperature upsets the balance of a Wheatstone bridge, and an automatic slider moves along a slide wire in the other arm of the bridge until the balance is restored; a pen attached to the slider records the changes upon a revolving drum. The principle is very simple, but the details present several points of great ingenuity, and the recorder, which is a large and solidly constructed instrument, is likely to be useful mainly in observatories where a trained staff is available. The thermometer is adapted for use as a sunshine recorder (or rather as a black-bulb solar radiation thermometer) by taking account of the difference in resistance of two coils, one of plain platinum wire, the other exactly similar but embedded in a thin layer of black enamel. For observing air temperature the change of resistance is measured in a fine copper wire wound on a light mica frame and enclosed in a

brass tube. This company also showed a novel device called the Blakesley Portable Barometer, the practical working of which it would be interesting to test. It consists of a straight tube closed at one end, open at the other and with a bore of about one-twentieth of an inch. The tube contains air shut in by a column of mercury about eight inches long. The length of this air space is read with the tube vertical, first with the closed end uppermost, then with the open end uppermost, and the barometric height is equal to the sum of the two readings divided by the difference of the two readings and multiplied by the length of the thread of mercury at 32° F. No temperature correction is required.

Messrs. Newton & Co. showed an altimeter designed for measuring the height of kites or balloons; and Mr. A. L. Rotch an instrument for showing the true direction and velocity of the wind at sea when its apparent direction and the speed of the ship are known. Mr. Dines exhibited his kites and winding gear; and Mr. P. Y. Alexander showed some of the unmanned balloons with which he has made interesting experiments at Bath.

Dr. W. N. Shaw exhibited the anemoidograph, a new instrument for tracing air trajectories of the kind described in this Magazine for July, p. 103; and also his thermopsychrophorus, the interesting performances of which before it had attained the dignity of so expressive a title were touched upon in this Magazine for April, 1902, p. 39.

Many interesting maps of meteorological and magnetic conditions were exhibited; we have space only to mention those showing the distribution of the stations of the Meteorological Office, and the Royal Meteorological Society, and of the 3636 rain gauges whose records appeared in "British Rainfall, 1902." Some interesting early synoptic charts, many records of special phenomena, and not a few striking photographs added to the interest of an exhibition which was much appreciated by the members of the British Association and reflected credit on its organizers, presided over by Dr. Shaw, and on Mr. R. G. K. Lempfert and Mr. Marriott in particular, to whose efforts the arrangement of the collection and the prompt publication of the catalogue were largely due.

Correspondence.

THE OCTOBER RAINFALL.

To the Editor of Symons's Meteorological Magazine.

THE Rainfall measured here in October was 8·88 in. and not 7·88 in. as given in my letter to you dated 2nd November.

I am, Sir, your obedient servant,

MORRIS BIRKBECK.

Dippen Hall Cottage, Farnham, Surrey, 9th Dec., 1903.

USE OF THE RAIN GAUGE ON SHIPBOARD.

To the Editor of Symons's Meteorological Magazine.

ACCORDING to Dr. W. N. Shaw, F.R.S., "we know practically nothing of the distribution of rainfall over the sea." This desideratum ought to be supplied. There is a form of rain gauge for use at sea. Is there no means of using it? Meteorologists would do well to give attention to this requirement now that it has become desirable to know the precipitation in various parts of the ocean, this being an important factor in the genesis and maintenance of cyclonic and electrical storms, as well as of oceanic currents; and without this knowledge the physics of the atmosphere over the oceans must be defective. Some knowledge of the frequency of rain over the oceans has been obtained from the log books of ships; but these documents give no account of the quantity of the rain. A rain gauge mounted on gimbals is made suitable for use on shipboard, but hitherto it has not been much employed. There are some difficulties in using it. When the most appropriate position is selected for its exposure, the water which it collects is not always, indeed seldom, entirely due to rain. There is always the liability of sea water being mixed with the rain water, for the sea comes on the ship often as spray, sometimes as topping waves. The problem is to find how much of the contents of the gauge at any time is due to rain and how much should be eliminated as sea water. A rule may be proposed for the purpose which apparently admits of sufficient accuracy.

The water collected by the gauge should be tested by an accurate glass hydrometer, such as is now very generally used on shipboard for observing the specific gravity of the surface water of the sea. Let the specific gravity of the collected water be s ; that of the surface water must also be observed in the usual way; let it be S . The temperature must be noted at the same time, as usual. If the temperature is at or about 62° , the specific gravity of rain, that is of pure water is 1. The contents of the gauge should be examined regularly every day, or preferably at shorter intervals, say every four hours, commonly the observing interval at sea for meteorological conditions. Let the quantity of water be represented by Q ; the part due to rain by x ; then $Q-x$ will be the amount of sea water to be deducted. The observations s , S , Q yield the equation

$$x f + (Q-x) S = Q s ; \text{ whence } x = \frac{Q (S-s)}{S-f}$$

Here f is the specific gravity of water, taken as 1 at the temperature of 62° , which becomes 1.0015 at 42° , 0.9976 at 82° , and for any other temperature may be known by interpolation near enough. The equation expresses the Rule : Multiply the quantity of water by the difference between its specific gravity and that of the sea water; divide the product by the difference between the specific gravity of

the sea water and that of fresh water at the same temperature ; the result is the amount of rain.

Example :— $Q = \cdot 87$ inch, $s = 1\cdot 0095$, $S = 1\cdot 0267$, temperature 51° .

Here $f = (1\cdot 0015 - 1) \frac{11}{20} + 1 = 1\cdot 0008$, and the equation becomes

$$x = \cdot 87 \frac{1\cdot 0267 - 1\cdot 0095}{1\cdot 0267 - 1\cdot 0008} = 0\cdot 58 \text{ inch.}$$

Of course it would save the calculation if the gauge were unaffected by sea spray, having regard to good exposure to rain. The record should supply Time, Latitude, Longitude, Quantity collected, its specific gravity and that of the sea water, Temperature, Value of f used, Rain deduced. The last two items might be systematically neglected, to be afterwards worked out by a computer. A table might be calculated for a more expeditious mode of reducing the observations.

RICHARD STRACHAN.

[For water of such low salinity as rain mixed with sea-spray in a ship's rain gauge, a hydrometer of very great delicacy would have to be employed. It would probably be found easier and more accurate to estimate the salinity by determining the chlorine chemically.—ED. *S.M.M.*]

SEASONAL RAINFALL OF 1902—3.

To the Editor of Symons's Meteorological Magazine.

WITH the month of November I bring to an end another year of *Seasonal Rainfall*, and a heavy record it proves, owing to the excess during the summer and autumn. Comparing the actual fall with the average of 1880—99, we get the following values :—

	1903.	1880—99.	Diff. 1903.
Winter (December—February)...	4·45 in. ...	5·14 in. ...	—0·69 in.
Spring (March—May).....	7·42 in. ...	4·81 in. ...	+2·61 in.
Summer (June—August)	13·74 in. ..	6·56 in. ...	+7·18 in.
Autumn (September—November)	10·20 in. ...	7·65 in. ...	+2·55 in.

Dec. 1902—Nov. 1903.....	35·81 in.	24·16 in.	+11·65 in.
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These values show that, roughly speaking, we had the average fall for the whole year during the summer and autumn, when 67 per cent. of the total fall was recorded ; and the excess of 1903 above the average during the winter and spring. The total number of wet days was 196, giving an average fall of $\cdot 18$ inch per wet day—the largest average I have yet observed. I have gauged one fall of 2 inches, and four exceeding 1 inch. Snow has been almost conspicuous by its absence, only a total of $\cdot 13$ inch being gauged on four days.

C. WIGAN HARVEY.

Throcking Rectory, Herts.

RAINFALL ON THE RIVER BANN, CO. DOWN, IRELAND, AT BANBRIDGE AND LOUGH ISLAND REAVY RESER- VOIR, FOR 40 YEARS, FROM 1862 TO 1901.

By JOHN SMYTH, M.A., M.Inst.C.E.I., F.R.Met.Soc.

IN the year 1857, as engineer of the Bann Reservoir Company, I was engaged in an arbitration between that company and the riparian proprietors or occupiers of the lands adjoining the River Muddock, which were alleged to be flooded by an excessive amount of water sent down from the reservoir through that river (an affluent of the Bann) to supply the mills on the River Bann. In trying to show the arbitrators that the damage done was principally due to heavy rainfalls, too great for the capacity of the several streams passing through the lands, I was met by the difficulty of making calculations of the amount of water to be provided for, when I found no rain gauges had been kept in that neighbourhood or even near it. I, therefore, in the meantime having thoroughly studied the subject, commenced in the year 1861 to take rainfall observations. Amongst others, I established the gauges at Milltown, Banbridge and Lough Island Reavy, and now proceed to give an account of the observations taken by means of these gauges and the results obtained from them.

Milltown, Banbridge.

I have prepared a summary of the 40 years' observations to accompany this paper, giving the total rainfall for each year, and for each month of the year. The mean values of all these are given for periods of 10, 20, 30 and 40 years, so that by comparing these results with any year or portion of a year it will be seen whether the rainfall is below or above the average.

The average rainfall for the whole period was 31.1 inches. The greatest 10 year average was 33.3 in. from 1872 to 1881. The least 10 year average was 29.1 in. from 1862 to 1871. The wettest year was 1872, when 46.6 in. was registered. The driest, 1887, with 23.1 in. registered. The greatest fall in 24 hours was 2.3 in. on October 12th, 1865.

On July 4th, 1883, in one hour, 1.6 in. fell; this is an important point to know, as a guide to the capacity required for traps, grates and drains.

A copper gauge was used, 8 inches in diameter, the funnel 1 foot above the ground level, placed in a box.

The three consecutive driest years at Banbridge were 1885, 1886 and 1887, averaging 28.60 in.

Bann Reservoir at Lough Island Reavy.

I give also a summary of the 40 years' observations at this station, giving the same elements as in the case of Milltown, Banbridge.

The average rainfall for the whole period was 44.0 inches. The greatest 10 year average was 46.61 in. from 1863 to 1872. The least 10 year average 40.81 in. from 1873 to 1882. The wettest year was 1872, when 61.2 in. was registered. The driest was 1887, with a fall of 26.5 in. The three driest consecutive years were 1878 to 1880, when the average fall was 35.2 in. The greatest fall in 24 hours was 3.9 in., November 29th, 1868.

Bateman's mountain gauge was used for nearly all these observations up to 1892, when an ordinary copper 5 inch gauge was substituted. Bateman's gauge was of 8 inches diameter, read by means of a rod resting on a float, the reading being facilitated by a vernier carried on a temporary cover placed on the gauge for that purpose.

Foffanny, near Lough Island Reavy.

At the Belfast Meeting of the British Association, 1874, I read a paper on the Rainfall of Ulster, and in the discussion it was seen that there was a great want of gauges all over the country, and the Rainfall Committee of the Association supplied gauges to a number of suitable applicants whom I was enabled to induce to undertake the work. I was particularly anxious to get observations on the highest point possible near the reservoir, so employed a man called Patrick McAlinden, who lived in the highest inhabited house, to take the three years' observations which I herewith supply. It will be seen that the average at this high elevation (920 feet) is nearly double that at the reservoir; such, however, was to be expected from its position close to the higher range of mountains (rising to from 2000 to nearly 3000 feet) which intercept the southerly water-laden currents and cooling them cause them to precipitate their moisture as they pass over. I would have been glad, however, to have had a longer series, but McAlinden left the place and went to live near the Deers Meadow Mountain, where the River Bann rises. I got him to try the gauge there, at an elevation of 1300 feet, but two miles from his house; it was soon interfered with, however, so I removed it to Divis Mountain, near Belfast, where the late Mr. Lavens Ewart, employed a gamekeeper to observe, but the arrangement did not work well.

Rainfall at Foffanny, near Lough Island Reavy Reservoir, for the years 1875, 1876 and 1877.

Lat. $54^{\circ} 12'$. Lon. $6^{\circ} 2' 30''$. Above sea level 920 ft. On Butter Mountain, $2\frac{1}{2}$ miles on Muddock River above intake to Lough Island Reavy Reservoir. Mountain rain gauge, 8 in. diameter, 3 ft. above surface of ground.

MONTH.	1875.	1876.	1877.
	in.	in.	in.
January	17.73	5.00	16.15
February	1.93	7.50	2.60
March	3.04	2.63	3.90
April .....	.90	5.20	10.10
May	4.25	.60	6.50
June	6.25	3.90	4.15
July	6.00	1.74	6.00
August	5.86	7.82	5.50
September	11.60	8.72	3.75
October	12.25	9.15	7.00
November	9.30	11.37	10.00
December	4.75	19.05	8.50
	83.86	82.68	84.15

TEN YEARS' AVERAGES.

Milltown, Banbridge.		Bann Reservoir, Reavy.	
	in.		in.
1862-1871	29.13	1863-1872	46.61
1872-1881	33.27	1873-1882	40.81
1882-1891	31.25	1883-1892	42.82
1892-1901	30.63	1893-1902	46.34
40 years' average	31.07	40 years' average	44.15

Summary of Rainfall at Milltown, Banbridge, co. Down.

Lat. 54° 15' N. Lon. 6° 18' W. 200 ft. above sea level.

YEAR.	Jan.	Feb.	Mar.	Apl.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.	TOTAL.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
1862.....	3.6	1.0	2.7	2.8	3.8	2.8	3.5	1.8	1.9	3.6	2.6	3.1	33.2
1863.....	3.1	0.8	1.7	1.3	2.5	2.7	0.8	3.8	3.0	5.6	2.3	1.8	29.4
1864.....	1.4	1.2	2.0	2.1	1.8	2.6	1.3	2.4	2.5	2.4	3.5	2.0	25.2
1865.....	2.7	2.7	2.2	0.6	4.2	0.5	1.5	2.7	0.3	6.0	3.5	2.2	29.1
1866.....	3.5	2.3	2.5	1.5	0.9	2.1	2.1	2.7	3.5	2.0	2.3	2.7	28.1
1867.....	3.7	1.7	2.0	3.8	2.9	1.0	6.4	2.0	1.7	4.3	0.8	1.6	31.9
1868.....	2.5	2.2	2.9	2.1	2.3	0.7	0.9	4.0	1.6	1.8	2.5	4.5	28.0
1869.....	3.4	4.1	1.9	2.0	2.1	0.9	1.5	1.6	3.9	1.5	3.1	3.2	29.2
1870.....	3.0	2.4	1.1	1.1	1.6	1.0	1.8	1.6	2.5	7.2	1.8	2.5	27.6
1871.....	3.1	2.8	1.4	2.9	0.8	1.8	4.0	3.4	3.6	2.3	1.6	1.9	29.6
Average of 10 years	3.0	2.2	2.0	2.0	2.3	1.6	2.4	2.6	2.4	3.7	2.4	2.5	29.1
1872.....	4.1	3.5	2.4	4.1	2.7	3.6	3.3	4.2	4.4	4.5	4.2	5.6	46.6
1873.....	4.0	1.1	2.3	0.5	1.9	1.5	4.1	4.4	2.7	2.7	1.8	0.6	27.6
1874.....	1.7	1.8	1.3	1.7	0.7	1.1	2.9	4.4	2.9	3.6	3.2	3.0	28.3
1875.....	3.9	1.8	1.0	0.4	1.5	3.3	3.9	2.4	4.7	3.5	3.3	1.7	31.4
1876.....	1.1	3.4	2.9	2.1	0.5	2.0	2.0	2.9	3.4	4.5	3.5	7.7	36.0
1877.....	5.9	2.4	3.6	3.1	3.5	2.4	4.8	3.4	2.1	2.7	3.3	2.8	40.0
1878.....	3.1	2.0	1.5	1.4	3.8	3.0	0.4	2.5	3.3	2.9	1.5	1.5	26.9
1879.....	2.3	1.5	2.0	1.7	3.8	4.0	6.1	3.8	4.4	1.1	1.3	1.3	33.3
1880.....	1.0	2.5	1.8	3.7	0.6	2.9	4.8	0.9	3.2	1.2	2.4	2.6	27.6
1881.....	0.7	2.8	2.9	1.7	2.6	4.2	2.9	4.7	2.2	3.5	3.8	3.0	35.0
Average of 20 years	2.9	2.2	2.1	2.0	2.2	2.2	3.0	3.0	2.9	3.3	2.6	2.7	31.1
1882.....	1.9	2.1	2.4	2.7	2.9	3.1	5.0	3.6	4.3	2.4	4.6	2.6	37.6
1883.....	3.5	3.1	1.5	1.4	2.0	2.1	4.7	3.8	3.7	2.6	3.3	1.9	33.6
1884.....	3.8	3.4	2.7	1.9	2.1	0.8	2.9	1.8	3.0	2.4	2.5	3.1	30.4
1885.....	2.2	3.7	1.6	2.0	1.8	0.7	1.9	1.4	4.6	3.1	1.6	2.0	26.6
1886.....	3.8	2.1	2.6	1.4	5.1	1.4	3.5	2.4	2.4	4.1	2.9	4.4	36.1
1887.....	2.5	1.0	1.5	2.0	1.5	0.7	2.7	2.1	3.0	1.9	2.5	1.7	23.1
1888.....	1.8	0.5	3.4	1.7	2.7	4.4	4.6	2.7	1.0	1.1	3.9	2.4	30.2
1889.....	1.8	2.1	2.3	3.3	3.4	0.3	3.7	7.6	1.7	3.2	1.6	2.9	33.9
1890.....	3.3	1.3	2.7	1.1	1.5	2.9	2.1	2.6	3.2	1.5	6.0	1.7	29.9
1891.....	1.1	0.2	1.2	2.5	3.1	3.0	2.9	5.3	1.9	3.6	2.4	3.9	31.1
Average of 30 years	2.8	2.1	2.3	2.0	2.3	2.1	3.1	3.1	2.9	3.1	2.8	2.7	31.2
1892.....	2.1	1.8	0.6	0.8	3.4	3.1	2.6	5.5	2.9	3.0	3.5	1.8	31.1
1893.....	2.7	2.5	0.7	1.1	0.9	1.6	2.7	4.3	1.7	1.8	1.4	2.6	24.0
1894.....	2.9	1.9	1.1	2.4	1.6	3.5	3.3	2.3	0.3	5.0	1.7	2.8	28.8
1895.....	1.9	0.7	3.1	2.0	0.2	2.5	4.7	5.0	0.5	3.5	3.4	2.8	30.3
1896.....	1.7	1.3	3.0	1.3	0.3	2.5	7.4	2.0	4.5	2.1	0.7	3.8	30.6
1897.....	1.8	1.8	4.2	2.4	1.7	4.5	1.7	4.0	2.1	2.2	3.2	3.2	32.8
1898.....	1.2	2.6	0.9	3.5	3.7	3.0	0.6	3.6	4.8	3.2	2.0	1.9	31.0
1899.....	2.9	2.5	1.4	2.9	3.6	2.4	3.5	1.2	3.4	1.8	2.8	4.0	32.3
1900.....	2.0	2.3	0.9	1.7	2.7	3.2	3.0	4.8	1.8	3.6	4.9	3.2	34.1
1901.....	2.8	1.4	2.1	2.1	1.5	2.7	1.1	4.3	3.5	2.6	4.0	3.2	31.3
Average of 40 years	2.6	2.1	2.2	1.8	2.2	2.3	3.1	3.2	2.8	3.0	2.8	2.8	31.1
1902.....	1.9	2.5	1.6	2.6	3.5	2.2	3.6	2.4	3.7	1.3	3.3	2.4	31.0
1903.....	4.3	1.8	3.9	0.9	2.3	1.2	6.0	5.1	3.9	...	...	...	...

*Summary of Rainfall at Bann Reservoir, Lough Island Reary,
near Castlewellsan.*

Lat. 54° 15' N. Lon. 6° 2' W. 440 ft. above sea level.

Diameter of Gauge 8 in. up to 1892, after which 5 in. Plane of receiver 1 ft. above ground.

YEAR.	Jan.	Feb.	Mar.	Apl.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.	TOTAL.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
1862.....	6.0	2.6	5.6	3.3	3.0	5.0	4.4	2.0	2.0	5.7	5.0	8.3	52.9
1863.....	4.3	1.0	4.9	1.0	2.4	3.4	0.8	5.2	2.0	11.8	3.5	2.5	42.8
1864.....	5.2	1.2	6.7	2.0	1.7	2.7	1.6	1.8	3.1	4.5	10.3	3.9	44.7
1865.....	5.0	3.7	1.9	0.5	4.6	0.8	2.9	4.5	0.3	12.0	9.3	6.8	52.3
1866.....	7.7	4.0	8.4	3.9	0.9	5.0	1.4	4.0	6.4	4.8	3.9	4.2	54.6
1867.....	4.4	2.0	7.1	5.0	8.2	0.5	6.5	1.7	3.0	6.6	0.5	1.7	47.2
1868.....	3.8	1.7	3.1	1.3	2.4	0.2	0.4	7.0	2.5	1.9	7.9	11.1	43.3
1869.....	7.1	2.6	1.9	1.2	2.1	0.1	1.2	1.6	4.7	0.8	1.9	3.7	28.9
1870.....	5.9	8.4	0.9	0.8	3.4	0.5	0.9	1.6	2.8	14.7	2.5	5.7	48.1
1871.....	4.5	6.5	2.1	5.3	0.5	1.8	3.3	2.4	5.7	5.0	3.3	2.6	43.0
Average of 10 years	5.4	3.4	4.3	2.4	2.9	2.0	2.3	3.2	3.2	6.8	4.8	5.1	45.8
1872.....	7.2	9.0	3.0	3.6	1.5	3.3	3.1	3.3	4.0	5.4	6.8	11.0	61.2
1873.....	6.2	0.8	4.4	0.3	1.2	1.9	4.2	3.9	1.9	1.6	4.0	0.8	31.2
1874.....	2.1	4.0	3.0	0.3	0.7	2.0	3.9	4.8	6.3	3.6	4.0		35.5
1875.....	7.1	1.2	1.4	0.3	2.2	3.8	3.2	2.8	5.6	6.3	5.1	2.4	41.4
1876.....	2.3	3.7	2.1	2.0	0.2	2.0	0.8	3.4	5.8	8.9	8.7	13.0	52.9
1877.....	11.9	1.7	3.6	5.6	3.8	3.3	2.7	4.2	1.9	3.8	6.0	5.6	54.1
1878.....	2.2	4.2	0.4	1.8	6.9	2.9	0.4	2.6	4.8	4.1	0.9	0.7	31.9
1879.....	2.7	3.0	2.2	3.5	1.6	6.1	5.9	4.7	7.2	0.9	0.9	1.1	39.8
1880.....	1.1	4.4	1.7	5.8	0.1	3.0	6.2	0.3	4.5	2.3	3.5	0.9	33.8
1881.....	0.4	4.6	4.7	0.7	0.8	4.0	0.8	3.6	1.2	2.8	6.0	4.8	34.4
Average of 20 years	4.8	3.5	3.3	2.5	2.4	2.6	2.6	3.2	3.7	5.5	4.7	4.7	43.7
1882.....	1.6	5.9	2.5	6.1	2.4	2.7	4.7	4.5	4.4	6.9	6.6	4.8	53.1
1883.....	5.8	9.2	1.9	1.8	1.3	0.7	2.5	3.5	9.0	4.0	2.7	0.9	43.3
1884.....	5.7	7.9	7.4	2.1	2.5	0.3	3.0	1.3	1.9	1.7	4.3	2.5	40.6
1885.....	3.8	6.0	2.4	6.6	2.0	0.4	0.8	2.1	7.4	4.0	5.0	0.4	40.9
1886.....	2.2	2.2	3.4	1.8	5.7	1.3	3.3	2.0	2.2	9.1	3.8	5.3	42.3
1887.....	3.9	1.0	0.7	1.3	1.0	0.8	3.1	3.0	3.1	2.5	4.0	2.1	26.5
1888.....	1.6	0.0	5.6	2.8	4.1	5.2	6.6	1.5	0.5	1.2	8.4	5.8	43.3
1889.....	6.3	0.4	3.2	6.1	6.3	0.0	3.5	4.6	2.5	7.6	0.9	3.3	44.7
1890.....	4.8	2.7	5.7	2.0	2.5	2.8	2.0	4.2	4.4	1.3	10.9	3.0	46.3
1891.....	1.6	0.3	1.8	6.3	3.5	6.5	2.9	8.4	2.5	10.4	8.7	6.1	59.0
Average of 30 years	4.5	3.5	3.4	2.9	2.6	2.4	2.8	3.3	3.7	5.3	5.0	4.3	43.8
1892.....	4.1	1.9	0.5	0.9	4.2	3.6	1.8	6.2	3.9	6.9	6.0	1.3	41.3
1893.....	5.7	3.6	0.6	1.2	1.0	1.8	2.9	4.6	1.5	1.5	2.6	6.1	33.1
1894.....	5.9	2.9	0.6	4.5	4.0	3.8	3.9	2.2	0.3	10.9	5.7	3.9	48.6
1895.....	3.6	0.5	4.9	3.7	0.1	1.2	5.2	6.9	0.3	3.5	8.1	4.1	42.1
1896.....	1.8	2.8	3.7	1.0	0.4	3.4	6.7	1.9	6.8	2.4	2.2	7.2	40.3
1897.....	3.1	2.7	6.8	3.4	1.6	6.1	1.7	6.9	2.4	4.1	3.8	5.9	48.6
1898.....	1.9	2.8	1.0	6.7	4.6	4.3	0.5	3.7	4.0	5.1	4.5	3.9	43.0
1899.....	5.5	5.7	2.0	4.6	4.6	3.2	3.6	1.8	3.6	1.4	5.5	8.4	49.9
1900.....	3.3	5.4	1.0	2.6	4.9	3.4	4.4	5.1	1.2	5.7	7.2	4.9	49.1
1901.....	6.9	3.4	3.3	4.3	2.2	3.7	1.7	3.3	7.0	4.6	4.6	4.6	49.6
Average of 40 years	4.4	3.4	3.2	3.0	2.7	2.6	3.0	3.5	3.6	5.1	5.0	4.5	44.0
1902.....	3.3	5.6	2.2	5.1	7.0	4.1	5.2	4.5	4.8	2.7	9.8	4.9	59.2
1903.....	7.4	5.0	7.6	1.8	2.8	1.2	5.7	5.9	5.2	...	...	...	...

THE ELEVEN MONTHS' RAINFALL OF 1903.

Aggregate Rainfall for January—November, 1903.

Stations.	Diff. from Aver.	Per cent. of Aver.	Stations.	Diff. from Aver.	Per cent. of Aver.	Stations.	Diff. from Aver.	Per cent. of Aver.
	in.			in.			in.	
London+	15·95	176	Arnccliffe ...+	21·75	139	Braemar ...+	9·50	130
Tenterden+	6·51	127	Hull+	5·63	125	Aberdeen ...+	8·49	130
Hartl'y W'ntn'y +	13·40	159	Newcastle...+	9·05	139	Cawdor+	5·55	120
Hitchin+	14·35	167	Seathwaite +	34·36	129	Glencarron ...+	20·50	125
Winslow+	11·91	155	Cardiff+	14·57	141	Dunrobin ...+	8·26	130
Westley+	7·07	130	Haverf'dwest+	13·37	135	Darrynane +	6·07	114
Brundall.....+	5·25	123	Gogerddan +	17·86	145	Waterford +	9·32	127
Alderbury+	11·62	147	Llandudno +	8·14	130	Broadford ..+	11·27	138
Ashburton+	15·43	135	Dumfries ...+	17·94	146	Carlow+	11·36	138
Polapit Tamar +	14·43	144	Lilliesleaf ...+	12·89	147	Dublin+	5·05	120
Stroud+	13·64	155	Colmonell ...+	9·09	123	Mullingar ...+	12·68	138
Woolstaston ...+	14·48	155	Glasgow ...+	20·06	162	Ballinasloe +	10·53	132
Boston+	9·93	153	Inveraray ...+	18·19	128	Clifden+	7·83	111
Hesley Hall ...+	6·36	133	Islay+	12·28	130	Crossmolina +	13·27	129
Derby+	9·16	144	Mull+	13·51	127	Seaforde ...+	11·37	135
Bolton+	11·64	131	Loch Leven +	16·74	152	Londonderry+	6·99	119
Wetherby+	14·50	167	Dundee+	7·41	130	Omagh+	14·90	142

The rainfall in November was for the first time since February below the monthly average at most stations. If it had not been for a depression with very heavy rainfall which crossed our islands on the 27th, the month would have been extremely dry. Consequently the rainfall for the year to date shows a less remarkable excess over the average than it did at the end of October, although the excess over the average of the ten years 1890–99 amounts to about 43% for England and Wales, 34% for Scotland and 29% for Ireland.

METEOROLOGICAL NEWS AND NOTES.

THE ROYAL METEOROLOGICAL SOCIETY held its opening meeting for the new session on November 18th, when a communication on the Great Dust Fall of February, 1903, was submitted by Dr. H. R. Mill and Mr. R. G. K. Lempfert. We are obliged to hold over our report until next month.

IN BINDING THIS VOLUME our readers will please note that the photograph accompanying the present number is to be placed as a frontispiece. New reader may be reminded that the last number of Volume XXXVIII. will be published on January 16th, and will contain the usual index.

REVIEWS.

Die Luftströmungen auf dem Gipfel des Säntis (2504 m.) und ihre jährliche Periode. [The air currents on the summit of the Säntis (8215 ft.) and their annual period.] Von J. HANN. From the *Sitzber. k. Akad. Wiss. Wien, Math.-naturwiss. Klasse*; Bd. CXII. Abt. II. a. Vienna: 1903. Size, $9\frac{1}{2} \times 6$. Pp. 42.

THE unwearied activity of Dr. Hann has led him to discuss in detail the hourly observations of wind made at the high-level Alpine observatory on the Säntis and to compare them with similar observations at low-level stations. He says the work was made "inviting and light" by the way the observations were published by M. Billwiller, the head of the Swiss meteorological service. Westerly winds were found to predominate at the summit both in frequency and intensity, the average direction for the fifteen years considered being nearly W.S.W. The wind in summer averages nearly true west, in winter north-east, and in autumn nearly south. The contrast with Zürich is very marked, both by the comparative absence of calms at the higher station and the relative frequency of easterly winds at the lower.

Monthly Record of Bright Sunshine measured at Upton, near Slough.

[By RICHARD BENTLEY.] *Privately printed.* Size, 10×6 . Pp. 10. MR. BENTLEY'S record of sunshine was taken with a Campbell-Stokes Recorder and commenced in May, 1898. Records are given for five years to 1902. Of the four complete years the sunniest was 1899, with $175\frac{1}{2}$ hours; the dullest, 1902, with $135\frac{1}{2}$. The sunniest month was July, 1900, with over $9\frac{1}{2}$ hours sunshine per day as an average; the dullest month was December, 1900, when the average duration of sunshine was only 1 hour per day. The longest succession of sunny days was 105, from June 21st to October 3rd, 1901; the longest succession of sunless days was only 7, in December, 1899, and again in December, 1902.

Weather Warnings. By J. REGINALD ASHWORTH, D.Sc. (Reprinted from the *Transactions of the Rochdale Literary and Scientific Society*). Rochdale: 1903. Size, $8\frac{1}{2} \times 6$. Pp. 4.

DR. ASHWORTH has tested certain weather prognostics and gives the result of two years' observations. The most complete are—(1) The rosy glow after sunset, which was observed 59 times and followed by a fine day on 52 occasions, by a wet day on 7. (2) Smoke rising vertically from chimneys, which was noticed 48 times and was followed by a fine day on 42 occasions, by a wet day on 6. (3) Smoke hanging round the tops of chimneys, which was observed 21 times and was followed by a wet day on 15 occasions, by a fine day on 6. It is always interesting to find the truth of old weather proverbs demonstrated by observation.

RAINFALL AND TEMPERATURE, NOVEMBER, 1903.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which -01 or more fell.	TEMPERATURE.				No. of Nights below 32°.	
		Total Fall.	Differ- ence from average 1890-9.	Greatest Fall in 24 hours.		Max.		Min.	In shade.	On grass.			
				Dpth	Date								
											Deg.	Date	Deg.	Date
		inches.	inches.	in.									
I.	London (Camden Square) ...	1.85	—	.37	1.05	27	12	57.2	1	29.9	20	3	14
II.	Tenterden	2.33	—	.24	1.12	27	19	57.0	2	30.0	20	2	12
"	Hartley Wintney	1.76	—	.72	.87	27	10	54.0	1a	29.0	19e	8	13
III.	Hitchin	2.15	—	.27	1.05	27	16	54.0	9	27.0	6, 19	7	...
"	Winslow (Addington)	1.68	—	.79	.78	27	15	56.0	10	25.0	20	8	17
IV.	Bury St. Edmunds (Westley) ..	2.18	—	.32	1.01	27	16	55.0	2	28.0	30	...	...
"	Norwich (Brundall)	1.87	—	.59	.26	2	23	56.0	2	28.2	7	6	16
V.	Winterborne Steepleton	1.91	...	...	.64	27	15	55.2	2	26.0	20	5	14
"	Torquay	1.44	...	...	.73	27	12	58.7	1	33.4	30	0	5
"	Polapit Tamar [Launceston]..	3.42	—	.46	.89	27	21	56.3	2	23.3	19	5	8
VI.	Stroud (Upfield)	1.59	—	1.10	.70	27	10	55.0	13	27.0	19	7	...
"	Church Stretton (Woolstaston) ..	2.70	—	.08	1.00	27	20	54.0	12	25.0	30	2	...
"	Worcester (Diglis Lock)	1.25	—	.85	.53	27	13	...	...	...	...	...	...
VII.	Boston	1.59	—	.26	.50	27	11	52.0	21	28.0	19	...	...
"	Hesley Hall [Tickhill].....	1.16	—	.78	.33	27	13	55.0	10b	25.0	7, 19	8	...
"	Derby (Midland Railway).....	1.96	+	.03	.52	27	18	55.0	4	27.0	6	8	...
VIII.	Bolton (The Park).....	4.71	+	1.20	.67	14	23	53.7	1	28.0	19	3	13
IX.	Wetherby (Ribston Hall) ...	1.79	—	.17	.31	2	18	...	...	...	...	...	...
"	Arnccliffe Vicarage.....	3.35	—	2.72	.48	14	23	...	...	...	...	...	...
"	Hull (Pearson Park).....	1.63	—	.66	.32	2	17	56.0	10	27.0	30	7	20
X.	Newcastle (Town Moor)	2.04	—	.42	.50	30	16	...	...	...	...	...	...
"	Borrowdale (Seathwaite).....	9.70	—	4.28	1.29	23	19	...	...	...	...	...	...
XI.	Cardiff (Ely).....	2.36	—	1.60	.54	27	20	...	...	...	...	...	...
"	Haverfordwest	3.35	—	1.51	1.07	1	17	56.6	2	25.4	19	3	11
"	Aberystwith (Gogerddan) ...	6.01	+	1.06	1.42	27	16	61.0	13	20.0	18	13	...
"	Llandudno.....	3.89	+	.55	.85	27	21	59.0	12	32.0	19f	2	...
XII.	Cargen [Dumfries]	3.62	—	.92	.61	8	17	56.0	4	22.0	30	9	...
XIII.	Edinburgh (Royal Observatory) ..	1.47	...	...	.55	28	14	54.9	12	25.6	30	5	12
XIV.	Colmonell	4.92	+	.28	.74	24	20	56.0	1	21.0	29	4	...
XV.	Tighnabruaich	5.83	...	...	.68	14	22	51.0	4	27.0	29	5	7
"	Mull (Quinish)	5.36	—	.61	.84	23	23	...	...	...	...	...	...
XVI.	Loch Leven Sluices	1.63	—	2.02	.39	28	13	...	...	...	...	...	...
"	Dundee (Eastern Necropolis) ..	.85	—	1.96	.20	2	14	55.6	12	26.0	30	6	...
XVII.	Braemar	1.99	—	1.78	.36	13	20	51.2	6, 12	20.2	30	9	26
"	Aberdeen (Cranford) ...	3.45	+	.09	.54	15	24	55.0	5	24.0	6	13	...
"	Cawdor (Budgate)	3.40	+	.66	.55	14	22	...	...	...	...	...	...
XVIII.	Strathconan (Dalbreac)	5.85	+	.20	.73	10	14	...	...	...	...	...	...
"	Glencarron Lodge.....	11.69	+	1.77	2.19	23	28	55.2	13	19.0	30	7	...
XIX.	Dunrobin	4.78	+	1.49	.87	14	16	55.0	14	25.0	30	8	...
"	Castletown	5.27	...	...	.69	14	24	52.0	11	22.0	27	8	...
XX.	Darrynane Abbey.....	3.09	—	1.86	.75	1	22	...	...	33.0	30	0	...
"	Waterford (Brook Lodge) ...	2.10	—	1.42	.63	13	9	56.0	12	23.0	19	7	...
"	Broadford (Hurdlestown) ...	2.44	—	.81	.42	11	21	52.0	18	28.0	29f	7	...
XXI.	Carlow (Browne's Hill)	2.73	—	.34	.46	28	13	...	...	...	...	...	...
"	Dublin (Fitz William Square) ..	2.13	—	.43	.62	28	16	60.0	12	29.2	30	3	8
XXII.	Ballinasloe	2.35	—	1.22	.42	11	22	61.0	11c	23.0	30	11	...
"	Clifden (Kylemore)	4.70	—	3.24	1.10	13	22	...	...	...	...	...	...
XXIII.	Seaforde	2.06	—	1.64	.70	28	19	53.0	10d	26.0	29	6	10
"	Londonderry (Creggan Res.) ..	3.99	+	.12	.73	27	25	...	...	...	...	...	...
"	Omagh (Edenfel)	3.04	—	.67	.64	27	26	54.0	11	26.0	30	7	12

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

a and 9, 10. b and 12, 13, 14, 23. c and 13. d and 11. e and 25, 30. f and 30.

SUPPLEMENTARY RAINFALL, NOVEMBER, 1903.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Harrow Weald	1.85	XI.	Llandefaelog-fach.....	2.82
II.	Dorking, Abinger Hall .	2.53	„	New Radnor, Ednol.....	3.06
„	Sheppey, Leysdown	2.62	„	Rhayader, Nantgwillt ...	6.49
„	Hailsham	2.33	„	Lake Vyrnwy	3.75
„	Crowborough.....	2.56	„	Ruthin, Plâs Drâw	2.95
„	Ryde, Beldornie Tower..	1.45	„	Criccieth, Talarvor	5.59
„	Bournemouth, Kempsey	1.70	„	I. of Anglesey, Lligwy..	3.24
„	Emsworth, Redlands ...	1.76	„	Douglas, Woodville.....	4.21
„	Alton, Ashdell	1.92	XII.	Stoneykirk, ArdwellHo.	3.35
„	Newbury, Welford Park	2.05	„	Dalry, Old Garroch	5.46
III.	Oxford, Magdalen Coll..	1.40	„	Montaive, MaxwelltonHo.	4.25
„	Banbury, Bloxham	1.38	„	Lilliesleaf, Riddell	1.86
„	Pitsford, Sedgebrook ...	1.49	XIII.	N. Esk Res. [Penicuik]	3.25
„	Huntingdon, Bampton.	2.30	XIV.	Dalry, Blair	2.70
„	Wisbech, Bank House...	1.82	„	Glasgow, Queen's Park..	2.70
IV.	Southend	2.85	XV.	Inveraray, Newtown ...	6.83
„	Colchester, Lexden	1.98	„	Ballachulish, Ardsheal ...	7.78
„	Saffron Waldon, Newport	1.77	„	Campbeltown, Redknowe	4.80
„	Rendlesham Hall	1.96	„	Islay, Eallabus.....	5.63
„	Swaffham	1.63	XVI.	Dollar.....	1.68
V.	Salisbury, Alderbury ...	1.31	„	Balquhider, Stronvar...	...
„	Bishop's Cannings	2.04	„	Coupar Angus Station...	.86
„	Ashburton, Druid House	2.97	„	Blair Atholl	2.00
„	Okehampton, Oaklands.	4.43	„	Montrose, Sunnyside ...	1.57
„	Hartland Abbey	3.09	XVII.	Alford, Lynturk Manse..	2.71
„	Lynmouth, Rock House	3.23	„	Keith H.R.S.....	3.33
„	Probus, Lamellyn	3.10	XVIII.	Fearn, Lower Pitkerrie..	2.95
„	Wellington, The Avenue	1.99	„	S. Uist, Askernish	5.60
„	North Cadbury Rectory	1.95	„	Invergarry	6.97
VI.	Clifton, Pembroke Road	1.91	„	Aviemore, Alvey Manse.	3.50
„	Ross, The Graig	1.18	„	Loch Ness, Drumnadrochit	3.61
„	Shifnal, Hatton Grange	2.29	XIX.	Invershin	5.65
„	Wem Rectory	2.27	„	Bettyhill	5.88
„	Cheadle, The Heath Ho.	2.96	„	Watten H.R.S.....	4.93
„	Coventry, Kingswood ...	1.93	XX.	Cork, Wellesley Terrace	1.64
VII.	Market Overton	1.85	„	Killarney, District Asyl.	2.90
„	Grantham, Stainby	1.88	„	Glenam [Clonmel]	1.44
„	Horncastle, Bucknall ...	1.53	„	Ballingarry, Hazelfort...	2.64
„	Worksop, Hodsck Priory	1.41	„	Miltown Malbay	3.62
VIII.	Neston, Hinderton	3.46	XXI.	Gorey, Courtown House	2.19
„	Southport, Hesketh Park	3.06	„	Moynalty, Westland ...	2.43
„	Chatburn, Middlewood.	3.60	„	Athlone, Twyford	2.38
„	Duddon Val., Seathwaite Vic.	6.86	„	Mullingar, Belvedere ...	2.68
IX.	Langsett Moor, Up. Midhope	2.85	XXII.	Woodlawn	2.87
„	Baldersby	1.26	„	Westport, Murrisk Abbey	3.33
„	Scalby, Silverdale	2.95	„	Crossmolina, Enniscoe ..	4.59
„	Ingleby Greenhow Vic..	2.47	„	Collooney, Markree Obs.	3.82
„	Middleton, Mickleton ...	2.08	XXIII.	Enniskillen, Portora ...	2.55
X.	Beltingham	2.16	„	Warrenpoint.....	2.02
„	Bamburgh	2.10	„	Banbridge, Milltown ...	2.07
„	Keswick, The Bank	3.46	„	Belfast, Springfield	2.59
„	Melmerby Rectory	2.54	„	Bushmills, Dundarave..	4.25
XI.	Llanfrechfa Grange	1.84	„	Stewartstown	2.37
„	Treherbert, Tyn-y-waun	5.56	„	Killybegs .....	...
„	Castle Malgwyn	3.12	„	Horn Head	3.78

METEOROLOGICAL NOTES ON NOVEMBER, 1903.

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 AND WALES.

LONDON, CAMDEN SQUARE.—Until the 27th the R was very light and the weather on the whole was fair and mild, but dull and cloudy. On the 27th and 28th 1·38 in. of R fell during a deep depression, bringing the total to within half-an-inch of the average. There was very little fog. Slight S on 30th. Mean temp. $44^{\circ}8$, or $1^{\circ}8$ above the average.

ABINGER HALL.—Mild and genial throughout, with 1·43 in. of R on 27th.

TENTERDEN.—Very little R till the 27th. Three or four inches of S on 30th. Gales on 21st and 27th. Duration of sunshine 64·6 hours.

CROWBOROUGH.—Dull and cold on the whole, but more or less sun on 18 days. Till the 25th it was dry, but heavy R fell on the subsequent days. S on the night of the 29th. Frost on 10 nights. Mean temp. $43^{\circ}5$.

HARTLEY WINTNEY.—Beautifully fine until the last few days. Little fog or frost. Storm of wind and R on 27th, followed by colder days till the end. Ozone every day; mean $4^{\circ}35$.

WINSLOW, ADDINGTON.—Not much R until the end, and the land was getting dry, so that it was possible to get over fields in comfort. But the R of 27th and 28th brought back the state of saturation and covered the meadows with water. Some S on 30th.

PITSFORD, SEDGEBROOK.—Dry, but dark and gloomy. R ·93 in. below the average of 10 years. Mean temp. $42^{\circ}2$. Hoar frost on several nights.

BURY ST. EDMUNDS, WESTLEY.—R fell in small quantities till the 27th, when 1·01 in. fell in 24 hours causing floods.

TORQUAY, CARY GREEN.—R 2·37 in. below the average. Up to 22nd only ·22 in. fell. Mean temp. $48^{\circ}8$, or $1^{\circ}4$ above the average. Duration of sunshine 92·6 hours, or 29·0 hours above the average. Mean amount of ozone 4·9; max. 8·5 on 21st with W.N.W. wind; min. 1·0 on 19th with N.W. wind.

WELLINGTON, THE AVENUE.—The driest month of the year except February and one of the finest. R about 1·25 in. below the normal amount.

NORTH CADBURY RECTORY.—The least abnormal month since January. The number of wet days was very large, but the R below the average. Temp. slightly below the average. The month ended with a bright, quiet frost in spite of the deep barometric depression.

CLIFTON, PEMBROKE ROAD.—A whole day's R on 2nd was followed by a week of dry weather with easterly winds and morning fog. Westerly winds prevailed for the rest of the month, with frequent light R and strong winds. Frost on 29th and 30th, with N.E. winds. R 1·50 in. below the average.

ROSS, THE GRAIG.—Very fine and a contrast to October. Tender plants were not injured till the 4th, which is late, although a fortnight earlier than in 1902. R less than half the average. Although there were several severe frosts, the mean temp. was slightly above the average.

BOLTON, THE PARK.—From 1st to 9th fine and calm weather prevailed, afterwards the weather was less settled. The temp. was above the average until the 19th and again from 21st to 29th, the mean being $42^{\circ}7$, or 0·1 below the average. Bright sunshine on 19 days, making a total of 41·25 hours, or 15·7 hours above the average, and the greatest amount in any November since 1886, when 41·7 hours was reached. The total R for the 11 months of 1903 was 49·19 in., or 3·70 in. more than the previous greatest annual fall.

SEATHWAITE VICARAGE.—Another sad, rainy month, but mild until the last two days.

HULL, PEARSON PARK.—Frequently cold and dull, with but 38·5 hours of sunshine, half of which occurred on 4 days. Occasional dense fog. The first heavy S fell on 30th, followed by sleet and H.

LLANFRECHFA GRANGE.—Free from much fog, but very damp. Mild, with frost on 19th and 30th, and mild nights until 29th. R much below the average.

HAVERFORDWEST.—Very cold from 15th to 20th, a storm system of considerable magnitude developing between 2 a.m. on 20th and 21st. The last two days were cold and dry. Duration of sunshine 62·2 hours.

ABERYSTWITH, GOGERDDAN.—A considerable amount of R, the heaviest being on 27th, when there were floods again. Two spells of sharp frost.

DOUGLAN, WOODVILLE.—Weather most unsettled, with absence of any defined type. Very stormy at times, with violent W. and N.W. gales on 20th, 21st and 25th. H on 3 days. Sharp frosts on 29th and 30th.

SCOTLAND.

CARGEN [DUMFRIES].—Although no heavy fall occurred on any single day, it was an exceptionally damp month, many days on which no R fell being moist and misty. A considerable quantity of the grain crop was still in the fields at the end, and much that had been "secured" was absolutely valueless.

LILLIESLEAF, RIDDELL.—The weather was variable, with a very heavy storm and some S near the end. Wind westerly throughout.

MULL, QUINISH.—Very mild and wet and singularly sunless up to the 29th, when S fell, followed by frost and sunshine.

COUPAR ANGUS.—R on 15 days, in all cases very sparingly, the total being two inches below the average. There was a great improvement in the weather, and a good potato crop. The temp. became very low during the last week.

MONTROSE, SUNNYSIDE ASYLUM.—A capital month, favourable for finishing the harvest and pitting potatoes.

ALFORD, LINTURK MANSE.—Somewhat early S, a slight fall on the 21st and lasting from 24th more or less to the end.

DRUMADROCHIT.—R 56 in. above the average of 17 years. Notwithstanding the almost daily R, the farmers on higher lands secured crops in good condition except potatoes, which became frost-bound in the ground. Of the 63 days ending on 30th, 01 in. of R, or more, fell on 56.

WATTEN, H.R.S.—Very changeable. Cloudy and wet, with a series of storms of wind and R; then frost and S, thaw and renewed S.

CASTLETOWN, THE CLETT.—The first 8 days were fairly dry, giving farmers some opportunity to finish cutting and partly secure their corn. Broken wet weather to 19th, with an occasional dry day and high winds. From the 19th to the end was very wet and cold with high winds, and on 25th a steady S storm set in, continuing to the end. Some grain still in the fields buried under S, and some still uncut. The potato crop is generally still in the ground.

IRELAND.

DARRYNANE ABBEY.—Mild, with some very fine days in the first half. Some S on 30th.

CORK, WELLESLEY TERRACE.—R 2·42 in. less than the average, and for the 11 months 14·35 in. over the average. The mean temp. was 41°·1, the lowest for 25 years. Gales on 21st and 27th, the latter after a fall of 58 in. in 9 hours. First S on 30th.

MILTOWN MALBAY.—The last 5 days of the first week were calm, dry and sunny, and splendid for gathering the remainder of a bad harvest, but the remainder was damp and rainy, finishing with sharp frost and slight S.

DUBLIN, FITZWILLIAM SQUARE.—An average month as regards temp. and R. Frost and S showers in the last two days. Mean temp. 45°·4, or exactly the average. Duration of sunshine 98 hours. High winds on 8 days, attaining the force of a gale on 21st and 23rd. Foggy on 6 days.

COLLOONEY, MARKREE OBSERVATORY.—Very broken and stormy at times, with R. Temp. about the average. The amount of bright sunshine was very small as the weather was cloudy. A few fogs in the early part.

OMAGH, EDENFEL.—A typical November, with a good deal of weather that in another year, with an atmosphere and soil less saturated by previous R, would have been fine. It was dark, humid and mild, with practically no frost until the last few days.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JUNE, 1903.

STATIONS. (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
°		°		°	°	°	0-100	°	°	inches			
London, Camden Square	85·9	28	39·7	13	67·5	48·6	49·4	76	133·7	35·4	6·43	10	6·0
Malta	86·7	17	59·5	1	78·4	63·9	60·7	74	136·6	52·5	·08	1	2·5
Lagos, W. Africa	81·0	3, 4	69·0	5	83·8	75·0	73·9	83	134·0	69·0	21·62	21	...
Cape Town	72·3	7	38·8	10a	60·2	47·7	48·4	83	...	...	6·79	19	6·3
Durban, Natal	80·4	1	46·1	27	73·9	52·7	...	...	131·3	...	·70	5	2·0
Mauritius.....	79·6	2, 13	56·5	11	77·5	63·7	61·8	75	142·2	48·2	1·98	16	5·1
Calcutta.....	98·9	2	72·5	3	94·0	78·2	76·4	75	156·2	71·5	10·70	11	7·2
Bombay.....	93·1	12	74·8	23	87·6	79·4	77·5	82	135·7	73·4	19·75	19	6·7
Madras	103·1	27	74·3	14	96·8	79·7	73·8	71	143·7	73·7	1·46	7	5·4
Kodaikanal	72·3	6	52·0	19	66·4	54·7	52·2	79	152·1	40·2	5·29	11	7·2
Colombo, Ceylon.....	89·2	29	70·8	3	87·5	78·2	75·6	84	146·5	70·0	5·42	25	7·6
Hongkong.....	90·5	12	73·4	28	86·4	78·5	76·0	82	145·3	...	25·23	18	7·4
Melbourne.....	60·1	30	33·1	24	54·6	42·8	42·6	82	115·6	25·8	3·35	16	7·7
Adelaide	64·0	2	38·2	19b	58·6	44·9	45·4	81	124·3	31·6	3·87	18	7·2
Coolgardie	71·8	6	35·0	16	62·2	45·1	45·7	73	139·0	31·1	1·58	8	6·2
Sydney	64·9	23	38·4	26	59·7	47·6	42·0	75	96·0	30·0	1·74	13	4·3
Wellington	62·0	30	32·0	8	53·1	40·3	39·6	79	95·0	25·0	3·04	16	4·9
Auckland	62·0	12	40·5	26	57·4	48·1	44·3	74	120·0	38·0	3·20	21	6·3
Jamaica, Negril Point..	91·8	29	69·6	11	87·6	74·5	73·4	75	...	...	2·65	7	...
Trinidad	96·0	1	61·0	4	75·1	73·7	72·3	79	167·0	62·0	5·42	15	...
Grenada	88·8	9	72·0	2	84·5	74·7	71·7	78	152·0	...	8·73	29	4·0
Toronto	87·6	30	44·3	19	71·1	52·5	52·6	74	104·0	39·4	3·34	15	6·3
St. John's, N.B.....	75·0	23	41·8	5	65·3	49·2	...	...	...	...	3·13	12	7·1
Winnipeg	87·0	26	34·5	15	75·4	47·6	...	...	...	...	·49	8	4·5
Victoria, B.C.	87·8	8	42·3	3	66·6	51·4	...	...	...	...	·67	13	6·4
Dawson	89·5	19	34·5	7	71·5	46·1	...	...	...	...	·50	8	3·6

a and 22. b and 28.

MALTA.—Mean temp. of air 69°·6 or 2°·0 below, mean hourly velocity of wind 10·2 miles or 1·4 above, averages. Mean temp. of sea 73°·3.

Mauritius.—Mean temp. of air 1°·1, dew point 1°·0, and R ·07 in., above averages. Mean hourly velocity of wind 10·3 miles, or 0·9 below average; extremes, 28·7 on 26th and 1·7 on 3rd; prevailing direction E.S.E.

MADRAS.—Bright sunshine 126·3 hours, or 32·8 per cent. of possible.

KODAIKANAL.—Mean temp. of air 58°·7. Mean velocity of wind 337 miles per day. Bright sunshine 107·2 hours.

COLOMBO.—Mean temp. of air 81°·8 or 0°·8 above, of dew point 1°·4 above, and R 2·90 in. below, averages. Mean hourly velocity of wind 9·8 miles, prevailing direction S.W.

HONGKONG.—Mean temp. of air 82°·0. R 9·42 in. above average. Bright sunshine 151·6 hours. Mean hourly velocity of wind 11·7 miles, prevailing direction S.S.W.

Adelaide.—Mean temp. of air 51°·8 or 1°·6 below, and R ·98 in. above, the average. Very cloudy month, with humid weather and frequent rain in settled areas, but rains deficient inland.

Sydney.—Mean temp. of air 0°·7, humidity 4·8, and R 3·87 in. below, averages.

Wellington.—Mean temp. of air 2°·6 below, and R 2·06 in. below, averages.

Auckland.—Mean temp. of air slightly below average. R 1·50 in. below average of 35 years. Cloudy and showery.

TRINIDAD.—R 2·90 in. below the 40 years' average.