

# SYMONS'S METEOROLOGICAL MAGAZINE.

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## THE RAINFALL OF THE WINTER MONTHS.

THE year may be conveniently divided for some rainfall purposes into a winter and a summer half, and the winter half-year just concluded presents some special features as a whole, and in its several parts, to which reference must be made.

March has proved a wet month at all stations in the British Isles, except a very few on the east coast. It will be noticed in our table on p. 56 that only Newcastle, Aberdeen, Dunrobin, and Roeberry, in Orkney, show readings below the average March fall for the ten years 1890-99. In some cases twice the average fall was experienced, and in most there was an excess of from a half to two-thirds. At Seathwaite, and several other stations in the Lake District, and at some stations in Scotland, rain was reported on every day of the month. While a considerable part of the east of England had less than two inches of rain, the whole of Ireland (except a little patch round Dublin) had more than four inches, and a large area in the west Highlands of Scotland, had a rainfall exceeding 12 inches, and in some places reaching 20 inches. In the Lake District the gauge at The Styne collected 30·3 inches of rain. The distribution of rainfall was similar to that of February, though the contrast between the south-east and north-west was not nearly so great. The prevalence of S.W. and W. winds continued, due to the same cause, the passing of a procession of cyclonic disturbances towards the N.E. off our west coasts.

Table I. gives for 25 representative stations the rainfall in inches for each of the three months of 1903, and the total for three months, followed by the difference in inches from the ten years' average for each month and for the three months.

The values range from  $3\frac{3}{4}$  inches for Brundall near Norwich, where the fall fell short of the average by one-quarter, to no less than  $61\frac{1}{4}$  inches for Seathwaite in Borrowdale, where the fall exceeded the average by nearly two-thirds. At two of the Scottish stations it will be noticed each of the three months had more than ten inches of rain, an unusual circumstance even in the wetter parts of the Highlands.

TABLE I.—*Rainfall of the First Three Months of 1903.*

STATIONS.	RAINFALL.				DIFF. FROM AVERAGE.			
	Jan.	Feb.	Mar.	Total.	Jan.	Feb.	Mar.	Total.
	in.	in.	in.	in.	in.	in.	in.	in.
London .....	2·15	·83	2·30	5·28	+·44	—·64	+·84	+·64
Hitchin .....	2·52	1·03	3·22	6·77	+·81	—·43	+1·78	+2·16
Westley .....	1·90	·28	2·12	4·30	+·21	—1·26	+·49	—·56
Brundall .....	1·68	·34	1·73	3·75	+·01	—1·18	+·12	—1·05
Ashburton .....	6·83	4·38	8·72	19·93	+1·39	+·01	+5·13	+6·53
Polapit Tamar .....	5·14	2·60	5·86	13·60	+1·81	—·01	+3·58	+5·38
Woolstaston .....	2·74	2·19	4·81	9·74	+·28	+·19	+3·04	+3·51
Wetherby .....	2·21	2·20	3·50	7·91	+·55	+·76	+1·87	+3·18
Arncliffe .....	9·81	9·15	10·69	29·65	+3·43	+4·33	+5·57	+13·33
Seathwaite .....	18·18	20·85	22·23	61·26	+3·33	+9·08	+11·57	+23·98
Cardiff .....	5·65	2·51	5·75	13·91	+2·09	—·38	+3·19	+4·90
Haverfordwest .....	6·11	3·09	6·44	15·64	+1·49	—·25	+3·70	+4·94
Gogerddan .....	5·38	3·52	6·02	14·92	+1·13	+·37	+3·18	+4·68
Dumfries .....	6·24	5·70	10·15	22·09	+1·66	+2·04	+7·10	+10·80
Lilliesleaf .....	5·47	3·79	5·03	14·29	+3·12	+1·67	+2·79	+7·58
Glasgow .....	7·16	7·27	7·96	22·39	+3·72	+4·47	+5·48	+13·67
Inveraray .....	10·60	11·17	11·20	32·97	+2·51	+5·29	+5·36	+13·16
Loch Leven .....	7·20	6·96	6·56	20·72	+3·90	+4·18	+3·98	+12·06
Braemar .....	4·57	6·74	6·96	18·27	+1·79	+4·16	+4·64	+10·59
Aberdeen .....	4·98	2·47	1·92	9·37	+2·26	+·06	—·28	+2·04
Glencarron .....	14·01	13·54	11·45	39·00	+3·62	+6·22	+4·51	+14·35
Waterford .....	6·04	2·75	5·95	14·74	+2·52	—·16	+3·43	+5·79
Carlow .....	4·85	3·03	5·98	13·86	+1·78	+·48	+3·77	+6·03
Mullingar .....	6·45	4·45	6·16	17·06	+3·48	+1·80	+3·72	+9·00
Omagh .....	6·19	4·00	7·03	17·22	+2·68	+1·40	+4·45	+8·53

TABLE II.—*Six Months' Winter Rainfall, October, 1902—March, 1903.*

Stations.	Diff. from Aver.	Per cent. of Aver.	Stations.	Diff. from Aver.	Per cent. of Aver.	Station.	Diff. from Aver.	Per cent. of Aver.
	in.			in.			in.	
London .....	—1·33	88	Arncliffe ...+	10·19	129	Braemar ...+	11·56	163
Tenterden .....	—·95	93	Hull .....	—·53	96	Aberdeen .....	+·03	100
Hartley Wintney .....	+1·23	110	Newcastle .....	—1·07	92	Cawdor .....	+3·04	121
Hitchin .....	—·22	98	Seathwaite +	16·58	121	Glencarron +	10·88	120
Winslow .....	—1·03	91	Cardiff .....	+4·62	121	Dunrobin .....	—2·01	89
Westley .....	—3·51	71	Haverfordwest .....	+5·32	121	Darrynane ...	+·61	102
Brundall .....	—3·83	68	Gogerddan ...	+2·69	111	Waterford .....	+7·06	135
Alderbury .....	+1·29	109	Llandudno ...	+2·73	116	Broadford .....	+4·87	128
Ashburton .....	+5·16	117	Dumfries ...+	10·78	143	Carlow .....	+6·44	136
Polapit Tamar ...	+6·41	132	Lilliesleaf .....	+6·95	144	Dublin .....	+3·23	123
Stroud .....	+1·76	113	Colmonell .....	+4·54	118	Mullingar .....	+7·71	143
Woolstaston .....	+2·58	117	Glasgow ...+	12·02	161	Ballinasloe ...	+6·14	133
Boston .....	—·17	98	Inveraray .....	+8·97	121	Clifden .....	+4·32	110
Hesley Hall .....	+·33	103	Islay .....	+3·05	111	Crossmolina ...	+7·81	125
Derby .....	+1·58	115	Mull .....	+6·31	119	Seaforde .....	+6·51	134
Bolton .....	+2·46	112	Loch Leven ...	+9·88	151	Londonderry..	+2·38	111
Wetherby .....	+4·04	135	Dundee .....	+1·83	112	Omagh .....	+7·40	137

Turning now to the six months' winter rainfall as a whole, Table II. shows the condition of the country.

It will be seen that, except along the east coast, where Norfolk and Suffolk have received little more than two-thirds of their usual supply, the country has been well watered. In Ireland the winter rainfall shows on the average an excess of one-third, the centre of Scotland has the very unusual excess of one-half, while in Wales and the west of England, the excess averages one-fifth. The winter months have thus been wet not only relatively to the recent run of dry years, but relatively to the normal rainfall of a very long period. The consequences may be unpleasant for the farmer, but they will ensure a water-supply which will relieve the water-works engineer from anxiety as to the possible dryness of the summer half-year.

### THE TEMPERATURE OF MARCH, 1903.

It would probably be difficult to find any month in any year which was not in some way unique with regard to its weather, so distinct is the individuality which the grouping of the multitudinous conditions of climate can confer. But it is not often that the month of March pushes itself so far in advance of the season as it has done this year, at least in the south of England. In the north of England, in Scotland and in Ireland, the excessive rainfall has drowned all other considerations, but everywhere in the British Isles March has been unduly mild.

The average values for the daily mean, 9 a.m., 9 p.m., maximum and minimum thermometer readings for the whole month of March at Camden Square were as follows for the average of 40 years, 1858-95, for 1903, and for the occasion of highest value previously recorded.

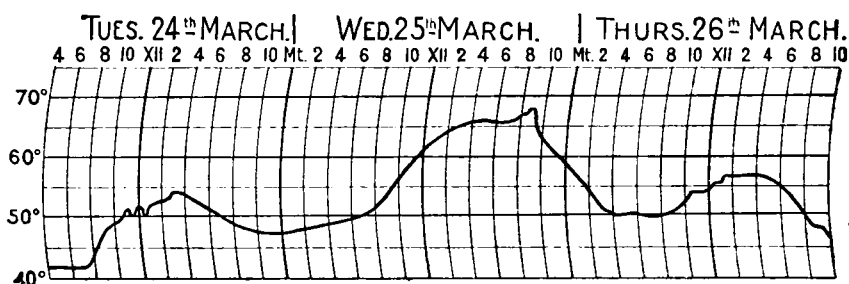
	Average	Mean.	9 a.m.	9 p.m.	Max.	Min.			
Average March .....	42.1	...	41.8	...	41.3	...	50.2	...	35.5
March, 1903 .....	46.4	...	46.1	...	46.0	...	53.9	...	39.5
Difference .....	+ 4.3	...	+ 4.3	...	+ 4.7	...	+ 3.7	...	+ 4.0
Highest previous ...	46.3	...	46.7	...	45.7	...	56.6	...	39.9
Year .....	1859	...	1859	...	1896	...	1893	...	1859 & '96

It will be noticed that March, 1859, was very nearly as warm on the average as March, 1903.

The main feature of the temperature of the month was the warmth of one day, the 25th. The mean temperature of that day at Camden Square was 58°·3, the warmest March day recorded previously (March 24th, 1858) having had a mean of 56°·0. The maximum temperature on a Glaisher stand was 67°·9, which has been exceeded in three years out of the last forty-six, viz.: March 16th, 1884 (68°·0), March 24th and 26th, 1871 (68°·4 and 68°·7), and March 24th, 1858 (70°·1). The unprecedented nature of the day was due to the fact that the maximum temperature was not reached until nearly two hours after sunset, and the 9 p.m. reading

was  $64^{\circ}2$ , the highest ever previously recorded at that hour having been  $57^{\circ}2$  on March 22nd, 1896.

Mr. F. Campbell Bayard has kindly sent us the trace of his thermograph at Wallington, near Croydon, which is reproduced in order to show the peculiar nature of the day. After the normal maximum about 4 p.m. the temperature fell slightly until 6 p.m., and then rose steadily until about 8.30 p.m., when an abrupt fall occurred. Mr. G. von U. Searle informs us that his thermograph at West Kensington showed a maximum of  $68^{\circ}3$  at 8 p.m. precisely.



The fall of temperature was simultaneous with a sudden rise of the barometer resembling the first half of a typical thunderstorm curve. A slight thunderstorm was noted in London, but it seems to have been more severe to the south west. Lady Jenkyns, of Botley Hill, Botley, writes:—

"The 25th was our one warm day at Botley. From 1 p.m. till 5 p.m. the distant thunder was almost continuous, and so unlike thunder sometimes that people said it must be the sound of guns; but guns would not have gone on so long. As it grew dark there was a good deal of lightning, some forked, but that never came nearer. All this was to the south-west of us, towards Southampton; perhaps it was in the Isle of Wight or at sea."

Colonel Ward, writing from Upton Park, Slough, says:—

"On the 25th the temperature went up to  $67^{\circ}$  at 2 p.m., and at 4 it was  $65^{\circ}$ , where it remained until a heavy thunderstorm passed over from the south-west about 7 p.m. Between 9 and 10 a.m. very distant thunder was heard almost continuously in the south-west and south. At 2 p.m. heavy clouds came up from the south-west, and at 5 p.m. they were real 'pocky clouds' such as one sees in the north of Scotland, and which my old friend Clement Ley called mammato-cumulus. The day reminded me of one in the sixties or late fifties in Wiltshire, when we heard what we then thought was thunder, but it turned out to be the French and British fleets saluting at Cherbourg."

Several observers comment on the remarkably low relative humidity of the day, the depression of the wet-bulb exceeding  $11^{\circ}$  at 9 p.m.

At Greenwich Observatory the mean temperature was  $58^{\circ}2$ , or  $15^{\circ}8$  above the normal mean temperature of March 25th as shown by a record of fifty years.

## THE SHORTAGE OF WATER.

A CONFERENCE on the present shortage of water available for supply was held in the Parkes Museum, Margaret Street, London, under the auspices of the Sanitary Institute, on Wednesday, February 11th, Sir A. R. Binnie, C.E., in the chair. Mr. W. Whitaker, F.R.S., opened the conference by showing that in all parts of England the level of underground water had been sinking in recent years, in some cases at an alarming rate. This he attributed in part to a diminution of the rainfall, which, he suggested, might possibly be of the nature of a progressive change, though on this point he would not express a decided opinion. In part it was undoubtedly due to the excessive pumping of water from the permeable water-bearing strata, sometimes for the purpose of manufactures or water-supply; but frequently, as in the case of the Severn tunnel, and of many mines and quarries, simply to clear the workings, the water pumped being absolutely wasted. Mr. Whitaker urged the importance of legislation as to property in underground water.

Mr. J. Hopkinson followed with explicit details as to the very remarkable diminution in the supply of water from the deep wells in Hertfordshire, where the dearth of water was becoming a serious matter, especially in the valley of the Lea.

Dr. H. R. Mill pointed out that rainfall statistics did not bear out the theory of a secular diminution of rainfall. Taking the average rainfall of the British Isles as a whole, he showed that out of the 37 years, 1865-1901 (regarding which data were available in "British Rainfall") the seven years, 1865-71, had on the average the same annual fall as the whole period, the 15 years, 1872-86, had an average excess of eight per cent., and the 15 years, 1887-1901, had an average deficiency of eight per cent. During the last 15 years the rainfall of the country as a whole had only been above the average on three years. The deficiency was scarcely noticeable in Ireland, or Wales; in the West of Scotland, the English Lake District and the north-west of Yorkshire, there had been an actual excess, but the deficiency in the central parts of England had been very great, reaching 16 or 17 per cent. for the ten years, 1890-99. We were at present in a dry period, but it was impossible to say whether we were near the end of it or not.

Mr. Baldwin Latham pointed out a number of historical occasions when the dearth of water in particular areas was much greater than at present, and he made special reference to the conditions determining the evaporation and percolation of rain-water on the ground. He believed the average rainfall would ultimately be re-established.

Mr. Verney, of the London County Council, said it was the duty of the citizens of London to secure such a water supply that no period of local drought, however prolonged, would lead to the risk of a water famine.

Mr. Clayton Beadle gave particulars of the drying-up of streams and the sinking of the water-level in the chalk in the north of Kent, where the inhabitants were becoming seriously alarmed.

Mr. Douglas Archibald said that the statistics of rainfall appeared to him to leave little room for any theory of secular change ; but on the contrary, they showed evidence of periodical variations agreeing in so striking a way with Brückner's  $35\frac{1}{2}$ -year cycle that, without making a prediction, he would not be surprised if the present dry period were to terminate in the year 1905 or 1906.

Sir Alexander Binnie briefly summed up the discussion, and thanked Mr. Whitaker for his opening paper. A vote of thanks to the Chairman terminated the meeting.

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### James Glaisher, F.R.S.

1809-1902.

THE death of so distinguished a meteorologist as the late James Glaisher, requires more than a mere record of the fact in the pages of any English magazine devoted to meteorology.

Mr. Glaisher was born so long ago as the year 1809, and at the time of his death he was within a couple of months of completing his 94th year. His early life was spent not far from the Royal Observatory, and his determination to follow a scientific career was, probably, largely due to an intimate friendship he formed in those days with a member of the Observatory staff. At the age of twenty Glaisher obtained an appointment upon the trigonometrical survey of Ireland, and for about three years he remained in that country, occupied for the most part in field work. He then became assistant to Professor G. B. Airy, who was at that time the Director of the Observatory at Cambridge. Subsequently, when Airy became Astronomer Royal, Glaisher was offered a post on the Greenwich staff, of which he continued to be a member from the year 1835 until his retirement in 1874.

Glaisher's early work, both at Cambridge and at Greenwich, was wholly astronomical, and it was not until, in the course of re organization of the Observatory, the Magnetical and Meteorological Department was established that he entered upon the study of the science in which he made his mark. When this new department was established Airy placed it under Glaisher's superintendence, and probably a better choice for the post could hardly have been made. He lost no time in getting to work, not only upon organization, and observational details, but also in carrying out various investigations which presented themselves in his new field of research.

One of the earliest of these was an enquiry into "the amount of heat radiated at night from the surface of the earth," published in the *Philosophical Transactions* for 1847 ; and this was followed by his tables of correction for diurnal range, which appeared in the next volume of the same publication. About the same time, too, he was busy upon the production of the Hygrometrical Tables, which are so familiar, and so useful, to every meteorologist, and without which determinations of the dew-point, the humidity of the air, and its

elastic force, would be a far more difficult and intricate business than it now is ; the fifth edition of these tables was issued in 1869.

The year 1849 was an important one to Glaisher because he then became a Fellow of the Royal Society, and also because it was in that year that he began to furnish to the Reports of the Registrar General, the quarterly meteorological returns for England, which have regularly appeared there ever since, and which Mr. Glaisher himself continued to supply until last year. This was the first attempt ever made to organize a body of volunteer meteorological observers for such co-operative work, and in it we have the germ of the system which became so largely developed under the late Mr. Symons, in the British Rainfall Organization, and which has also been adopted and extended by the Meteorological Office, and by the Meteorological Societies, in their corps of climatological observers.

In the year 1850 the Meteorological Society was founded by Dr. Lee and others, of whom Glaisher was one, and Glaisher becoming its first Secretary, and seventeen years later its tenth President. The prominent part he took in the early development of the society is generously acknowledged in the following words, written by the late Mr. Symons in anticipation of the Jubilee of the society, held three years ago,—words which, alas ! had to be spoken by another—“during the first half of its career the society was largely guided by its original secretary, and our oldest Fellow, Mr. James Glaisher, F.R.S., who nursed it through its infancy and youth, and left it to other hands only when it was old enough and strong enough to walk alone.” By the death of Mr. Glaisher the last of the ten men who first constituted the Meteorological Society has passed away.

But the work which most of all drew public attention to Mr. Glaisher was that done by him, at the instigation of the British Association, in exploring the upper regions of the atmosphere by means of balloons. This work was spread over a period of five years, and embraced about 30 ascents, the most remarkable of which was also one of the earliest, and was made from Wolverhampton on September 5th, 1862, when a height estimated at about 7 miles was reached, and both Glaisher and his aeronaut, Coxwell, narrowly escaped losing their lives. Subsequently these “free” ascents were supplemented by others, made with a large “captive” balloon at Chelsea.

Thenceforward the subject of aërostation occupied a great deal of Mr. Glaisher's attention. He wrote the article on Aëronautics (23 pp.) in the ninth edition of the *Encyclopædia Britannica*, and besides many smaller contributions to various magazines, he edited English translations of works on the subject by the French writers, M.M. Tissandier and Flammarion.

Space will not allow us to name the subjects dealt with in the 52 works with which he is credited in the Royal Society's catalogue of scientific papers, the latest of which was on the “variation of temperature with altitude in the neighbourhood of the ground” and

appeared in the *Comptes Rendus* of the Paris Academy of Sciences, and in *Nature*, in 1877; but the subjects covered a great deal of ground, chiefly on the statistical and climatological side of meteorology.

Strong both physically and mentally, Mr. Glaisher's was an active life throughout, and he was ever a keen controversialist. Up to the end he maintained his interest in the several learned societies to which he belonged, besides continuing to take an active part in the directorate of more than one public company.

He died on February 7th, 1903, and was buried at Shirley, near Croydon. R.H.C.

### ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on March 18th, at the Institution of Civil Engineers, Great George Street, Westminster, Capt. D. Wilson-Barker, F.R.S.E., President, in the chair.

The following gentlemen were elected Fellows:—Mr. A. E. Abbott, M. L. Teisserenc de Bort, Mr. B. P. Evans and Mr. A. F. Waterhouse.

This was the "popular" meeting of the session, and was very numerously attended by the Fellows and their friends. Mr. C. V. Boys, F.R.S., at the request of the Council, gave a lecture on "The Transmission of Sound through the Atmosphere," which he illustrated by experiments and lantern slides.

The lecturer began by stating that his object was not to give examples of observations of the anomalous manner in which sound sometimes either passes to great distances or fails to pass to moderate distances, but to give some account of the physical causes of such anomalous behaviour. Sound is transmitted as a compression and rarefaction wave in the air. Mr. Boys contrasted the apparent differences in the behaviour of waves of water, sound waves, and light waves, and showed that these were merely an effect of the relative wave lengths and the means of observation. He pointed out the perfection of the behaviour of ripples as compared with larger water waves in obeying the laws of reflection and refraction, and exhibited some beautiful illustrative slides.

Experiments with sound waves of a similar kind require apparatus on the scale of magnitude of houses or hills, unless sound waves too short to be audible are employed. By the aid of a sensitive flame the lecturer showed the absolute obedience to the ordinary laws of radiation of sound waves too short to produce audible effects.

When a sound wave is passing through the air there is an alternate condensation and rarefaction. Even though this may be very small, the variation amounting generally to far less than  $\frac{1}{1000}$  of the whole pressure, the air, so compressed, or rarefied, is, to an almost infinitesimal extent, more slowly or more quickly traversable by light, *i.e.*, it is almost infinitesimally more or less refractive to light. This opens up the possibility of seeing and photographing a sound wave. Mr. Boys exhibited photographs of rifle bullets travelling at a speed greater

than that of sound. In such cases there is no time for the air to pass round and get to the other side of the bullet. It is compressed in front, so that a wave like a ship's wave is produced, the limbs travelling outwards with the velocity of sound, while the highly compressed wave in front travels twice or perhaps three times as fast, according to the speed of the bullet. By means of the animatograph representations were given of Mr. Ryves' observation of the shadow of the sound of a great explosion, and also of Prof. R. W. Wood's photographs of sound waves.

He concluded by referring to mirage and looming in optics, and stated that the corresponding phenomena in acoustics give rise to abnormal audibility of sound.

On the motion of the chairman a hearty vote of thanks was accorded to Mr. Boys.

## IRISH BAROGRAMS OF THE STORM OF FEBRUARY 26TH.

By PROFESSOR C. J. JOLY, *Royal Astronomer for Ireland.*

I HAVE examined about one hundred barograms obtained during the week of the recent storm, culminating on the night of February 26th-27th, which were kindly sent to me from many parts of Ireland, nearly every county being represented. Assuming that the trough of the depression was a straight line and that it moved with uniform velocity across the country, I combined the records so as to get rid of uncertainty in the time as much as possible, and the results of my calculations showed that the trough travelled at the rate of about 47 miles an hour from the south-west, or more exactly from a point  $50\frac{1}{2}$  degrees west of south. The data at my disposal hardly warrant any more definite conclusion on account of the uncertainty in the time. This uncertainty is partly due to carelessness in setting the instrument and in taking account of the error in the clock driving the drum, and partly owing to defects in the barograph sheets. I feel sure, from cases that have come under my own observation, that owners of barographs do not always insist on being supplied with sheets made specially for their type of instrument. From this cause an error of an hour or more may occur in parts of the curve. Moreover some sheets appear to be most carelessly manufactured. This may be seen by partially superposing two sheets of the same make so that on looking through them in a strong light the time lines of the first part of the week on one sheet may cover as nearly as possible the time lines of the second part of the week on the other sheet. With well-made sheets the coincidence should be exact, but I have seen sheets in which there is a divergence of nearly half an hour.

In the same way I investigated the depth of the depression, from a well-marked summit immediately preceding the storm, to the lowest point of the curve. I assumed, in the first place, that the curves of equal depression across the country were straight lines, and

that the depression increased uniformly at right angles to these lines. The results showed that this assumption was not strictly accurate though it appears to be a very fair approximation. These lines of equal depression make an angle of about 11 degrees with the line of advance of the trough; in fact, looking along one of these lines towards the east, the direction is about  $28\frac{1}{2}^{\circ}$  north of east. I drew these lines for depressions of .9 in., 1.0 in., 1.1 in., 1.2 in., 1.3 in. and 1.4 in., the distance between neighbouring lines representing about 31 miles, and the means of the observed depressions adjacent to the lines I found to be respectively .86 in., 1.00 in., 1.12 in., 1.28 in., 1.30 in. and 1.29 in. The divergence is apparent, and the depressions are very large near the fourth line which runs nearly from Galway to Dundalk. The first line runs just south of Cork and Waterford.

Comparison of the shapes of the barograph curves is very interesting but difficult to describe without diagrams. Speaking generally, the first thought on superposition of a shallow and a deep curve is that the latter has simply grown deeper from the former, the upper parts of the curves remaining much the same. There is, however, a multitude of minute characteristics which can be traced from one locality to another, and after a little study it would be quite possible to predict the place from which a curve had been sent. One of the most striking peculiarities consists in the thickening and roughening of the lower parts of the curve caused by vibration of the pen. This seems to indicate rapid alterations in the pressure. It is not much marked on the southern curves with smoothly rounded blunt bends; it becomes very much marked indeed on the sharp curves from the neighbourhood of Dublin and along the line from that place to Ennis, and also on the south east, but curves north of Ennis and of Dublin show hardly a trace of the vibration. They become deeper and the bend consists of a smooth small round curve.

I think it is a pity that more is not done to encourage owners of barographs to keep careful records, for I believe that the barograph would prove to be a most valuable instrument for scientific purposes, if even one-tenth the attention were given to it that the mercurial barometer has received. A thorough discussion of all the available records for a year might lead to very important results, and I hope, even if this laborious task is not undertaken, that some one with more leisure than I have will completely work up the barograms of the recent storm.

[In our last number we gave some particulars of the great damage wrought by the storm, the barograms of which have been collected and discussed in so interesting a manner by Professor Joly. We have now the pleasure of reproducing two striking photographs taken by Mr. Greenwood Pim, of Monkstown, Co. Dublin. They illustrate the fate of many thousand trees in all parts of Ireland; their fall may be viewed as a trace from nature's recording anemometer, the marks of which will not soon be obliterated.—ED. S.M.M.]



*Photograph by Greenwood Pim, Esq.]*

TREES UPROOTED BY THE GALE AT MONKSTOWN, CO. DUBLIN, FEBRUARY 26TH, 1903.



*Photograph by Greenwood Pim, Esq.]*

TREE UPROOTED BY THE GALE AT GLASNEVIN, BOTANIC GARDENS, FEBRUARY 26TH, 1903.

## REVIEWS.

*The Meteorology of the Ben Nevis Observatories. Part II, containing the observations for the years 1888, 1889, 1890, 1891 and 1892 with Appendices.* Edited by ALEXANDER BUCHAN, LL.D., F.R.S., and ROBERT TRAIL OMOND. (Forming Vol. 42 of the "Transactions of the Royal Society of Edinburgh.") Edinburgh, 1902. Size  $12\frac{1}{2} \times 9\frac{1}{2}$ . Pp. xiv. + 552.

THE high-level observatory on Ben Nevis was opened in 1883, and the hourly readings of the various instruments from December 1st, 1883, to December 31st, 1887, were printed in full in vol. 34 of the *Transactions* of the Royal Society of Edinburgh. The present volume contains the hourly readings for the following five years, 1888-92, and also those for the low-level observatory which was founded as one of the five observatories of the Meteorological Council in 1890. The cost of preparing the volume has been shared by the Royal Societies of London and Edinburgh.

The hourly tables present a mass of honest hard work such as has very rarely been put on record before, for since the severe climatic conditions of the summit of Ben Nevis make it impossible to leave ordinary recording instruments in the open air, every reading at every hour, summer and winter, day and night, has been made by direct personal observation. The difficulties of the task are briefly touched upon in the introduction, and for the most part the records show that these have been bravely and successfully met. One difficulty, however, has not been got over, and that is the measurement of wind-force. A Robinson cup-anemometer is used in summer, but on account of the accumulation of ice-crystals deposited from fog it cannot be employed in winter. So far as we are aware a Dines' anemometer which, we believe, could readily be adapted to the conditions of Ben Nevis, has not been tried, and the strength of the winds has to be estimated without instrumental aid; a serious matter, for the velocity on extreme occasions is stated to exceed 150 miles per hour. The importance of obtaining trustworthy anemometric observations at so great a height is one argument for the continuance of the observatory and the extension of its equipment; indeed, without such observations, a great deal of the most valuable part of the work cannot be fully utilized. It is shown very clearly by Dr. Buchan in the appendix that the readings of the barometer require a large correction during gales; the mercury being depressed as much as one-hundredth of an inch by the suction of the wind at 20 miles an hour blowing past the barometer room; while a wind of 80 miles an hour produces a depression of one-tenth of an inch. As a violent gale may be raging at Ben Nevis, while a calm reigns in Fort William, it is plain that the whole value of the barometric observations depends on determining the wind factor. This is, of course, not a local effect, and a similar correction must doubtless be applied to barometers at sea-level read in windy weather, so that the whole

question of the relation of wind-force to barometric gradient is opened up for discussion.

The numerous papers in the appendix show that solid results have already been obtained; but we deplore the absence of diagrams which are really essential to the clear comprehension of any discussion involving time-changes of phenomena. The scientific world is indebted to the Ben Nevis directors for their splendid enterprise, which has been carried out in a way that is an honour, not only to Scotland, but to the British Empire and to the world at large. The work can be extended and improved at the observatories; it can be discussed for scientific purposes with the certainty of success; and it may very well be that thorough discussion of the records will give to the Observatory a permanent place in weather forecasting, though as yet the way in which this may be done has not been discovered. If the whole series of Ben Nevis observations could be discussed by some competent specialist, who would be relieved from all other work until the task was finished, we believe that the result would justify the expense; and could not a temporary chair of meteorology in the University of Edinburgh be instituted for this purpose by the Carnegie Trust?

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*Temperature Tables for the British Islands. Supplement. Difference Tables for each five years for the extrapolation of mean values. Size 12 × 10. Pp. viii + 36. Price 3s.*

*Hourly means of the readings obtained from the self-recording instruments at the five observatories under the Meteorological Council. 1899. Size 12 × 10. Pp. xii. + 240. Price 37s. 6d.*

*Meteorological Observations at Stations of the Second Order, for the year 1899. With frontispiece Map. Size 12 × 10. Pp. xiv. + 182. Price 22s. 6d. Published by Direction of the Meteorological Council. London, 1902.*

THE occasional delay in noticing new publications, necessitated by the abundance of other matters of interest pressing on our restricted space, has at least the incidental advantage, that we are sometimes able to notice together several works of kindred aim, or similar origin, as in the case of the three publications of the Meteorological Office named above. The volume to which the first named is a supplement (see this magazine for July, 1902, p. 93) gave the mean monthly values for temperature for 117 stations, but not in all cases for the same period of years. The present publication gives the mean monthly values for the same stations grouped in five-year periods, showing the correction to be applied to bring any period to the mean value for 30 years wherever so long a period exists. As the stations are arranged under the Meteorological Office forecasting divisions, it is easy in cases of shorter records to see, by inspecting the values for neighbouring stations, what correction is required to deduce the 30 years mean from the mean of any five years.

The second volume is a record of the hourly values of the various meteorological elements which are registered automatically at the Meteorological Office observatories at Valencia, Fort William, Aberdeen, Falmouth and Kew. It is in all respects similar to the issues for earlier years, and supplies information which for many purposes is of great value. For other purposes, however, the results as published cannot be utilized. It is natural to wish to compare the duration of sunshine with the duration of rainfall; but the tables only offer a comparison of the duration of sunshine with the intensity of rainfall per hour, when any rain happened to fall in a given hour, and as the rainfall "hour" called 2 is that extending from 1 o'clock to 2 o'clock, while the sunshine hour called 2 is that extending from 1.30 to 2.30, the attempt to utilize these tables even for such a purpose is wholly vain.

The third volume is also on the familiar lines and it permits of the comparison of the 9 a.m. and 9 p.m. observations at 80 stations, the geographical positions of which as shown on the map leave large tracts of country in some places unrepresented, while in others two or even three stations are close together. Where, as in the case of Fort William and Ben Nevis, the adjacent stations differ greatly in their elevation, or exposure, their vicinity of course adds much to the interest of the comparison.

We regret to see the disparity between the dates of observation and publication, and we regret still more to see the high prices placed upon reports which can never, by their sale, pay more than a fraction of the cost of production. If the observers—most of them voluntary and unpaid—whose work is here set forth, receive a copy of the publications in return for their observations the high price may be accepted as a delicate compliment; but the delay in publication would deprive the compliment of much of its value, even if the hypothesis put forward could be accepted.

### BOOKS RECEIVED.

- County Borough of Bolton. Annual Report of the Museums and Meteorological Observatory for 1902. [By W. W. Midgley.] Bolton, 1903. Size  $8\frac{1}{2} \times 5\frac{1}{2}$ . Pp. 20 and table.
- U.S. Department of Agriculture. Weather Bureau. Bulletin I. Eclipse Meteorology and allied problems. By Frank H. Bigelow, Professor of Meteorology. Washington, 1902. Size  $11\frac{1}{2} \times 9\frac{1}{2}$ . Pp. 166.
- Meteorological History of the Seven Monsoon Seasons, 1893-1899, in relation to the Indian Rainfall. By W. L. Dallas. Indian Meteorological Memoirs, Vol. XII. Pp. 409-486.
- Meteorological Data of the Wirral Peninsula, Liverpool and District and Southport. By the Rev. J. Cairns Mitchell. [From *Liverpool Flora*, 1902.] Size  $8\frac{1}{2} \times 5\frac{1}{2}$ . Pp. 12.
- United States Magnetic Declination Tables and Isogonic Charts for 1902. By L. A. Bauer. Washington, 1902. Size  $11\frac{1}{2} \times 7\frac{1}{2}$ . Pp. 405. *Plates and illustrations.*
- Report on the Meteorology of Margate, 1882-1901. By John Stokes. Margate, 1902. Size  $9\frac{1}{2} \times 6$ . Pp. 8.

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

RAINFALL.—EXTREMES.

MONTHS.	MONTHLY TOTALS.				MAXIMUM FALL IN MONTH.				RAINY DAYS.				No. of Falls of 1.00 in. or more in the whole period.	
	EXTREMES.				EXTREMES.				EXTREMES.					
	Mean 40 Years.	Highest Month.	Lowest Month.	Depth.	Date.	Depth.	Date.	Depth.	Date.	Lowest.	Mean.	Highest.		Lowest.
January .....	2.02	4.74	1877	in. .31	1880	1.20	10th, '66	.13	22nd, '92	'77 & '94	5	1880	4	
February.....	1.61	3.77	1879	.01	1891	.76	10th, '79	.01	7th, '91	1879	1	1891	0	
March.....	1.71	3.69	1862	.32	1893	.95	3rd, '70	.08	12th, '74	1896	5	'58 & '80	0	
April .....	1.66	4.97	1878	.24	1893	2.56	10th, '78	.08	4th, 12th, 13th, 14th & 29th, '96	1867	3	1893	2	
May .....	1.92	4.79	1886	.14	1896	1.71	7th, '78	.12	( 17th, '95 } 21st, '96 )	1887	3	1896	7	
June .....	2.23	6.71	1878	.30	1895	3.28	23rd, '78	.20	18th, '95	1860	3	1887	10	
July .....	2.39	5.10	1880	.45	1868	.71	1.82	25th, '67	3rd, '64	1888	3	'63 & '68	6	
August ...	2.39	6.72	1878	.45	1880	.68	1.71	27th, '92	9th, '86	1860	4	1880	6	
September	2.39	5.51	1896	.55	1865	.69	1.66	26th, '59	14th, '91	1866	2	1895	7	
October ...	2.71	6.22	1865	.56	1897	.66	1.35	30th, '94	18th, '97	'82 & '86	7	'64 & '88	8	
November	2.30	4.65	1861	.53	1858	.58	1.42	13th, '61	27th, '58	1877	4	1867	3	
December	2.13	6.25	1876	.36	1864	.54	1.82	26th, '86	19th, '64	1868	8	'64 & '73	2	
YEAR .....	25.46	34.08	1878	16.93	1864	1.31	3.28	June 23, 1878	Dec. 2nd, 1896	'60 & '72	106	1858	55	

\* The values in this line relate to the year as a whole, not to the months.

## RAINFALL AND TEMPERATURE, MARCH, 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.	Difference from average 1890-9.	Greatest Fall in 24 hours.		Max.		Min.		In shade.	On grass.		
						Deg.	Date	Deg.	Date				
I.	London (Camden Square) .....	inches. 2.30	inches. + .84	in. .37	2	18	67.9	25	29.9	11	3	14	
II.	Tenterden .....	2.26	+ .57	.36	2, 17	20	66.0	25	27.0	11	2	12	
„	Hartley Wintney .....	3.97	+ 2.41	.60	23	22	64.0	25	26.0	11	9	14	
III.	Hitchin .....	3.22	+ 1.78	.65	23	21	66.0	25	29.0	10	7	...	
„	Winslow (Addington) .....	3.20	+ 1.68	.71	23	19	66.0	25	29.0	11	8	11	
IV.	Bury St. Edmunds (Westley) .....	2.12	+ .49	.47	23	18	64.0	26	29.0	12	5	...	
„	Norwich (Brundall) .....	1.73	+ .12	.33	23	19	64.6	25	28.2	12	4	12	
V.	Winterborne Steepleton .....	4.82	...	.78	5	21	56.4	25	27.5	12	2	10	
„	Torquay .....	4.24	...	.72	1	23	57.9	22	36.0	11	0	4	
„	Polapit Tamar [Launceston] .....	5.86	+ 3.58	.48	17a	26	58.0	22	32.0	11	1	5	
VI.	Stroud (Upfield) .....	3.86	+ 2.18	.51	1, 26	25	63.0	22	32.0	5	1	...	
„	Church Stretton (Woolstaston) .....	4.81	+ 3.04	.62	13	26	57.5	24	30.0	2	5	...	
„	Worcester (Diglis Lock) .....	...	...	...	...	...	...	...	...	...	...	...	
VII.	Boston .....	2.81	+ 1.62	.45	23	16	65.0	25	30.0	6	...	...	
„	Hesley Hall [Tickhill] .....	2.54	+ 1.14	.60	17	16	58.0	13b	30.0	11	4	...	
„	Derby (Midland Railway) .....	3.43	+ 2.01	.73	17	23	62.0	25	28.0	12	2	...	
VIII.	Bolton (The Park) .....	4.04	+ 1.32	.76	17	25	59.8	22	31.2	2	...	...	
IX.	Wetherby (Ribston Hall) .....	3.50	+ 1.87	.77	17	22	...	...	...	...	...	...	
„	Skipton (Arncliffe Vicarage) .....	10.69	+ 5.57	1.57	19	29	...	...	...	...	...	...	
„	Hull (Pearson Park) .....	2.64	+ .98	.79	17	16	65.0	25	32.0	11	1	16	
X.	Newcastle (Town Moor) .....	1.14	— .80	.22	20	16	...	...	...	...	...	...	
„	Borrowdale (Seathwaite) .....	22.23	+ 11.57	2.09	20	31	55.5	31	31.3	2	1	...	
XI.	Cardiff (Ely) .....	5.75	+ 3.19	.65	1	25	...	...	...	...	...	...	
„	Haverfordwest .....	6.44	+ 3.70	.95	18	24	55.3	21	33.2	10	0	12	
„	Aberystwith (Gogerddan) .....	6.02	+ 3.18	1.08	13	19	56.0	22c	...	...	...	...	
„	Llandudno .....	4.26	+ 2.32	.78	17	23	59.0	23	33.2	18	0	...	
XII.	Cargen [Dumfries] .....	10.15	+ 7.10	1.22	19	28	55.0	31	32.0	4g	4	...	
XIII.	Edinburgh (Royal Observatory) .....	4.10	...	.48	22	26	54.5	22	30.7	15	4	13	
XIV.	Colmonell .....	5.65	+ 2.41	.90	22	23	54.0	22	33.0	9	0	...	
XV.	Tighnabruach .....	8.62	...	.82	16	30	52.0	31	31.0	7, 13	4	...	
„	Mull (Quinish) .....	7.77	+ 3.60	.88	8	29	...	...	...	...	...	...	
XVI.	Loch Leven Sluices .....	6.56	+ 3.98	.59	21	26	...	...	...	...	...	...	
„	Dundee (Eastern Necropolis) .....	2.40	+ .42	.30	22	27	55.9	22d	28.0	7	6	...	
XVII.	Braemar .....	6.96	+ 4.64	.86	18	27	50.0	21	23.2	7	11	25	
„	Aberdeen (Cranford) .....	1.92	— .28	.40	16	24	58.0	23	26.0	6	15	...	
„	Cawdor (Budgate) .....	3.24	+ 1.00	.51	18	20	...	...	...	...	...	...	
XVIII.	Strathconan [Beaul] .....	7.47	+ 3.25	1.13	19	16	...	...	...	...	...	...	
„	Glenarron Lodge .....	11.45	+ 4.51	1.21	21	29	55.2	21	26.0	2	11	...	
XIX.	Dunrobin .....	2.10	— .34	.40	19	19	52.0	21	29.0	7	6	...	
„	S. Ronaldshay (Roeberry) .....	2.03	— .66	.31	27	25	51.0	25	30.0	1, 2	4	...	
XX.	Darrynane Abbey .....	6.25	+ 3.13	.90	22	30	...	...	...	...	...	...	
„	Waterford (Brook Lodge) .....	5.95	+ 3.43	.63	12	28	54.0	31	31.0	8, 10	4	...	
„	Broadford (Hurdlestown) .....	5.26	+ 3.06	1.00	22	27	59.0	18	30.0	12h	4	...	
XXI.	Carlow (Browne's Hill) .....	5.98	+ 3.77	.94	12	30	...	...	...	...	...	...	
„	Dublin (Fitz William Square) .....	3.62	+ 1.80	.81	12	26	60.7	22	34.1	2	0	4	
XXII.	Ballinasloe .....	6.45	+ 4.03	.98	22	30	55.0	22	19.0	31	17	...	
„	Clifden (Kylemore) .....	10.10	+ 4.91	1.33	24	25	...	...	...	...	...	...	
XXIII.	Seaforde .....	5.29	+ 2.88	.61	19	27	58.0	26	28.0	7i	12	12	
„	Londonderry (Creggan Res.) .....	5.11	+ 2.42	.80	16	28	...	...	...	...	...	...	
„	Omagh (Edenfel) .....	7.03	+ 4.45	1.06	23	27	54.0	21e	28.0	1	8	15	

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

a and 23, 26. b and 20, 21, 26. c and 24. d and 31. e and 25. f and 12. g and 7, 10, 14.

h and 13. i and 8, 23.

## SUPPLEMENTARY RAINFALL, MARCH, 1903.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	3.52	XI.	Llandefaelog-fach.....	6.61
II.	Dorking, Abinger Hall .	3.39	„	New Radnor, Ednol.....	7.97
„	Sheppey, Leysdown .....	1.52	„	Rhayader, Nantgwillt...	12.49
„	Hailsham .....	2.69	„	Lake Vyrnwy .....	...
„	Crowborough.....	3.66	„	Ruthin, Plâs Drâw .....	5.73
„	Ryde, Beldornie Tower..	2.70	„	Criccieth, Talarvor .....	4.76
„	Bournemouth, Kempsey	3.31	„	I. of Anglesey, Lligwy..	5.71
„	Ensworth, Redlands ...	2.83	„	Douglas, Woodville.....	3.90
„	Alton, Ashdell .....	5.12	XII.	Stoneykirk, Ardwell Ho.	4.00
„	Newbury, Welford Park	4.49	„	Dalry, Old Garroch .....	13.35
III.	Oxford, Magdalen Coll..	2.77	„	Montaive, Maxwelton Ho.	11.66
„	Banbury, Bloxham .....	3.40	„	Lilliesleaf, Riddell .....	5.03
„	Pitsford, Sedgebrook ...	3.20	XIII.	N. Esk Res. [Penicuik]	6.75
„	Huntingdon, Brampton.	2.48	XIV.	Dalry, Blair .....	6.56
„	Wisbech, Bank House...	2.25	„	Glasgow, Queen's Park..	7.96
IV.	Southend .....	1.36	XV.	Inveraray, Newtown ...	11.20
„	Colchester, Lexden .....	1.32	„	Ballachulish, Ardsheal...	13.54
„	Saffron Waldon, Newport	2.34	„	Campbeltown, Redknowe	5.24
„	Rendlesham Hall .....	1.64	„	Islay, Eallabus.....	6.15
„	Swaffham .....	2.30	XVI.	Dollar .....	5.11
V.	Salisbury, Alderbury ...	4.51	„	Balquhider, Stronvar...	18.31
„	Bishop's Cannings .....	3.72	„	Coupar Angus Station...	3.91
„	Ashburton, Druid House	8.72	„	Blair Atholl .....	7.02
„	Okehampton, Oaklands ...	6.05	„	Inveraray, Sunnyside ...	3.19
„	Hartland Abbey .....	5.54	XVII.	Alford, Lynturk Manse..	1.69
„	Lynmouth, Rock House	7.30	„	Keith H.R.S.....	1.07
„	Probus, Lamellyn .....	5.23	XVIII.	Fearn, Lower Pitkerrie..	2.52
„	Wellington, The Avenue	4.28	„	S. Uist, Askernish .....	5.96
„	North Cadbury Rectory	3.54	„	Invergarry.....	15.94
VI.	Clifton, Pembroke Road	4.44	„	Aviemore, Alvie Manse.	4.11
„	Ross, The Graig .....	3.34	„	Loch Ness, Drumnadrochit	6.69
„	Shifnal, Hatton Grange	4.22	XIX.	Invershin .....	2.69
„	Wem, Clive Vicarage ...	3.98	„	Bettyhill .....	2.23
„	Cheadle, The Heath Ho.	4.52	„	Watten H.R.S.....	...
„	Coventry, Kingswood ...	4.33	XX.	Cork, Wellesley Terrace	5.45
VII.	Market Overton .....	3.20	„	Killarney, District Asyl.	12.87
„	Grantham, Stainby .....	2.17	„	Glenam [Clonmel] .....	7.50
„	Horncastle, Bucknall ...	3.23	„	Ballingarry, Hazelfort...	5.33
„	Worksop, Hodsck Priory	2.58	„	Miltown Malbay .....	7.99
VIII.	Neston, Hinderton .....	3.58	XXI.	Gorey, Courtown House	4.79
„	Southport, Hesketh Park	2.96	„	Moynalty, Westland ...	5.64
„	Chatburn, Middlewood.	5.90	„	Athlone, Twyford .....	5.15
„	Duddon Val., Seathwaite Vic.	10.92	„	Mullingar, Belvedere ...	6.16
IX.	Langsett Moor, Up. Midhope	6.56	XXII.	Woodlawn .....	6.48
„	Baldersby .....	3.13	„	Westport, Murrisk Abbey	7.97
„	Scalby, Silverdale .....	2.12	„	Crossmolina, Enniscoe ..	9.55
„	Ingleby Greenhow Vic..	2.89	„	Collooney, Markree Obs.	6.84
„	Middleton, Mickleton ...	3.91	XXIII.	Enniskillen, Portora ...	6.25
X.	Beltingham .....	3.65	„	Warrenpoint.....	5.54
„	Bamburgh .....	1.29	„	Banbridge, Milltown ...	3.87
„	Keswick, The Bank .....	12.98	„	Belfast, Springfield ...	4.77
„	Melmerby Rectory .....	4.47	„	Bushmills, Dundarave..	4.26
XI.	Llanfrechfa Grange .....	6.39	„	Stewartstown .....	4.52
„	Treherbert, Tyn-y-waun	15.84	„	Killybegs .....	7.82
„	Castle Malgwyn .....	7.94	„	Horn Head .....	6.28

## METEOROLOGICAL NOTES ON MARCH, 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.

LONDON, CAMDEN SQUARE.—Generally unsettled and showery, with fine intervals. Remarkably mild. (See p. 43.)

TENTERDEN.—A warm month. Early foliage and blossom were abnormally forward. Duration of sunshine 154·5 hours. TS in S.E. on evening of 26th.

SHEPPEY, LEYSDOWN.—Almost incessant strong winds and gales from S. and S.W. At 7 p.m. on 25th, the shade temp. was 64°. L on 23rd, 24th and 25th.

CROWBOROUGH.—Very wet, R 1·26 in. above the average of 27 years. Mean temp. 43°·8, and ground frost on 11th and 12th only. Much sun and more than usual strong wind. H on 7th, 16th and 30th.

ENSWORTH, REDLANDS.—Continual gales. The 25th, a very warm day, wound up with a short TS. T and L on 1st and 25th and L on 26th.

HITCHIN.—An extraordinary month for temp. The mean on 25th, 55°, was the highest ever recorded. The mean for the month, 44°·1, was the highest except 1893, 44°·8, and a singular contrast to 1883, with 32°·9.

WINSLOW, ADDINGTON.—R very much above average, and, with one exception, 3·60 in. in 1876, the greatest since 1871. Vegetation very forward.

PITSFORD, SEIGEBROOK.—Remarkable for excessive R, high temp. and strong winds. R 1·50 in. above the average of 10 years. Mean temp. 45°·1.

NORWICH, BRUNDALL.—Mean temp. 45°·6, being higher than any March since 1882. Vegetation very forward. Much L in evening on 25th.

TORQUAY, CARY GREEN.—R 1·71 in. above the average. Duration of sunshine 133·1 hours, or 6·6 hours below the average. Mean temp. 47°·7, or 3°·8 above the average. Mean amount of ozone 6·3; max. 8·5 on several days, min. 3·5 on 11th, with W. wind.

LYNMOUTH, ROCK HOUSE.—Mild throughout, with strong winds from S.W. or W., and no frost. H on 4 days. T and L on 31st.

WELLINGTON.—One of the stormiest and wettest Marches for many years.

NORTH CADBURY RECTORY.—The windiest month ever experienced, with only two quiet days. All this wind blew from S.—W., mostly S.S.W., with extraordinary pertinacity and vehemence. Though R was frequent, the roads kept dry, but the fields soaking, making seeding most difficult. High temp., especially at night, with small range. Vegetation very forward.

CLIFTON, PEMBROKE ROAD.—Very wet, with no settled weather. R nearly double the average, and the greatest since 1889. H on 1st and 6th.

ROSS, THE GRAIG.—A record month. No frost in screen, and only three frosts since January 18th. R  $1\frac{1}{2}$  times the average and number of rainy days in excess of any previous March. Mean temp. 46°·0. The mean max., 51°·9, has been frequently exceeded, but the mean min., 40°·2, is the highest since at least 1859, and probably much longer. Frequent heavy gales from S.W. and W. Vegetation the earliest remembered.

BOLTON, THE PARK.—Mild, changeable and windy. Vegetation was fully a month ahead of the average at the end. The distance travelled by the wind exceeded the average by 36 per cent. Mean temp. 42°·7, or 3°·3 above the average. Duration of sunshine 51 hours 50 minutes, or 28 hours below the average. Two inches of S, the heaviest of the season, fell on 2nd, and a smaller fall on 17th. H on 28th and 30th.

ARNCLIFFE VICARAGE.—January, February and March were the wettest three months ever known in this district.

HULL, PEARSON PARK.—Wind generally S.W., and at times strong, but on the whole warm. S on 2nd and 3rd; L on 25th; TS on 26th.

## WALES AND THE ISLANDS.

LLANFRECHEFA GRANGE.—Unusually wet and stormy, with the heaviest R in March since observations began in 1865, the nearest approach being 6·03 in. in 1873. T, L and H on 26th.

HAVERFORDWEST.—Gales 1st and 2nd, and from 17th to 25th. Almost entire absence of frost. Blackthorn in bloom on 22nd; vegetation forward, but farm work impeded by the continual wet. Duration of sunshine 77·5 hours.

DOUGLAS, WOODVILLE.—March, like January and February (but worse), was wet, very rough and stormy, no consecutive 24 hours being calm, and very sunless. Probably the worst and stormiest three months within general memory. Although mild, there was little sign of spring at the end, the direct effect of the wind.

#### SCOTLAND.

CARGEN [DUMFRIES].—Nothing like the R of this month has been experienced since observations were commenced, the nearest being 5·91 in. in 1897. The fall for the first three months of the year is 22·09 in., a figure not reached till September 3rd of last year. Farm work is terribly backward, not a seed sown and much land unfit for horse labour. Vegetation, on the other hand, is unusually forward. Strong S.W. winds prevailed.

MONIAIVE, MAXWELTON HOUSE.—Very wet and stormy. R on 31 days and 8·22 in. above the average. The fall for the last three months was 26·59 in., or 15·46 in. above the average. All low ground was constantly flooded and farming operations were stopped.

LILLIESLEAF, RIDDELL.—Very remarkable for frequency and quantity of R, and for continuous high wind. In 39 years there has been nothing like it, and the previous highest was 3·72 in. in 1897. The temp. was much higher than usual. The hedges and young larches came out before the middle of the month, in sheltered places. Ploughing was checked for every field was a bog.

DALRY, BLAIR.—Not one day without R, making 41 rainy days in succession.

TIGHNABRUACH.—Only one day on which R did not fall, and since January 1st R has been excessive, the total being 24·94 in. Many gales and frequent sheet L.

BALLACHULISH, ARDSHEAL.—R 7·75 in. above the average. A heavier monthly fall has only twice been recorded. Continued gales from 18th to 29th, preceded by T and L on 17th.

COUPAR ANGUS.—Absence of morning frosts and of bright sunny days. High mean temp., and R almost double the average. Mean temp. 40°·9.

BLAIR ATHOLL.—High temp., and the most excessive R for 25 years.

DRUMNAIROCHIT.—As in February, R was the second largest for the last 17 years, more than double the average. The fall for the first three months of 1903 was 21·14 in., or 11·94 in. above the average. Extensive and serious flooding of low lands accompanied by the bursting of river banks and injury to roads.

S. RONALDSHAY, ROEBERRY.—Very unsettled and windy. Several severe gales from S.W. and W., from which direction it blew with very few exceptions, the entire month. Mean temp. 40°·5, or 1°·5 above the average.

#### IRELAND.

CORK, WELLESLEY TERRACE.—The greatest R for 25 years, except 1897 with 5·57 in. Mean temp. 40°·6. The R of the first three months of the year was 6·99 in. over the average.

MILTOWN MALBAY.—The most inclement, wet and stormy March in memory, with heavy H, T and sheet L. No agricultural work could be done.

WATERFORD, BROOK LODGE.—Very wild and wet, being the wettest March for over 50 years. Mean temp. 44°·2.

BROADFORD, HURDLESTOWN.—The wettest March on record.

CARLOW, BROWNE'S HILL.—The R exceeded that of any March since the record was commenced in 1866.

DUBLIN, FITZWILLIAM SQUARE.—Stormy, blustering, rainy and open. Though the mean temp., 45°·6, was 2°·0 above the average, it was 1°·9 below the mean of February, 1903. R very frequent and often heavy. The wind reached gale-force on 11 days. S or sleet on 4 days and H 4 days.

BALLINASLOE.—The worst March for 32 years. Constant R and heavy storms.

OMAGH, EDENFEL.—R was by far the heaviest in March in 38 years, the next being 4·47 in 1868.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, OCTOBER, 1902.

STATIONS.  (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.  0-100	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp. °	Date.	Temp. °	Date.									
London, Camden Square	66·2	10	32·7	19	57·2	44·7	46·3	87	102·9	29·3	1·46	17	7·5
Malta	82·9	11	55·2	27	76·0	65·2	62·6	80	136·1	50·9	6·35	9	4·7
Lagos, W. Africa	88·1	12	70·1	2, 3	84·5	75·0	74·6	80	148·0	...	3·30	10	...
Cape Town	83·8	8	48·7	18	70·9	54·8	52·9	70	...	...	4·72	8	4·2
Durban, Natal	91·2	13	51·3	5	77·6	59·8	...	...	144·4	...	2·23	17	5·9
Mauritius	85·8	17	61·0	23	82·4	66·9	63·8	71	151·4	53·0	1·94	9	5·6
Calcutta	93·0	12	69·6	26	88·4	74·0	71·7	74	155·9	65·9	2·78	4	4·1
Bombay	92·9	28	74·2	14	89·6	78·9	75·7	77	142·5	69·8	·78	5	4·0
Madras	92·7	18	68·6	20	87·9	73·9	73·5	83	147·7	65·2	20·69	18	5·3
Kodaikanal	67·5	1	45·7	21	62·4	51·1	52·3	89	145·0	37·2	16·85	21	6·8
Colombo, Ceylon	90·7	1	72·7	25a	86·5	74·1	73·4	85	152·0	71·0	31·47	29	7·3
Hongkong	86·3	3	65·4	31	81·1	73·3	66·3	70	142·1	...	·94	4	3·6
Melbourne	82·5	2	39·0	16	67·0	49·0	47·6	75	144·1	31·0	·76	7	6·0
Adelaide	95·0	21	42·9	11	74·2	53·7	46·4	56	151·3	39·8	1·77	14	5·0
Coolgardie	94·0	12	40·3	2	77·4	50·7	...	...	165·3	33·4	3·09	5	3·6
Sydney	81·1	10	50·4	17	69·4	57·4	...	73	121·4	44·7	10·81	16	5·6
Wellington	65·0	14a	35·0	3	59·0	43·8	42·8	74	119·0	28·0	3·06	13	5·6
Auckland	68·0	31	41·0	6	60·0	48·9	44·1	68	132·0	38·0	2·74	16	6·0
Jamaica, Negril Point.	88·6	17	76·1	29	86·7	72·8	73·3	80	...	...	5·58	17	...
Trinidad	93·0	31	69·0	sevl	87·9	70·3	76·1	92	169·0	66·0	7·40	12	...
Grenada	88·0	6	71·4	21	84·5	74·6	72·4	77	160·0	...	5·63	15	2·8
Toronto	68·1	19	26·4	30	57·3	39·9	42·8	79	88·0	20·4	2·78	11	6·0
Fredericton, N.B.	70·0	2	18·9	24	55·4	35·7	33·8	59	...	...	4·99	8	5·7
Winnipeg	72·0	5	14·0	9	53·3	30·5	...	...	...	...	1·23	7	5·4
Victoria, B.C.	70·4	3	38·7	19	57·9	46·9	48·1	86	...	...	1·09	13	6·2
Dawson	68·0	1	7·8	22	35·8	23·8	...	...	...	...	·92	7	4·3

a—and 28.

MALTA.—Mean temp. of air 69°·3, or 0°·2, below average. Mean hourly velocity of wind 10·6 miles or 1·8 above average. Mean temp. of sea 73°·5. TSS on 3 days.

J. F. DOBSON.

MAURITIUS.—Mean temp. of air 1·3 above, of dew point 1°·6 above, rainfall ·36 in. above, and mean hourly velocity of wind 0·4 mile below, average. T. F. CLAXTON.

MADRAS.—Sunshine 138·7 hours, or 38·0 per cent. of possible amount.—A. MOFFAT.

COLOMBO.—Mean temp. of air 0°·9 above, of dew point 0°·5 above, and R 17·44 in. above, average. Mean hourly velocity of wind 5·2 miles, TSS on 14 days.

H. O. BARNARD.

HONGKONG.—Mean temp. 76°·7. Bright sunshine 234·7, or 20 hours above average. R 4·42 in. below average of 39 years. Mean hourly velocity of wind 14·1 miles; prevailing direction E.

F. G. FIGG.

ADELAIDE.—Mean temp. 64°·0, or 2°·0 above average. Fair average rains in the agricultural districts, but no relief from drought in the interior. C. TODD, F.R.S.

COOLGARDIE.—Mean temp. 1·3 in. below average. R in excess of average.

W. ERNEST COOKE.

SYDNEY.—Mean temp. 0°·1 below, humidity 4°·9 above, and R 7·85 in. above, average.

H. C. RUSSELL, F.R.S.

WELLINGTON.—Mean temp. 2°·2 below, and R 1·31 in. below, average. A. H. GORE.

AUCKLAND.—Mean temp. quite 3°·0 below the average of 33 years. T. F. CHEESEMAN.

TRINIDAD.—R ·63 in. above the 40 years' average. J. H. HART.