

SYMONS'S
MONTHLY
METEOROLOGICAL
MAGAZINE.

VOLUME THE TWELFTH.

1877.

LONDON:
EDWARD STANFORD, CHARING CROSS, S.W.
AND ALL BOOKSELLERS.

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SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CXXXIII.]

FEBRUARY, 1877.

[PRICE FOURPENCE
or 5s. per ann. post free.]

ON KEEPING A METEOROLOGICAL JOURNAL.

Few people pass from one year to another without any thought as to the past or the future. For ourselves we are writing page 1 of a new volume, and we think that a little time may be well spent in considering the objects and the duties connected with keeping a Meteorological Journal.

We do not profess prophetic powers, and therefore as regards the objects of such work, we can only mention those of which we are at present aware. But it must be remembered that just as past records, ignored in bygone times, are often of use and interest to subsequent generations; so is it with scientific facts; the generation which observes them, rarely extracts all the information which they are capable of yielding, but it is the duty of each generation to do its best towards providing for those who are to follow. There is, however, one moral duty connected with this subject to which we must call attention at once—namely, that no records are worthy of any generation, of any person, place, or organization which are not as accurate as it is reasonably practicable to make them.

Meteorological Journals are rarely kept for bad purposes; in fact, the only case of the kind that we recollect was a record at a watering place, which was so kept as to be more or less of a bait to catch visitors. Meteorological Journals are sometimes kept mainly from a vague curiosity as to weather changes, and partly also from old established habit. Records of this class generally embrace the reading of a thermometer outside a bedroom window, with perhaps the entry of a barometer to the nearest tenth of an inch; the time of reading depending upon the observer's personal convenience, and the record being interrupted whenever he goes from home. Fortunately, such records are generally entered in pocket memorandum books, and are, therefore, usually destroyed after the death of the observer.

We will suppose, however, that the observer is in earnest, and though his means may be limited, he is yet desirous that what he does shall be useful both to the men of his own time, and to those who come after. Now let us consider some of the uses which his records

will serve, and for the present we will confine our attention to the British Isles.

(1.) CLIMATE.—There are at present scarcely any absolutely accurate data whence we can learn the relative climate of our various health resorts. We are frequently consulted as to the destination of consumptive patients, but where are the data to prove the relative advantages even of the places which are in popular repute? Where can we find identical data, similarly observed, at Penzance, Torquay, Sidmouth, Ventnor, and Bournemouth? Accurate records are being made at some of these places, but there are twenty health resorts without accurate records for one that possesses any. One object, then, of a journal is to enable us to decide on the effect of different localities upon the human frame.

(2.) AGRICULTURE.—Accurate knowledge of the average climate of different localities, coupled with acquaintance with their geology, would render great services to agriculture. It is impossible to doubt that if farming were made more conformable to atmospheric conditions, it would be far more profitable than it is at present. It would do this in many ways. We will mention only two. (a) As regards manuring and cropping, the date of the former could profitably be so adjusted in connection with the normal date of heavy rains as to avoid the per centage washed into the drains, reaching its present extravagant figure, and (b) by teaching the farmer at precisely what distances he should lay his drain tiles.

(3.) ENGINEERING.—There are few branches of this science which are independent of Meteorologists. Is a town to be provided with a supply of water? The rainfall, over the watershed proposed to be taken up, must be ascertained. Is the town to be drained? The capacity of the sewers is regulated by the rainfall. Is a large light edifice to be erected? The force of the wind must not be ignored. As regards roofs, the probable quantity of snow must be considered. For example, as regards both wind and snow, how would the Bedford Station of the Midland Company fare if re-erected at Dalnaspidal, on the Highland line? Again, take the case of town sewerage, the rainfall and humidity of the district affect every stage of the works; the greater the rainfall the larger the sewers must be, and the less will be the value of the sewage for agriculture, while irrigation, as a mode of disposal in a district of heavy rainfall, would be ridiculous.

(4.) LEGAL.—It is impossible to quote the varied forms in which Meteorological Journals are useful in disputed questions. We will quote two, one small case and one large one. A tradesman was driving to market, his horse worth £70 fell down and broke its leg, and had to be killed. The owner claimed compensation from a tramway company, asserting that an imperfection of their roadway threw the horse down. All his witnesses swore that it was a fine morning, that there was not a trace of frost, and that the only possible cause of the accident was a defect in the iron of the tramway. The evidence on the other side was to the effect that it was a slippery frosty morning, and that the

horse fell down on sloping ground some yards from the tramway metal. The relative credibility of the two sets of witnesses was proved by the production of a Meteorological Journal, showing that there had been a slight frost in the air throughout the night, and a sharp one upon the grass. The other case was one involving several hundred thousand pounds. A company undertook to use their best endeavours to lay a telegraph cable by a certain date; they did not deliver it up until long after the time originally specified, and then the company for whom they laid it refused to accept it, or pay for it. In order to show that the company laying the cable "had used their best efforts," they produced evidence of a series of storms, during the three years that they had been at work, far exceeding the average, and probably without precedent.

(5.) SYNCHRONOUS METEOROLOGY AND STORM WARNINGS.—This branch of the science will probably always, and in all countries, be conducted by Government officials and at the national cost, and rightly so. But the judicious course appears to us to be, for the Governments to maintain only as many stations as are sufficient for ordinary circumstances, and when exceptional phenomena occur to apply to private observers for short extracts from their records.

We must not dwell further upon the uses of Meteorological Journals, but before proceeding to consider the duties of observers, we desire to say a few words respecting an abuse of Meteorological Journals, although we believe and rejoice in the belief, that it is rapidly decreasing.

There was a time (we put it in the past tense to avoid all offence) when it was not thought wrong to allow observers to take the trouble of copying out four or five hundred figures every month, and yet for the recipient to utilise but an infinitesimal portion thereof. We do not think that it was fair to observers to allow them to waste time in needless copying or needless observation.

THE DUTIES OF OBSERVERS.

We do not think that the majority of persons keeping Meteorological Journals regard themselves as thereby undertaking a certain responsibility, and certain duties. We think that they are. Irrespective of such proverbs as "What is done should be well done, what is not well done had better be let alone," and "What is worth doing at all is worth doing well," we hold that any one who undertakes to keep a record is bound to keep it carefully. We consider, in short, that there are reciprocal duties appertaining respectively to the observers and to those who reduce and publish their results. We have mentioned one duty on the part of recipients, and we now come to those of the observers.

The first essential is accuracy both of observation and of record. Accuracy involves a good deal more than would at first be thought likely. An accurate record of a bad instrument, or of a good instrument badly placed, is not merely useless, it is worse than useless—it is misleading; and to forward such a record is to lead the recipient into trouble. Accuracy, therefore, involves the keeping of a faithful

record of accurate instruments, properly placed. We string together some offences which have been committed by those generally regarded as high-class observers, and we leave them without comment.

One observer always read the wrong end of the vernier of his barometer; another, having a Fortin standard, never adjusted the mercury to the ivory point. One had a beautifully sensitive bifurcated grass minimum thermometer; it was broken, and he substituted (without making any entry of the fact) a 3s. 6d. thermometer with a bulb as thick as the top of one's finger. Such a change would utterly stultify any comparison of the radiation at that station. Another observer allowed $7\frac{1}{2}$ degrees of spirit to collect at the top of his minimum thermometer, and thus all his minimum temperatures were $7\frac{1}{2}$ degrees too low. A rain gauge was kept in use, and its record forwarded for publication after its receiving area had been entirely changed by its being run into by a mowing machine. Another was placed so close to a house that if a mass of snow slipped off the roof it would have fallen upon the gauge.

Probably we shall be told that it is injudicious to mention such things in print; that by mentioning them we discredit the general body of observers, both public and private; that the instances are mostly so gross that they must have been detected from the published results. We hold that the very fact that they were *not* detected justifies us in quoting them as warnings for observers of all classes. As to our throwing discredit upon English observers, any one is welcome to accuse us of that, for we do not think that a single observer would credit the accusation. We know something of observers, English, Scotch, Irish, Colonial and Foreign, and we say no more than this—that if, for our catalogue of offences, we had travelled beyond our own country, it would have contained even more remarkable features than it does.

Accuracy of record involves several points. The essentials are: neatness of writing, unmistakableness of figures, and accuracy in the arithmetical operations required. By neatness of writing we do not mean merely the proper formation of letters, though general improvement in that respect would be a benefit to others besides meteorologists, but keeping the observation book tidy, writing upon the lines, keeping the decimal points in a vertical line, not omitting terminal cyphers. This is a great mistake, and very frequent. It is quite true that

29·825	has the same meaning as	29·825
29·8	„	29·800
29·316	„	29·316
29·44	„	29·440

but the gain of time in omitting the cyphers is far outweighed by the loss of time and risk of inaccuracy in the subsequent addition. This habit is even more injurious as regards rainfall entries, for observers will sometimes in the same column enter half-an-inch as ·5 and ·50, even occasionally aggravating matters by omitting the decimal point. The rainfall entry should always consist of two figures beyond the decimal point, even if the amount is less than a tenth of an inch.

We have known some very comical false entries made—September with 31 days' observations is not very usual. Maximum temperatures entered in degrees in the rainfall column and cast up as rain, have occurred more than once ; but the richest thing we ever heard of was an entry of 112 ; the observer never put any decimal points, and the entry therefore meant 1·12 in. on a certain date. Adjacent stations reporting no such fall on that day, enquiry was made of the observer, and he wrote to say that he was very sorry for having given trouble, but the figures which he had entered and added up as rainfall were the number of persons present at a parish meeting !

As to accuracy in the arithmetical operations we hardly know what to say. We believe that every one is liable to an occasional error ; but there would be fewer if all obeyed the latter part of rainfall rule, No. X., viz., " All columns should be cast *twice*, once up and once down, so as to avoid the same error being made twice." Our objection to bad computing is twofold—first, because it implies lack of care ; second, because it involves much extra labour. We know that some persons assume that if a column of figures has at the foot figures which are not the true sum of those figures the total should be corrected without further enquiry ; but we hold such a course to be entirely wrong, because there is no proof whether the error is in the total or in one of the entries, and the chances are nearly equal. Yet when we, some years back, declined to accept the records of an observer who rarely cast one column correctly out of three, his chief told us that he found that many who were very weak in arithmetic were very good observers, and he kept him upon his staff.


" What a mistake for the Editor of a magazine mainly supported by meteorological observers to admit so long and strong an attack upon them." Oh, yes. We know many people would say so. But we rarely study expediency ; we know that a staff of 90 good observers is better than one of 100 composed of 90 good and 10 bad, but that one of 100 good ones would be better still.

We believe that the time is coming, if indeed it has not come, when quality of work will be regarded as of more consequence than quantity. We know that the observers of this country, as a whole, are unsurpassed, and that the more their work is examined the more it will be appreciated. But we also know that there are some among them who should, and perhaps will, believe in the old copy-book motto—" Those are our best friends who tell us of our faults, and teach us how to avoid them."

GREAT STORMS.

We think that many of our readers may be glad to know that the February number of *The Cornhill Magazine* contains an anonymous, but very readable, paper upon the above subject. The article is a very long one, occupying more than twelve pages of that periodical ; but it is very good, and the concluding portion so worthy of consideration

that we reprint it. Our readers may recognise in the first ten lines of our extract, the views which have been repeatedly urged in our own pages, and it is perhaps an augury of their acceptance that they are reproduced in a periodical of wide general circulation. Is it possible that we shall live to see the day when it ceases to be true (for true it still is, in spite of all that we have urged) that "the observing is out of all proportion to the thinking power in meteorology."

"If there are in reality any regularly recurring periods in weather phenomena, we can only hope to recognise them by the careful examination of meteorological records. It appears to us that those already made have not been sufficiently examined, and their careful analysis by competent persons would be more likely to afford useful results than the same amount of labour devoted to the accumulation of fresh records. Of course, if any satisfactory results are to be obtained, meteorological observations must be continued steadily. But it certainly does seem as if some few among the persons who have meteorological matters under their charge, might devote their attention to the work of analysing the millions of observations already collected. Even if it is impossible, as we are disposed for our own part to fear, to deduce any system for predicting weather more than a few hours or a day or two in advance, yet this at least might be done for many regions of the earth, which at present have no warning, even for an hour, of the approach of the most desolating hurricanes. Telegraphic communication, especially as we may hope to see it developed in the coming years, might be employed much more extensively than at present. Thus our own country, which warns countries to the east of coming storms, but receives no warnings, might receive useful intimation from the United States and the West Indies (remote though they are) of the advance of great cyclonic disturbances upon us from the neighbourhood of the West Indies, Florida, and so forth. The further progress of great south-westerly disturbances towards our shores might be learned also from ships which, sailing towards the United States, have encountered rough weather when two or three days' sail from their destination. Ships making for Halifax or St. John's might afford even later intelligence. It is probable that in nearly every case, and certain that in many cases, cyclonic disturbances which have rounded the West Indian part of the great storm- and travelled along the shores of the United States beyond Hatteras (generally overlapping the land) pursue their course across the Atlantic, though with gradually diminishing force, until they reach Europe. Probably a law would be found to connect their motions, on the western part of their track, and the direction along which they would strike the shores of Europe. Storms which, after rounding the West Indies, pass towards the north-east, without closely approaching the United States, may usually reach the shores of Spain, or the Bay of Biscay, while those which overlap the south-eastern States of America, may pass across the Atlantic on a more northerly track, and make for the British Isles, or pass even north of Scotland to the shores of Norway. As it is probable that very few really fierce hurricanes reach us from the south-west which have not first been felt on the western side of the Atlantic, it would be worth while to analyse very carefully all that can be learned respecting the course of such storms. And certainly the expense of telegraphic communication from the other side of the Atlantic would not be worth considering in comparison with the advantage derived from early intimation of the approach of great hurricanes towards the shores of Europe. In other regions, and especially in the tropics, telegraphic communication might be much more readily and effectively employed in announcing the approach of hurricanes. There are reasons for believing that the great cyclone of October last traversed a course which at several points touched places whence news of the advancing storm might have been telegraphed to the threatened region. Although little could have been done to prevent the destruction to property which the cyclone caused, many thousands of lives (probably more than two hundred thousand) might have been saved if half a day's or even half an hour's warning had been given."

CLOUD-REFLECTING COMPASS.

To the Editor of the Meteorological Magazine.

SIR,—I see in your last number you state that Mr. Goddard exhibited his Cloud-reflecting Compass at the Exhibition in 1851. I therefore very willingly resign to him whatever credit there may be in the invention, as I did not publish the description of mine till 1855.—Yours faithfully,

THOMAS STEVENSON.

Edinburgh, 13th Feb., 1877.

GREENWICH EXTREME TEMPERATURES.

To the Editor of the Meteorological Magazine.

SIR,—I send for publication in your Magazine a very valuable table of Greenwich Extreme Temperatures, which Mr. Brumham has been kind enough to compile for me, thinking some of your readers may like to have copies of it.—I remain, Sir, yours truly,

EDWARD MAWLEY.

Addiscombe, Feb. 6th, 1877.

The extreme Shade Temperatures of the month of January at the Royal Observatory, Greenwich, during the past 36 years.

Year.		Maximum.		Minimum.		Year.		Maximum.		Minimum.	
	deg.	date.		deg.	date.		deg.	date.		deg.	date.
1841	53·0	27		4·0	8	1859	53·0	18		28·5	9
1842	46·8	31		23·2	23	1860	55·5	3		27·5	28
1843	57·0	28		24·0	2	1861	55·0	27 29		16·0	8
1844	53·7	5		18·8	2	1862	55·0	31		20·4	19
1845	51·3	6		24·4	31	1863	55·2	29		27·7	12
1846	55·3	25		29·4	4	1864	54·0	27		14·3	7
1847	49·4	26		24·0	10	1865	50·2	10		19·6	22
1848	50·4	3		16·8	28	1866	54·3	22		23·7	13
1849	56·4	14		19·9	3	1867	54·4	7		6·6	5
1850	53·1	25		23·6	13	1868	51·9	14 17		22·8	3
1851	56·5	1		26·6	24	1869	55·9	31		26·3	24
1852	55·5	16		28·1	5	1870	50·9	8 14		19·6	28
1853	55·5	20		30·8	19	1871	46·7	16		18·3	13
1854	54·8	30		13·5	3	1872	52·7	31		28·3	15
1855	52·4	2		16·2	19	1873	53·8	10		26·0	25
1856	54·0	24		24·3	15	1874	53·0	10		28·1	25
1857	52·7	2		20·0	30	1875	53·7	20		18·2	1
1858	51·9	9		20·9	6	1876	56·1	31		17·4	8

Extremes in 1877, Max. : 56°·1 on 19th ; Min. : 27° 7 on 21st.

	Year.	Max.	Date.	Min.	Date.	Year.
Means of 36 years	...	53·4	18	21·6	14	...
Highest	1843	57·0	28	30·8	19	1853
Lowest.....	1871	46·7	16	4·0	8	1841
Range .....	...	10·3	...	26·8	...	...

GALE AND HIGH TIDE ON THE EAST COAST OF IRELAND.

To the Editor of the Meteorological Magazine.

SIR,—The gale and high tide of 3rd inst. was so exceptional in its effects on the East Coast of Ireland as to merit some record in your pages.

The tide served on that day about 2 p.m., being shortly after the hour at which spring tides serve in Dublin, and aided by a strong easterly gale, rose to an unprecedented height, washing completely over the Dublin, Wicklow and Wexford Railway, which here (Monkstown) runs along the shore, separated from the sea by a broad pathway and sea wall. This wall, which is sloping and surmounted by a parapet some 3 ft. high and a coping of heavy blocks of granite, was broken down almost all along, the large coping stones being thrown across the pathway on to the rails, thus blocking up the traffic. The water was so deep on the line in some places as to put out the engine fires, and the waiting rooms and booking offices at several of the stations were flooded. Traffic was also stopped at several other places on the Dublin, Wicklow and Wexford Railway, from landslips, washing away of the line by the waves, &c.

The gale, which, though strong, was by no means excessive in its violence, was accompanied by a heavy fall of rain, which owing to their outlets being stopped by the height of the tide, caused many of the streams and sewers to burst up, flooding the roads and rendering them almost impassable in many places.

The amount of rain registered up to 9 a.m. on the 4th was 1·400 in., while at Fassaroe and Enniskerry, Co. Wicklow, 2·3 in. and 2·8 in. respectively were recorded.—I am, Sir, yours faithfully,

GREENWOOD PIM, M.A., F.L.S.

Monkstown, Dublin, 15th Jan. 1877.

THE WEATHER IN CAMBRIDGE IN 1874, 1875, AND 1876.

	1874.	1875.	1876.
Mean temp.	47°·6 ...	47°·7 ...	48°·2
Hottest by Day	July 19, 20 { 82° ...	Aug. 16 { 80° ...	Aug. 14 { 86°
Coldest by Night	Dec. 30 { 15° ...	Jan. 1 { 11° ...	Jan. 11 { 18°
Days on which the max. was at or under 32°	12 ...	12 ...	8
Nights on which the min. was at or under 32°	86 ...	70 ...	66
Mean of bar.	29·85 ...	29·85 ...	29·87
Bar. highest	Mar. 7 { 30·4 ...	Oct. 6 { 30·5 ...	Jan. 15 { 30·6
Bar. lowest	Dec. 11 { 28·5 ...	Nov. 9 { 28·4 ...	Dec. 4 { 28·4
Rainfall	15·60 in. ...	26·59 in. ...	24·63 in.

J. NUTTER.

Blitch House, Jan., 1877.

INFLUENCE OF WEATHER ON BIRDS.

To the Editor of the Meteorological Magazine.

SIR,—In several parts of England the green woodpecker is called the “rain-fowl,” or “storm-bird,” and I have several times seen the question asked whether it deserves the title. The greater part of my boyhood was spent among the Herefordshire orchards, where this species is exceptionally plentiful; and next to cloud-gazing, the pleasantest of my early reminiscences are connected with bird-watching. I used always to observe—and I have noticed the same fact of late years in this neighbourhood—that *P. Viridis* is most vociferous on days of electric disturbance of a particular kind. Its laughing cry is comparatively seldom heard either in settled weather, during or immediately before rain, or when the atmosphere is humid, but is loud and constant on the bright days which often occur after cold clear nights in its breeding season (April and May), when there are large cumulus clouds and distant thundershowers, and a rather calm atmosphere. When the sky becomes much overcast, this species becomes comparatively silent.

In this respect it is in contrast to another common bird, whose loquacity in connection with meteorological conditions I have often noticed, but never seen recorded. The greenfinch is especially noisy in sultry overcast weather, during the growls of an approaching thunderstorm, when most other species of birds seem commonly to feel the oppressiveness of the atmosphere, and to be rather taciturn.

I have often noticed the delight which the swift, in contrast to the swallow, takes in flying very high beneath a dark and threatening storm-cloud.

As regards the cry of the tawny owl, whose habits I have studied closely for many years, I could never myself discover any especial connection between it and the weather.—Yours truly,

W. CLEMENT LEY.

Ashby Parva, Lutterworth, Jan. 29th, 1877.

THE RAINFALL OF THE WINTER OF 1876-77.

THE widespread damage by floods during the last two months, renders it undesirable that the present issue of the *Meteorological Magazine* should appear without some remarks upon the rainfall of December and January. The relation of the fall in each month to the average for each, is shown by the usual monthly tables, and need not therefore be repeated. The following table is, however, very instructive, and especially the last column of it. The last two columns can alone need any explanation. “Mean total for December and January” gives the total for those two months on the mean of the six years, 1860-65. The last column gives the ratio of the fall in 1876-7 to the six years’ mean, which is taken as 100. If the mean be considered as 1·00, the first

entry would be 3·19, and so with all the other entries in the column. And that entry of 3·19 shows that the recent fall has been about $3\frac{1}{5}$ times as much as usual; which is evidently the case because the usual amount, $3\cdot45 \times 3\cdot19 = 11\cdot00$ inches, and the previous column shows that the actual fall was 10·99 inches.

We are now able to consider what this column teaches, and its lessons are perfectly clear, as anyone will see who takes the trouble to mark on a map the figures in the last column. They show that the greatest intensity of the excess, has been over the South Eastern and South Midland counties of England, where the fall has been three times, and even more than three times, the average; that over the rest of England the fall has generally been more than double the average; and that in the North West of Scotland the fall has not been half so much as usual.

STATIONS.		TOTAL RAINFALL.			Mean Total for Dec. & Jan.	Mean being 100 fall in 1876-7.
		Dec., 1876.	Jan., 1877.	Two months.		
		inches	inches	inches	inches	
ENGLAND.	Camden Square, N.W.	6·25	4·74	10·99	3·45	319
	Selborne (The Wakes)	9·77	8·28	18·05	6·02	300
	Hitchen	5·57	3·74	9·31	3·45	270
	Banbury	5·75	4·21	9·96	3·76	265
	Bury St. Edmunds (Culford) ..	3·97	2·95	6·92	3·36	206
	Bridport	9·52	6·49	16·01	6·56	244
	Barnstaple	6·91	5·23	12·14	6·64	183
	Bodmin	12·69	8·33	21·02	10·33	204
	Cirencester	7·54	4·45	11·99	5·29	227
	Shifnal (Houghton Hall) ...	4·75	3·81	8·56	3·58	239
	Tenbury (Orleton)	6·85	3·84	10·69	4·99	214
	Boston	4·26	3·08	7·34	3·20	229
	Manchester	4·44	5·01	9·45	4·85	195
	Skipton (Arncliffe)	10·63	11·17	21·70	10·19	213
	North Shields	6·14	3·08	9·22	4·31	214
WALES.	Borrowdale (Seathwaite).....	18·31	25·65	43·96	33·31	132
	Haverfordwest	8·16	8·98	17·14	9·88	173
	Llandudno	4·17	5·14	9·31	4·74	196
SCOTLAND.	Dumfries (Crichton Asylum) ..	8·68	7·66	16·34	8·21	199
	Braemar	8·70	4·43	13·13	6·90	190
	Portree	5·31	8·26	13·57	28·72	47
	Inverness (Culloden)	1·92	2·39	4·31	4·21	102
	Sandwick	5·95	3·43	9·38	7·26	130
IRELAND.	Killaloe.....	5·24	6·06	11·30	8·35	136
	Portarlington	6·00	4·39	10·39	7·20	144
	Monkstown (Dublin)	8·50	5·11	13·61	6·01	226

THE HEAT IN AUSTRALIA.

The *Melbourne Argus* of the 27th Dec. says:—"The unusually hot summer in Europe is having its counterpart a few months later in Australia. Early in December warm weather, such as we do not

generally get until a month later, set in, which culminated on the 15th inst. in a day of terrible heat. At the Melbourne Observatory the thermometer recorded $110^{\circ}7$ in the shade, and in the country districts the heat was still greater, the temperature in the shade at Dunolly, for example, being reported as 116° . The excessive heat, though causing considerable physical suffering and prostration, has not affected the bill of mortality in any marked degree, and although there have been several deaths from sunstroke, the public health continues to be good. Similarly torrid weather has been experienced in the other colonies, the temperature in the shade at Adelaide on the 15th being 114° , while at Walgett, in New South Wales, the unprecedented shade temperature of 124° was registered. In the sun the thermometer marked 188° .

SUPPLEMENTARY TABLE OF RAINFALL IN JAN., 1877.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see Met. Mag., Vol. XI., p. 28., but the list is under revision and further details will be given in a month or two.]

Div.	Station.	Total Rain.	Div.	Station.	Total Rain.
		in.			in.
II.	Acol	4.68	XI.	Llanfrechfa	10.47
"	Hailsham	6.95	"	Castle Malgwyn .....	...
"	St. Lawrence, I. of W....	7.35	"	Heyope .....	...
"	Andover.....	5.64	"	Carno .....	...
"	Strathfield Turgiss	4.02	"	Rhug, Corwen	6.14
III.	Addington Manor.....	4.16	"	Port Madoc	7.94
"	Oxford	4.50	XII.	Melrose	6.99
"	Northampton	3.41	XIV.	Cessnock, Glasgow	8.60
"	Cambridge.....	2.73	XV.	Gruinart	7.32
IV.	Sheering	4.89	XVII.	Keith	1.20
"	Ipswich	3.51	XVIII.	Dalwhinnie	1.37
"	Diss	2.51	"	Auchnasheen	7.49
"	Swaffham	3.10	"	Springfield, Tain	2.79
V.	Compton Bassett	4.37	XX.	Skibbereen	5.78
"	Dartmoor	17.32	"	Glenville, Fermoy	7.98
"	Teignmouth	7.56	"	Tralee.....	8.11
"	Langtree, Torrington ..	6.83	"	Newcastle W., Limerick ..	5.35
"	Trevarrick, St. Austell..	...	"	Kilrush	6.10
"	Taunton.....	5.19	XXI.	Kilkenny	5.30
VI.	Bristol	4.53	"	Kilsallaghan	5.44
"	Sansaw	3.37	"	Twyford, Athlone	5.61
"	Cheadle	5.01	XXII.	Ballinasloe	5.12
VII.	Coston, Melton Mowbray ..	3.61	"	Kylemore	18.33
"	Bucknall	3.31	"	Carriack on Shannon.....	6.68
VIII.	Walton, Liverpool	5.16	XXIII.	Rockcorry	6.47
"	Broughton-in-Furness ..	11.40	"	Warrenpoint	10.20
IX.	Stanley, Wakefield	3.18	"	Carnlough, Larne.....	10.25
X.	Gainford	4.31	"	Bushmills	6.31
"	Shap	12.81	"	Buncrana	6.68

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QUETELET, E.—Annales de l'Observatoire Royal de Bruxelles. July to October, 1876. 4to.

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DENMARK.

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MARIE-DAVY, M. H.—Bulletin Mensuel de l'Observatoire de Montsouris. July to September, 1876. 4to.

RAULIN, PROF. V.—Observations Pluviométriques faites dans l'Algérie et les Colonies Françaises de 1751 à 1870. 8vo. Paris, 1876.

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NEW ZEALAND.

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EBLUND, E.—Meteorologiska Iakttagelser i Sverige utgifna af Kongl Svenska Vetenskaps-Akademien. Femtonde Bandet. 2dra serien. Bd. I., 1873. 4to. Stockholm, 1876.

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HILDEBRANDSSON, DR. H. H.—Bulletin Météorologique Mensuel de l'Observatoire de l'Université d'Upsal. January to April, 1876. 4to.

JANUARY, 1877.

iv.	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° In shade On grass	
		Total Fall.	Differ- ence from average 1860-5	Greatest Fall in 24 hours.		Max.		Min.					
				Dpth	Date.			Deg.	Date.	Deg.	Date.		
		inches	inches.	in.			Deg.	Date.	Deg.	Date.			
I.	Camden Town	4.74	+ 2.79	.60	8	25	56.4	19	28.5	23	5	14	
II.	Maidstone (Hunton Court)...	6.03	+ 3.99	.98	10	28	...	...	...	...	...	...
III.	Selborne (The Wakes).....	8.28	+ 5.01	.88	2	26	53.0	18	27.0	12	6	11	
IV.	Hitchen	3.74	+ 1.60	.65	3	25	52.0	19	26.0	26	17	...	
V.	Banbury	4.21	+ 2.12	.84	3	26	55.0	19	28.0	12	11	...	
VI.	Bury St. Edmunds (Culford)...	2.95	+ 1.08	.56	3	23	55.0	19	24.0	26	11	17	
VII.	Norwich (Sprowston)	2.49	...	.59	3	24	...	...	...	...	...	...
VIII.	Bridport	6.49	+ 3.30	.61	6	24	54.0	4	29.0	12	...	7	
IX.	Barnstaple	5.23	+ 1.71	.60	2	28	57.0	4*	33.0	13	...	...
X.	Bodmin	8.33	+ 3.14	1.40	2	28	53.0	3	31.0	13	1	3	
XI.	Cirencester	4.45	+ 1.45	.75	3	23	...	...	...	...	...	...
XII.	Shifnal (Haughton Hall) ...	3.81	+ 1.91	.92	3	22	53.0	19	27.0	12	13	19	
XIII.	Tenbury (Orleton)	3.84	+ 1.31	.77	3	27	56.3	19	27.2	12	8	16	
XIV.	Leicester (Belmont Villas) ..	3.11	...	.79	3	24	57.0	19	30.5	12	2	...
XV.	Boston	3.08	+ 1.37	1.28	3	21	57.0	19	30.0	13**	5	...	
XVI.	Grimsby (Killingholme)	2.81	...	.90	3	22	56.0	19	31.0	27	1	...
XVII.	Mansfield	4.15	...	1.51	3	26	56.8	19	26.0	12	6	15	
XVIII.	Manchester	5.01	+ 2.49	.86	29	23	57.0	19	...	...	...	22
XIX.	York	3.20	+ 1.62	.84	3	17	57.0	19	27.0	25	11	...	
XX.	Skipton (Arncliffe)	11.17	+ 5.53	1.80	29	28	47.0	8	21.0	1	...	15	
XXI.	North Shields	3.08	+ .97	.71	3	25	54.6	19	27.0	3	10	11	
XXII.	Borrowdale (Seathwaite)	25.65	+ 9.29	3.21	16	26	...	...	...	...	...	...
XXIII.	Cardiff (Ely) .....	...	...	...	...	...	...	...	...	...	...	...
XXIV.	Haverfordwest	8.98	+ 3.93	1.31	6	24	54.0	19	31.5	19	1	6	
XXV.	Aberdovey	5.71	...	...	...	...	55.0	29	33.0	3, 12	0	...
XXVI.	Llandudno	5.14	+ 2.60	.70	29	24	56.2	19	31.0	12	1	...	
XXVII.	Dumfries (Crichton Asylum) ..	7.66	+ 3.47	.95	5	26	51.0	2	25.0	3	7	16	
XXVIII.	Hawick (Silverbut Hall)	6.43	...	.73	4	25	...	...	...	...	...	...
XXIX.	Kilmarnock (Annanhill)	5.48	...	.57	16	28	54.2	20	24.0	2	6	12
XXX.	Castle Toward	7.53	+ 1.24	1.13	30	28	49.0	7, 19	20.0	2	22	...	
XXXI.	Mull (Quinish)	5.81	...	1.57	21	15	...	...	...	...	...	...
XXXII.	St. Andrews (Cambo Ho.) ...	4.45	...	...	...	...	...	...	...	...	...	...
XXXIII.	Grandtully	6.72	...	.90	29	19	...	...	...	...	...	...
XXXIV.	Braemar	4.43	+ 1.30	.72	30	25	45.0	19	4.0	3	25	30	
XXXV.	Aberdeen	3.31	...	.61	29	23	48.7	19†	20.6	3	5	26
XXXVI.	Gairloch	4.38	...	.57	29	21	...	...	...	...	...	...
XXXVII.	Portree	8.26	- 4.83	1.31	23	25	...	...	...	...	...	...
XXXVIII.	Inverness (Culloden)	2.39	+ .11	1.11	31	18	49.9	16	16.5	3	13	30	
XXXIX.	Helmsdale	2.82	...	.46	6	22	...	...	...	...	...	...
XL.	Sandwick	3.43	+ .13	.87	19	24	48.0	25	26.4	11	6	21	
XLI.	Caherciveen Darrynane Abbey ..	7.40	...	.60	5	30	...	...	...	...	...	...
XLII.	Cork	8.08	...	1.50	2	26	...	...	...	...	...	...
XLIII.	Waterford	6.55	+ 1.69	.66	3	27	52.0	3, 4†	30.0	2††	3	...	
XLIV.	Killaloe	6.06	+ 1.20	.73	28	26	53.0	4, 16	22.0	2	11	...	
XLV.	Portarlington	4.39	+ .38	.44	8	31	52.0	16	30.0	19	8	...	
XLVI.	Monkstown, Dublin	5.11	+ 1.72	1.40	3	22	53.0	16§	28.0	13	7	...	
XLVII.	Galway	6.90	...	.60	18	28	55.0	21	29.0	26	4	...
XLVIII.	Ballyshannon	7.69	...	1.04	3	29	...	...	...	...	...	...
XLIX.	Waringstown	5.68	...	.90	3	29	51.0	16|||	26.0	1, 12	14	21
L.	Edenfel (Omagh)	6.79	...	1.10	3	29	50.0	16||	27.0	12	14	...	

* And 19, 20.

† 21.

‡ 7, 8, 29.

§ 30.

|| 31.

¶ 21:

** 23, 27.

†† 3, 13.

||| 19.

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

METEOROLOGICAL NOTES ON JANUARY.

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

ENGLAND.

SELBORNE.—An unusually mild and wet month; in the last two months R has been measured on 50 days, and on many others some R has fallen, but not enough to be measured.

HITCHEN.—Hurricane on the 1st; terrific gale on 30th; and altogether the stormiest January in our record.

BANBURY.—High winds on 6th, 10th, 14th, 18th, 23rd, 24th and 29th, and a very high wind on 30th, with H; L on 28th.

CULFORD.—Stormy on the 1st; high wind on 10th, 18th and 29th, and violent gale on 30th. A month of great rainfall, but mild for the season; the mean temp. being $40^{\circ}\cdot8$. No S during the month. High wind from N.W. during the whole of the 29th, which during the night became the most terrific gale which has been experienced in this neighbourhood for many years; this wind continued during the whole of the 30th, causing great injury to property of various kinds, unroofing buildings, blowing out windows, and uprooting many valuable and ornamental trees, which centuries will hardly replace.

SPROWSTON.—No S fell during the month, nor as yet has any been recorded this winter in this part of Norfolk. A very wet and mild month. Terrible gale on 30th, doing much damage to houses and trees.

BODMIN.—Average bar. during month $29\cdot90$ in.; mean temp. $45^{\circ}\cdot9$, being the highest for January ever registered here.

SHIFNAL.—The new year brought no better weather; R still continuing, with a slight respite from 6th to 12th, when it returned with all its copiousness, lasting daily with three exceptions (20th, 21st and 22nd), till the close. The fall of $\cdot92$ in. on the 3rd was almost unprecedented in January in this neighbourhood. Although there were 13 frosty nights they were scarcely strong enough to form ice. A severe storm from S.W. and W. on the 6th, p.m. and all night, and again on 9th, and a fearful storm on the morning of 29th. Strange halo round the moon on night of 28th. Slight S on 12th and 28th; winds chiefly from S.W. or W.

ORLETON.—River flooded at the beginning of the month. A very dull and rainy month, with frequent variations in temp., and very little sun. The ground was slightly covered with S on the morning of the 29th, followed by R and a great gale of wind, which blew down many trees before it abated on the following day. Lunar halos frequent at the end of the month, and there was a large bright solar halo from sunrise to 10 a.m. on the morning of 31st. The mean temp. of the month was about $3^{\circ}\cdot\frac{1}{4}$ above the average.

LEICESTER.—A very wet month, although the fall here has been less than in most parts of the country. Very mild for the season; the mean temp. about 6° above the average. Much S.W. wind. A violent gale on night of 29th and day of 30th, with showers of S and R.

BOSTON.—The heavy rainfall at the end of December and the beginning of this month has caused the worst floods that have been known in the Fen country for years. Owing to the height of the water in the river Witham, and the defective condition of its outfall, a great part of the lower districts in the city of Lincoln was flooded, and the inhabitants driven from their houses. Several of the barrier banks were broken in the side drains between Lincoln and Boston, and it was computed that 40 square miles of the best agricultural land was inundated to a depth of from one to five feet. The river Glen also broke its banks in three places, and inundated Bourne North Fen and part of Pinchbeck. To add to the list of disasters on the 30th, the wind, which all the previous night had been blowing a gale from the S.W., flew round to the N.W., and this occurring near the full moon brought up the largest tide which has been known here since

1854; the evening tide being 4-ft. 3-in. above that of the morning. Two sea banks (of land recently reclaimed) gave way, and a large tract of land sown with wheat is inundated. The temp. of the month was $3^{\circ}8$ above the average.

GRIMSBY.—Bar. 28.65 in. all the forenoon of the 1st; high tide in the Humber; aconites in flower on 6th; hazel catkins shed a little pollen on 19th, extremely mild day; large lunar halo on 24th; high tide in the Humber and gale all day on 30th.

MANSFIELD.—The month has been characterized by almost entire absence of frost, by dull, damp days; and by occasional violent winds, rising on 28th and 29th to almost a hurricane. Little S has fallen. Vegetation is very forward, the gooseberry trees showing leaves in a tolerably expanded condition.

ARNcliffe.—Very wild, with a deep fall of S, on 3rd; S also fell on 12th. Gale from the W. on 29th, with 1.80 in. of R, the max. fall of the month.

NORTH SHIELDS.—Near lunar halo on 1st, a distant one on 2nd, followed by a stormy day on 3rd, when .71 in., the max. fall of the month, occurred. Wall-flower in flower on 18th; polianthus on 19th; and periwinkle on 27th. S fell on 28th.

SEATHWAITE.—Total fall of R during the month 25.65 in., being 9.29 in. above the average; there were 10 days on which the fall exceeded 1.00; 6 on which it reached 1.50 in.; and 3 on which more than 2.00 in. fell; the max. fall being 3.21 in. on 16th. On the 4 days 15th–18th inclusive 6.86 in. fell.

WALES.

HAVERFORDWEST.—Very stormy, wet month, and extremely mild. Fearful weather on 6th and 7th; bar. 28.71 in. at 4 p.m. of 6th; T, with vivid forked L and H, with terrific squalls, at 6.45 p.m. A very violent and sudden gale from the W. on 19th, lasting with great violence from 1 to 4 p.m.; pressure 20 lbs. on the square foot; velocity 64 miles an hour. The weather notably stormy again; during this very stormy month, on the 28th, T, vivid forked L, and H, with very heavy squalls.

MACHYNLLETH.—A very wet, mild and stormy month. A very stormy night on 29th; many trees blown down; great damage done to railway and other property about here.

LLANDUDNO.—The month began and ended with stormy weather; the rainfall was double the average, a great portion of which, however, fell during the nights. There were many fine days in the month. Mean temp. about the average. There was only one night's frost, and that very slight. Primroses were gathered in the lanes on the 18th.

SCOTLAND.

DUMFRIES.—January shows a heavy rainfall (7.66 in.), but still 1.00 in. below that of last month. S fell on 10th, 13th and 26th, but only to the depth of a few inches. High winds have been prevalent. Bar. has been abnormally steady during the storms, and the mean temp. ($41^{\circ}01$) unusually high.

HAWICK.—Total fall 6.43 in., being 3.07 in. above the average of the last 11 years. Very stormy on New Year's Day, and 4th, 6th, 7th, 8th, and 28th. The long continued rains have kept back all out-door work, and gardening and husbandry operations have frequently been performed under the friendly shelter of siphonias and oil-skin capes. Mavis first heard whistling on the 20th.

ANNANHILL.—The year opened with a gale from S.E.; S and R. The month was generally unsettled; hard gales blowing from S.E. or S.W. on 11 days; max. anemometer, reading on the 28th with fine S; L was seen on 14th and 28th.

CASTLE TOWARD.—A very stormy month; the storms have been heavier this month than have been experienced in this district for many years; morning frosts have been frequent, but not of long duration; there has not been much S, but a great deal of sleet and R and very strong winds; on the 28th a very severe thunderstorm. the L very vivid, with pelting showers of H.

ABERDEEN.—Bar. pressure below the average (20 years) ; temp., R, and wind pressure rather above it ; a month of very unsettled weather, mild, but rather wet ; comparatively little S except during the first week.

PORTREE.—A very changeable month ; gales on 18th, 21st, 25th and 28th from S. to S.W. ; squally on 29th and 30th ; T and L on 21st, 28th and 29th, with heavy S and H showers.

CULLODEN.—Intense frost on 3rd, 16°·5 in air and 11°·1 on grass, followed by three snowy days ; a large lunar halo and strong gale from S.S.W. on 25th ; S more or less on 11 days ; S on 31st 5 inches deep.

IRELAND.

WATERFORD.—The wind was S. or S.W. on twenty days during the month, and S.E. on two days ; the remaining days it was N., N.E. or N.W.

KILLALOE.—A great depression of bar. on 7th (28·30), unattended with much R and wind, not more than a stiff breeze ; however, much R and very high winds seem to have prevailed in other parts of the country. 28th, frequent and very violent hailstorms and heavy squalls from W., which continued unabated to the evening of the 30th.

MONKSTOWN.—Month very wet and comparatively mild ; no snow or severe frost ; very heavy easterly gale, accompanied with heavy R on 2nd, which caused great damage. Bar. variable, 28·90 on 1st, and 30·59 on 22nd.

GALWAY.—Frequent storms during the month, accompanied by high tides. Direction of the wind generally *westerly*.

BALLYSHANNON.—The month has been remarkable throughout for heavy and constant rainfall, high winds, and floods, though the last month of 1876 was so unusually wet, this month (7·69) has exceeded it by 2·48 in. The river Erne is greatly swollen, and the low lands on its banks are all under water. On the 28th the tide rose higher than it has done for many years, and those of the 29th and 30th reached a still higher point. The bar has been very unsteady, and the temp. high.

WARINGSTOWN.—Very wet, stormy, and mild.

EDENFEL, OMAGH.—Remarkably wet, remarkably stormy, and remarkably mild.

THE WINTERS OF 1841-2 AND 1876-7.

To the Editor of the Meteorological Magazine.

SIR,—The enclosed is from a record kept by the late Wm. Goldney, Esq., of Clifton, near Bristol. Such a wet season having been succeeded by a very fine one may give despairing people hope.

Very truly yours,

R. C. A. PRIOR.

From Wm. Goldney's record.

1841. Aug. 15th.—Eight weeks' rain. Prayer read for fine weather on 8th and 15th.
 „ 26th.—Weather improved. This the first fine day that gives hope of the harvest being got in well.
1842. Jan. 1st.—Not one day's skating during December. Continued rain for the last ten weeks.
 June 19th.—Rain ; the first for nearly two months.
 Aug. 1st.—All last month extremely fine. Corn cut on Dundry Hill.
 „ 6th.—Rain ; the first wet day for six weeks.

SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CXXXIV.]

MARCH, 1877.

[PRICE FOURPENCE
or 5s. per ann. post free.]

GOVERNMENTAL METEOROLOGY.

DURING the ten years for which Admiral FitzRoy presided over the Meteorological Department, its aggregate cost was about £50,000. In 1866, the duties were transferred to the Meteorological Committee, who have since spent between £100,000 and £150,000. The Treasury, by a minute dated 1875, November 2, resolved that an enquiry should be held as to this expenditure; the report has at last been published,* and we do not think that we should be doing our duty as representing the meteorological and tax-paying public, if we allowed this report to pass without comment. The Treasury Minute is so clearly worded, and gives such a succinct account of governmental action, that we reprint it *in extenso* :—

Treasury Minute dated 2nd November, 1875.

MY LORDS read a letter, dated 21st April 1874, from the Marquis of Tweeddale, President of the Scottish Meteorological Society, submitting the claims of the Society for aid from the State, also previous applications of similar purport from the same Society, and the several replies thereto from this Board, which have been to the effect that my Lords were unwilling to propose to Parliament any grant in aid of Meteorological Science beyond that made to the Committee of the Royal Society, but that recognising the value of the labours of the Scottish Society, they should be glad if an arrangement could be made by which it should participate in the Parliamentary grant in proportion to the services rendered by it in furtherance of the objects of that grant.

To this decision my Lords would, under present circumstances, be disposed to adhere, seeing that the grant of £10,000 a year is made, not to a kindred English society, but to a scientific committee which undertakes in return to conduct, for the Government, business formerly entrusted to a public department.

But their attention having thus been drawn to the subject, my Lords are led to think that a general inquiry into the working of the present arrangements might with advantage be instituted, nine years having elapsed since they were entered into.

* Report of the Treasury Committee appointed to inquire into the conditions and mode of administration of the annual grant in aid of Meteorological Observations, London : Eyre and Spottiswoode, 1877. Price 2s. 4d.

It was in the year 1856 that the Government first began to give direct assistance to the study of Meteorology. In that year the Meteorological Department of the Board of Trade was constituted, with the primary object of collecting, and subsequently discussing, facts and observations too numerous to be collected and discussed by private persons. It continued in existence for ten years, under the direction of Admiral FitzRoy. On the death of that gentleman in 1866, a Committee, consisting of Mr. Galton, Commander Evans, and Mr. Farrer, was appointed to review the results of the labours of the department, and to make such a report as would enable the Government to decide on the policy to be adopted in the future.

In consequence of their recommendations, the control of the department was transferred to a Committee appointed by the Royal Society, who, in return for an annual grant of £10,000 per annum, agreed to carry out the duties connected with the Office. They were to be left perfectly free in their method, and in their choice of labour, and the only condition attached to the grant was that an annual account should be rendered to Parliament of the expenditure, and of the results obtained in each year.

This is the arrangement now in force and into the working of which my Lords think that the time has arrived for an inquiry. Judging by the annual reports of the Committee, they feel sure that it has spared no pains to carry out effectively the duties with which it was entrusted, and it is from no want of confidence in their method of proceeding that their Lordships have decided on this step. But the grant is so considerable that they do not think they would be justified in continuing for any lengthened period without satisfying themselves that the results obtained are such as to warrant the application of so large a sum of public money.

The inquiry should, They consider, be directed to the following points :—

I. How far have the statistics hitherto collected led to the discovery or confirmation of any Meteorological Laws ?

II. How far have the principles on which storm warnings are given, been justified by results ? The second of these questions is practically included in the first, but on the answers of the two will depend the further question of—

III. How far the appropriation of a large sum of public money in aid of Meteorology is justified, bearing in mind the fact that it is not the policy of Government in this country to give direct assistance to the study of any science, except with a view to the more immediate application of scientific theories to practical purposes in which the public rather than individuals have a direct interest.

IV. Should the Committee decide to recommend that public expenditure for Meteorological purposes be continued, they should proceed further to consider upon what system it may be best administered. With this object full information should be obtained with regard to the mode in which the present grant is applied, and in connexion with this part of the inquiry my Lords would wish that the representations of the Scottish Meteorological Society should receive the consideration of the Committee.

They propose that the Committee should consist of the following gentlemen :—

Sir W. Stirling Maxwell, Bart., M.P.

T. Brassey, Esq., M.P.

R. R. W. Lingen, Esq., C.B. (their permanent Secretary).

T. H. Farrer, Esq.

J. D. Hooker, Esq., M.D., C.B.

F. Galton, Esq., F.R.S.

Lieutenant-General R. Strachey, C.S.I.

Subsequently, Mr. D. Milne Home was added to the Committee, as a representative of the Scottish Meteorological Society.

The Committee, therefore, consisted of two members of the House of Commons, one representative of the Treasury, one of the Board of Trade, one of the Royal Society, two of the Meteorological Committee, and one of the Scottish Meteorological Society. Mr. Farrer and Mr. Galton, who sat on this Committee, were also two out of the three members of the Committee of 1866, who proposed the establishment of the office, into the operations of which the present enquiry was to be made; and as above mentioned, Mr. Galton and General Strachey are members of the very Committee whose operations were to be passed in review. Some of these gentlemen were, therefore, enquiring into the success of the plans which they had recommended, and others into the success of what they themselves had done; their criticism was not, therefore, likely to be very severe.

In the next place, we will give a list of the witnesses, printing in *italics* the names of members or officers of the Meteorological Committee:—

<i>Warren De La Rue, Esq., D.C.L., F.R.S.</i>	J. Knox Laughton, Esq.
<i>Robert H. Scott, Esq., F.R.S.</i>	Mr. C. Dawson.
<i>Captain Henry Toynbee.</i>	Mr. G. T. Watson.
<i>Captain Fredk. Evans, C.B., R.N., F.R.S.</i>	Thomas Stevenson, Esq., F.R.S.E.
<i>Rear-Adml. G. H. Richards, C.B., F.R.S.</i>	Alexander Buchan, Esq., M.A., F.R.S.E.
<i>Adml. the Hon. Sir F. W. Grey, G.C.B.</i>	Robert James Mann, Esq., M.D.
<i>Captain D. Murray.</i>	Prof. Sir William Thomson, F.R.S.
<i>Sir G. B. Airy, K.C.B., F.R.S.</i>	James Caird, Esq.
<i>W. Farr, Esq., M.D.</i>	<i>The Rt. Hon. the Earl of Rosse, F.R.S.</i>

The first thing which strikes anyone is the absence from this list of many names which one would have expected to have seen there. Surely the opinions of Baxendell, Balfour Stewart, Glaisher, Ley, Stow, and other outsiders, would have been of great value. Secondly, we note that one-third of the witnesses were connected with the present Meteorological Committee, and, lastly, that they gave more than half the evidence. This would have been both natural, and perhaps necessary, had the Enquiry Committee been a strictly independent body, but that, as we have shown, it was not.

We cannot pretend to epitomize the 216 foolscap folio pages of which the Blue Book consists, and if we single out the flatly-contradictory statements of the various witnesses, we are not aware that much benefit will arise. We therefore leave the evidence and the appendices, and pass to the report.

REPORT.

TO THE LORDS COMMISSIONERS OF HER MAJESTY'S TREASURY.

MY LORDS,

1. WE have, in accordance with the Treasury Minute of the 2nd November, 1875, made the inquiries therein mentioned. In doing so we have asked for the opinion of the President and Council of the Royal Society, who have favoured

us with an elaborate report. We have also taken evidence from members and officers of the Committee which has hitherto administered the grant; and from many other persons whose opinions appeared to us to be important, either on account of their scientific eminence, their official position, or their practical knowledge and experience of the subjects in respect of which, and the classes to whom, meteorological knowledge is specially useful. To this report and evidence, which are contained in the Appendix to our Report, we desire to refer in support of the following conclusions:—

2. The business of the Committee may be considered under two heads, viz. :—

(1.) The Meteorology of the Ocean.

(2.) The Meteorology of the British Isles.

And the business relating to the latter of these may again be subdivided as follows, viz. :—

(a.) That branch which by the use of the telegraph collects materials for, and issues daily weather charts and storm warnings.

(b.) That branch which collects, digests, and publishes meteorological statistics.

This last branch depends on two sources of information; viz., (1) on observations taken at a limited number of stations which are provided with self-recording instruments, and which furnish continuous observations; and (2) on observations taken by the eye at stated daily periods at more numerous intermediate stations.

3. All these divisions and sub-divisions of the business have produced results of value, and should be continued. For more specific information on these points we beg to refer to the evidence, and especially to the Report of the President and Council of the Royal Society.

4. Ocean Meteorology should, we think, be transferred to the Hydrographical Department of the Admiralty. The reasons for this are: first, that whilst this Department is equally able with the present Committee to collect observations from merchant ships, it must be better able to collect similar observations from Her Majesty's ships; and, secondly, that from its experience in chartography and in nautical wants, it is specially competent to put the results in a form useful to navigators.

5. In performing this new duty the Hydrographical Department should be in such relation with the Office or Department which manages Land Meteorology, as to insure that the observations taken at sea will be so made and digested as to be available for scientific purposes in connexion with those made on land.

6. Every effort should be made to act in concert with other nations in Ocean Meteorology, so that labour may be economised, and the utmost possible use be made of all available materials.

7. In recommending the above transfer, we assume that the Lords of the Admiralty will be willing that the Hydrographical Department should undertake the duty; that that Department will be organised and made in all respects adequate for the purpose; that the observations from merchant ships which have been hitherto successfully collected by the present Committee, and which are necessarily more numerous and more varied than any which can be obtained from the Royal Navy, will continue to be collected; and that the advancement of science, so far as the ocean is concerned, will be no less an object with the Hydrographical Department of the Admiralty than it has hitherto been with the present Committee.

8. As to Land Meteorology, we have considered the alternative proposals of

appointing one permanent head, as was the case before 1866, and of leaving matters to be managed by a Committee in the same manner in which they have since been managed. But we cannot recommend either of these proposals. As regards the first, although it may be desirable at some future time to create a permanent meteorological establishment on some such footing as that of the Astronomical Observatory at Greenwich, with an officer of scientific eminence at its head, we think that matters are scarcely ripe for such a step at present. As regards the second, it cannot be expected that the gentlemen who now constitute the Meteorological Committee, and who have by way of experiment given much valuable time to the work in its initial stages, will continue to do so under the existing conditions.

9. We think, however, that the Royal Society should be invited to continue to recommend to the Government persons eminent in science to superintend the work, under the title of the Meteorological Council. They should be appointed for limited periods and should be eligible for re-appointment. They should be fewer in number than the present Committee, and the means should be provided of remunerating them in the shape of fees for attendance. They should have and exercise complete control and supervision over and be responsible for the business, expenditure, and staff, the chief officer of which would be more appropriately designated by the title of Secretary than by his present title of Director. The important duty of selecting a Chairman, would rest with the Royal Society, or with the members of the Council.

It seems to us that these two paragraphs (8 and 9) are contradictory. The 8th begins by stating that there was one permanent head before 1866, and then it states that matters are scarcely ripe for such a step at present. That is to say, the time has not arrived in 1876 for doing what was done before 1866. The second half of the paragraph is equally obscure. If the Committee had abstained from giving reasons, and merely said that they thought the office would be best managed by a Secretary acting under a paid Committee, no exception could have been taken to the grounds of their decision, although it does seem rather hard that the Committee do not think any Englishman worthy of occupying Admiral FitzRoy's post, or of ranking with Buys Ballot, Wild, and Hann.

10. The present system of collecting daily information by telegraph and of issuing storm-warnings should continue. There is evidence that it is of real value to the seafaring population, and that it leads them to thought and observation on the subject of Weather. The want of communication by telegraph on Sundays causes a serious defect in the system, which ought to be remedied.

We have urged the absurdity of interrupting the telegraphy on Sunday for years, and are glad to find it recognised by the Committee. Either the storm warnings are useless, or it is as criminal to stop them on Sundays as it would be to extinguish the lamps in all the lighthouses at 12 o'clock on Saturday night.

11. An endeavour should be made to put into clear shape, and to issue, for public information, the maxims or principles upon which storm-warnings are in future to be given. This information should be revised from time to time, so as to embody the latest results of experience.

The report is very merciful in many respects. When the office was established, one leading duty was imposed upon it, viz., to compare its own forecasts with the weather which followed them. This was given out as one of the reasons for the costly self-recording observatories, and generally for the office taking up the Land Meteorology of the British Isles. For it must be remembered that the office was originally established for sea work, and therefore as it is now proposed to transfer all the sea statistics to the Admiralty, there is stronger reason than ever for using every effort to perfect the storm-warnings. The following questions and Mr. Scott's answers seem to us very unpromising, and yet the report passes over them without a word of comment:—

519. (MR. MILNE HOME.) Have you been able to carry out the recommendations of the Committee of 1866 which say "that the practice of issuing storm warnings shall be continued. That the officer of the Meteorological Department issuing the storm warning for force, should also at the same time, so far as he is able so to do, make, but not issue or publish, a prediction of the probable direction of the coming gale, endeavouring in so doing to render it as specific as possible, *e.g.*, whether within any particular quarter of the circle. That this officer shall note down at the time, and reduce into an exact shape afterwards, the maxims or principles which have guided him in making the signal of force or prediction of direction; the facts to which those maxims are applied, the mode in which he has applied and combined them, the value he has attached to each of them, and the value of the probability which he has thus obtained, and which is indicated by the signal or prediction. That the maxims so acted upon shall be reduced into a clear and definite shape, and kept in the office ready for reference." Has any attempt been made to carry out those maxims for issuing storm warnings? No, that has not been carried out in the detail recommended.

520. Why not? I do not consider that it is possible.

12. The process of issuing daily weather-charts, with explanations, should continue, with such improvements as experience may from time to time suggest. The information thus given not only creates a general interest in the subject, but is of value to persons who are disposed to engage in the discussion of scientific meteorological problems.

This is probably a judicious recommendation, but we are not sure that it is dignified for a Government office to supply illustrated newspapers with engravings and copy for half-a-crown a week (Question 494), and if there were a Meteorological Trades Union there would certainly be some trials for "rattening" the Meteorological Office thermometers.

13. A certain number of continuously self-recording stations should be retained. But it may deserve consideration by the Council whether some at any rate of the existing stations may not be discontinued, and others obtained on more eligible sites. Doubts have also been expressed whether in the present state of meteorological science the minute exactness of the observations now taken at these stations is of sufficient comparative value to justify the whole of the costs which they involve, when there are so many other objects of meteorological inquiry which call for increased expenditure.

This half-hearted paragraph is a true reflex of the evidence respecting the self-recording observatories—which is contradictory in the extreme. We are glad to find that the Astronomer Royal objects to

the reproduced curves as strongly as we have done ever since they were reduced to their present form.

14. The present system of supplementing self-recording observations by returns from eye-observers at intermediate stations should be continued. The positions of these latter stations should, however, be revised, and their number increased, especially in Ireland (where at present there are but few of them); so that the returns may exhibit a fair representation of the different climates and weather of the British Isles. Every possible endeavour should be made to secure the co-operation and assist the efforts of the different societies or other local bodies engaged in meteorology, and to further the adoption of uniform methods.

We are very glad to see the second half of this paragraph. No one supposes that the Government office concentrates all the knowledge of the country, and the old plan of ignoring the Meteorological Societies was a mistake. This recommendation implies the recognition of the true condition of affairs, and it only remains for the Government to pay well for work well done, but not to part with a sovereign for anything but first-rate work.

15. The evidence of the Astronomer Royal and of other scientific witnesses contains some important observations on the form and extent in and to which the results of the observations should be published. This is a subject which deserves the careful attention of the Council, with a view to saving all unnecessary expense on the one hand, and on the other to publishing the results in such a form as may render them most available for use by men of science.

16. There is evidence to show that the system adopted in the United States, by which observations are taken over the large area of the North American continent and are communicated by telegraph to Washington, is of great value both for the immediate practical purposes of agriculture and navigation, and also as throwing light on the general movement of the atmosphere. The position and extent of the United Kingdom do not admit of any similar system of equal value. But it is desirable in the general interests of science as well as for practical purposes, that, by means of co-operation between the different European nations, synchronous observations should be made throughout Europe and the adjacent seas, so as to afford all possible facilities for synoptic charts of the weather in Europe. To this end this country should give all the help it can.*

17. There is important evidence that the science of Meteorology at the present moment stands in need of hypothesis and discussion at least as much as, if not more than, of observation. It is not easy to lay down any rule concerning the method by which such investigations may be promoted. But we think that the Council should be at liberty to appropriate a part of their annual grant to the purposes of any special researches which they may think important, and in such cases it should rest with them to select the investigators, and fix the remuneration.

We do not see any statement of the number of persons of whom the proposed Council is to consist, but we see in paragraph 9 that they are to be fewer than the present Committee. It appears

* A note upon the United States synchronous observations will appear in our next issue.

to us that the satisfactory working of the scheme suggested in this paragraph will require considerable tact—for original investigators if often poor, are always an independent race, and if the Council accept the somewhat stilted position implied in several parts of this report they may find it more difficult than is here implied to “select the investigators and fix the remuneration.”

18. There is evidence of a connection between weather and health ; but it does not appear that any special meteorological observations are wanted at present, or are likely to be wanted in future for this special purpose, other than the observations, which, under the scheme we have recommended, the Council should collect for general purposes.

This paragraph read in connection with the evidence means a great deal more than it says. What it really means is, we believe, that the Registrar-General of England (what is to be done in Scotland is not clear) shall discontinue the publication of the tables which have been compiled for him for more than a quarter of a century by Mr. Glaisher, and be supplied instead with data collected by the newly-proposed Meteorological Council. If this is a specimen of the support to be given to “original investigators,” we do not think that the Council will receive many valuable offers. Mr. Glaisher has been very harshly treated lately. We know that his tables are far from perfect, but he has not had £10,000 a year to spend upon them, and latterly even the miserable pittance of £150 per annum, which he used to receive for compiling them, has been withdrawn. We have neither desire nor necessity to use strong language upon the subject. Pages 62 and 63 of this report adequately show the fate of an English man of science who is not in favour with the powers that be.

19. Again, the importance of meteorological data to the agriculturist and dealer in agricultural produce is clearly established. But neither do their requirements demand other observations than should be included in the general returns and information obtained by the Meteorological Council.

Here again a great deal more is implied than is said, and the new “Meteorological Council,” who are to do everything, seem also instructed to spend any amount of money. This 19th paragraph is evidently based upon the examination of Mr. Caird. If our readers will turn to his evidence they will find that he laid primary stress upon the importance of information respecting rainfall, but that not one word was said either by him, or by any of the Committee, as to the existence of two thousand rainfall stations in the British Isles. Mr. Caird went to the Meteorological Office, he heard what was being done there, and seems to have believed (and not to have been informed to the contrary) that the stations connected with that office were the only ones in the country, instead of there being, as is really the case, 20 non-official records for each official one. The fact is, evidence without cross-examination, is of very little use. We yield to no one in our appreciation of Mr. Caird's skill as an agriculturist, but it surely would have been better not to have allowed him, to be so ignorant of the true state of affairs as, to suppose that Leith

was the sole and best representative station for all the Lothians, Stirlingshire and Fifeshire [answer to question 1854]. Why the Scottish Meteorological Society alone has a dozen fully equipped stations in that district, there are 33 rainfall stations, and how far Leith is fairly typical may be judged from the fact that the rainfall even in the lowlands is twice as great in some parts as others. Leith is not even an average station, but if it were, an average of a value of which the maximum is twice the minimum would hardly be of much use.

Subsequently Mr. Caird, still regarding the stations of the Meteorological Office as the only ones, pointed out the deficiencies near Lincoln, Shrewsbury and Gloucester. Perhaps the finest station of the Meteorological Society is in Lincoln, another very good one is within a few miles of Shrewsbury, Mr. Glaisher has a station at Gloucester, and in the three counties concerned, viz., Lincoln, Shropshire and Gloucester there are 84 rainfall stations. What is the use of an enquiry with so many of the facts left out?

20. As regards the forms in which the information thus collected can be made most available for sanitary and agricultural purposes, it appears desirable that the Meteorological Council should place themselves from time to time in communication with the Registrars General, and with such bodies as the Medical Council, and the Agricultural Societies of the United Kingdom.

21. The expense of the scheme we have suggested may be estimated as follows:—

The following return has been prepared by members of our Committee who are also members of the Meteorological Committee of the approximate present cost of the Meteorological Office:—

Director's Office and general control	...	...	...	£
Ocean Meteorology, excluding supply of instruments	...	...	...	2,500
Land Meteorology, including self-recording observations and supply of instruments	...	...	...	1,500
Telegraphy and storm-warnings...	...	...	...	3,500
				2,500
Total	...	...	...	£10,000

The modifications that have been proposed would lead to certain additions to the necessary outlay, among which may be specified—

Remuneration of Council, say	...	...	...	...	£
Special Scientific researches	...	...	...	...	1,000
Extension of telegraphy on Sundays	...	...	...	...	1,000
New land stations	...	...	...	...	500
Inspection of Stations	...	...	...	...	1,500
					500
Total	...	...	...	...	£4,500
Deduct for Ocean Meteorology transferred to Admiralty	...	...	...	...	1,500
Net increase	...	...	...	...	£3,000

This sum being added to the present grant of £10,000 would bring the whole sum to be placed at the disposal of the Council up to £13,000 yearly. Assuming the expense of Ocean Meteorology transferred to the Admiralty to remain under the new arrangement at its old figure, £1,500, the whole additional annual burden on the National Exchequer proposed in the above suggestions is £4,500, or £14,500 instead of the existing grant of £10,000.

(To be continued.)

RAINFALL OF JANUARY AND FEBRUARY.

To the Editor of the Meteorological Magazine.

SIR,—The rainfall in January, 1877, was exceedingly heavy here, viz., 9.38 inches, or 1.38 in. more than in any January since 1863, and 5.36 in. above the mean of the previous 13 years. The January rainfall at The Folds, Bolton (which is usually much more than we have here) was 2.50 in. less than at Braystones. Last month (February) the rainfall here was only 3.00 in., while in Bolton we had 6.19 in. (3.19 in. more than at Braystones).—Yours very truly,

JOHN DALTON WATSON.

Braystones, Beckermeth, Cumberland, March 12th, 1877.

THE ASSENDEN SPRING.

To the Editor of the Oxford Journal.

SIR,—The breaking of the Assenden Spring or Bourn, falsely called a land-spring, as noticed in the *Journal* last week, is of more than local interest, as it is one of the most remarkable phenomena of the chalk so-called water-bearing stratum, which extends over a large extent of the south and south-eastern parts of England, and whence the greater portion of the perennial waters of the Thames are derived. It might be expected that in an exceptionally wet season, as in 1852, this phenomenon would be repeated. It may interest some of your readers to know the very remarkable identity of the two seasons, as observed at a place about 14 miles from the spot in question, with little probable difference in meteorological results. Taking the three months, or 91 days, previous to the 2nd of December, 1852, and the 23rd of January, 1877, the total rainfall for the first period was 12.22 inches, and for the latter period 12.16, a difference of less than one-tenth of an inch, so small that if it were not a copy from a record existing before the breaking of the Bourn it would not be believed. Then on the first period rain was noted on 49 days, on the latter 52. On one day only, 11th of November, 1852, did the rainfall exceed one inch in 24 hours, and on one only did it exceed half an inch. On December 7th, 1876, only it reached 0.92, or nearly an inch, and on two days only did it exceed half an inch; the further details show moderate and continued rainfall; added to this on both occasions the spring burst 18 days after the flood in the river Thames attained its extreme height. If there is any memorandum or remembrance of the day on which the Bourn ceased to run in 1852, it will probably furnish another proof of the identity of the two seasons.

It may be asked why did not the Bourn run in 1875, when the rainfall was as great as, if not greater than, in the two seasons 1852 and 1876-7, and when the flood attained a greater height by a few inches? The reason seems to be that the rainfall in 1875 came in storms and very heavy showers in 28 days only; in 91 days with two records, namely, 1.44 and 1.70 in 24 hours, with a total of 7.39 inches in October when the soil was not fully saturated, and the evaporation considerable; moreover, the very high flood was due to two inches of

heavy rain in five days, when the river was already in flood. It is the continued rains that sink to augment the springs, not sudden and heavy storms. The explanation of the bursting of these springs or bourns at high levels in the chalk district is easily explained.

The surface of the water in the chalk is described by a line inclining towards the natural vent or outfall of the water (in this case the Thames), at an angle of not less than 10 feet in the mile; when after heavy rain the angle of this line exceeds that of the surface of the ground in the same direction, the water shows itself above ground, as in this case, and runs till the angle is reduced by the discharge of water; this may be before the end of March.

There are many local sayings connected with the running of these Bourns, such as "When the Bourn runs, bread and wheat will be dear." The markets rise with the springs. This was before free-trade. In one place at least it is said that of old the farmers had a merry-making at a public-house at a Bourn End when the Bourn ran, and no doubt many an acre of would-be wheat will be unsown in the season 1876-77, to the loss of the farmer, though not of the public, who consume the corn from the whole habitable globe.

I am, Sir, yours obediently,

J. C. CLUTTERBUCK.

Jan. 29, 1877.

[The practical utility of the above letter is, we believe, ample justification for its reproduction in our pages.—Ed.]

EXTRAORDINARY DRYNESS.

To the Editor of the Meteorological Magazine.

SIR,—The following readings almost, if not quite, considering the difference of situation, "cap" those given by the Rev. F. Stow in the January Magazine:—

Date.	Dry Bulb.	Wet Bulb.	Dew Point.	Vapour Tension.
Feb. 27, 9 p.m.	29·5	24·5	7·5	·061
„ 28, 9 a.m.	29·7	25·9	13·4	·079
„ 27, 10.45 p.m.	29·0	24·1	6·5	·058
„ 28, 8 a.m.	27·9	24·8	11·9	·073

The first two observations were made with Kew Certified Thermometers, protected from radiation in a double Louvre-boarded stand. The last two with a separate pair uncertified, but good ones, outside a north window. They had been wetted about half-an-hour previously.

The 27th was the night of the eclipse of the moon. I well remember how cutting the wind was, although not strong. The sky, of course, was cloudless. The moon when totally eclipsed was of a coppery hue, the centre dark shadow, being plainly visible; the colour reminded one of the sun in a London fog. I looked at it through an ordinary Dolland, with a terrestrial eye-piece, and a two-inch object-glass. When the eclipse was total I could see small stars close to the moon's disc. The telescope was then turned to the nebula in Orion. I was much struck with its unusual brilliancy. A triangle of three

bright little stars was clearly visible, even with so small a telescope. Not being an astronomer, I leave others to judge whether the atmosphere was not unusually clear.—I am, Sir, faithfully yours,

ALEX. E. MURRAY.

Hastings, 6th March, 1877.

STORM OF FEBRUARY 19TH AND 20TH, 1877.

RECORD OF OSLER'S ANEMOMETER.

A fierce gale set in last evening from S.W., veering at midnight to W.N.W., Osler's anemometer registering per square foot 20 to 25 lbs. pressure, a velocity of 63 to 70 miles an hour. Between 3 and 6 a.m. the pressure in the squalls reached 27 to 35 lbs., equal to 73 to 83 miles. The gale has somewhat moderated, but it still blows very hard.

T. L. MANSELL, M.D.

Guernsey, 2 p.m., Feb. 20, 1877.

GREENWICH EXTREME TEMPERATURES.

The extreme Shade Temperatures of the month of February at the Royal Observatory, Greenwich, during the past 36 years.

Year.	Maximum.		Minimum.		Year.	Maximum.		Minimum.	
	deg.	date.	deg.	date.		deg.	date.	deg.	date.
1841	54·6	20	12·4	3	1859	59·0	16	30·5	5
1842	53·2	15	26·4	18	1860	53·5	28	23·2	11
1843	51·9	21	20·3	14	1861	56·0	17	24·4	12
1844	50·4	23	20·0	13	1862	56·3	20	24·4	8
1845	48·5	26	7·7	11	1863	55·7	28	27·2	18
1846	62·3	28	26·9	10	1864	53·8	13	20·1	10
1847	55·0	17 18	11·2	11	1865	52·7	28	15·5	15
1848	55·0	24	30·2	18	1866	57·0	1	24·2	18
1849	58·0	22	23·5	13	1867	57·1	16	32·9	3
1850	58·2	15	30·0	14	1868	61·7	25	26·7	9
1851	57·1	18	23·7	17	1869	61·6	5	31·7	13
1852	57·4	2 17	24·9	21	1870	55·6	28	19·4	11
1853	45·0	28	20·5	19	1871	57·0	27	25·0	11
1854	57·0	6	23·5	14	1872	57·9	9	32·4	28
1855	48·4	25	11·1	19	1873	50·1	26	25·0	24 25
1856	58·0	9	27·5	1	1874	55·9	28	21·0	11
1857	56·9	28	20·0	1	1875	51·3	15	23·3	24
1858	52·8	5	23·5	26	1876	59·0	18	21·8	13

Extremes in 1877, Max. : 59°·1 on 7th ; Min. : 24°·7 on 28th.

	Year.	Max.	Date.	Min.	Date.	Year.
Means of 36 years	...	55·3	19	23·1	14	...
Highest	1846	62·3	28	32·9	3	1867
Lowest.....	1853	45·0	28	7·7	11	1845
Range .....	...	17·3	...	25·2	...	...

FEBRUARY, 1877.

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 1860-5	Greatest Fall in 24 hours.		Max.		Min.					
				Dpth	Date.			Deg.	Date.	Deg.	Date.	In shade	On grass
		inches	inches.	in.									
I.	Camden Town	1.78	+ .56	.34	13	17	58.5	7	25.3	28	2	6	
II.	Maidstone (Hunton Court)...	1.83	+ .61	.47	13	15	...	...	...	...	...	...
"	Selborne (The Wakes).....	1.91	+ .20	.43	19	17	54.0	7, 14	25.0	28	2	6	
III.	Hitchen	1.76	+ .50	.30	19	16	51.0	7, 10	20.0	27†	11	...	
"	Banbury	1.72	+ .29	.46	19	21	54.0	7, 14	23.0	28	8	...	
IV.	Bury St. Edmunds (Culford)...	3.05	+ 1.63	.51	20	21	54.0	7	21.0	28	6	11	
"	Norwich (Sprowston).....	2.52	...	.40	20	23	...	...	...	...	...	...
V.	Bridport	1.31	— .75	.29	15	13	56.0	7	25.0	28	5	...	
"	Barnstaple.....	3.33	+ 1.25	.59	12	23	58.0	16	33.0	28	0	...	
"	Bodmin	3.27	+ .48	.49	12	24	55.0	14	33.0	27†	0	0	
VI.	Cirencester	2.01	+ .40	.41	19	15	...	...	...	...	...	...
"	Shifnal (Haughton Hall) ...	2.72	+ 1.83	.41	19	18	55.0	10	23.0	28	6	12	
"	Tenbury (Orleton)	2.09	+ .52	.42	19	17	56.3	14	28.0	28	4	8	
VII.	Leicester (Belmont Villas) ...	2.17	...	.72	25	18	55.8	14	23.0	28	2	...
"	Boston	2.09	+ .88	.48	25	18	55.0	13	23.0	28	3	...	
"	Grimsby (Killingholme)	2.10	...	.57	25	18	54.0	14	23.0	28	2	...
"	Mansfield	2.40	...	.73	25	25	53.8	15	20.0	27†	4	9
VIII.	Manchester	4.29	+ 2.34	1.16	25	22	55.0	14	24.0	28	3	15	
IX.	York	2.09	+ .71	.44	25	18	54.0	14	20.2	28	6	...	
X.	Skipton (Arncliffe)	6.56	+ 2.89	.62	6	22	...	...	...	...	...	...
"	North Shields	1.58	+ .05	.30	10	18	52.6	6	22.0	28	5	9	
"	Borrowdale (Seathwaite).....	14.42	+ 3.04	1.63	11	20	...	...	...	...	...	...
XI.	Cardiff (Crockherbtown).....	2.79	...	.42	11	20	56.0	14	27.0	28	...	...
"	Haverfordwest	3.77	+ .91	.50	2	18	55.0	14	25.0	28	2	4	
"	Aberdovey	4.75	...	...	...	19	59.0	15	26.0	28	2	...
"	Llandudno.....	4.14	+ 2.79	.91	25	22	56.0	2	28.5	28	2	...	
XII.	Dumfries (Crichton Asylum)...	2.66	+ .33	.51	12	17	52.8	16	21.0	28	6	8	
"	Hawick (Silverbut Hall)....	2.55	...	.39	2	18	...	...	...	...	...	...
XIV.	Kilmarnock (Annanhill).....	4.42	...	.60	11	24	53.0	15	17.5	27	6	8
XV.	Castle Toward	7.12	+ 3.38	1.25	12	25	51.0	6	16.0	27	13	...	
XVI.	Mull (Quinish)	6.17	...	.82	10	23	...	...	...	...	...	...
"	St Andrews (Cambo Ho.) ...	1.50	...	...	...	...	...	...	...	...	...	...
"	Grandtully	2.38	...	.65	2	9	...	...	...	...	...	...
XVII.	Braemar	3.03	+ 1.05	.55	8	21	46.8	15	17.0	27	14	25	
"	Aberdeen	2.68	...	.58	12	19	51.9	15	22.0	27	7	25
XVIII.	Gairloch	6.53	...	.84	10	27	...	...	...	...	...	...
"	Portree .....	...	...	...	...	...	...	...	...	...	...	...
"	Inverness (Culloden)	3.12	+ 1.24	.81	12	11	52.0	6	21.8	27	4	24	
XIX.	Helmsdale	5.53	...	.72	9	23	...	...	...	...	...	...
"	Sandwick	4.33	+ 1.85	.64	12	26	48.2	6, 15	20.3	27	5	8	
XX.	Caherciveen Darrynane Abbey	...	...	...	...	...	...	...	...	...	...	...
"	Cork	2.56	...	1.20	14	16	...	...	...	...	...	...
"	Waterford ...	1.20	— .83	.18	19	19	59.0	15	26.0	28	2	...	
"	Killaloe	4.72	+ 1.82	.56	19	21	58.0	14*	19.0	28	6	...	
XXI.	Portarlington	2.50	+ .47	.40	14	27	54.0	14	25.0	27	2	...	
"	Monkstown, Dublin	1.29	— .35	.43	13	15	58.0	2, 8	26.0	28	2	...	
XXII.	Galway	3.22	...	.47	13	23	56.0	25†	32.0	27	1	...
"	Ballyshannon	5.69	...	1.23	25	25	...	...	...	...	...	...
XXIII.	Waringstown	2.64	...	.76	25	24	55.0	5	24.0	28	6	15
"	Edenfel (Omagh)	3.40	...	.79	25	24	52.0	14	25.0	27	7	...

* And 19.

† 26.

‡ 28.

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

METEOROLOGICAL NOTES ON FEBRUARY.

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

ENGLAND.

SELBORNE.—The wind frequently very high; on the 20th, about 8.30 a.m., a violent gale from N.W. uprooted a large spruce fir-tree in my ground, planted by Gilbert White, in 1751; it was about 90 feet in height, and 7 ft. 6 in. in girth at 4 ft. from the ground—the long continued wet had completely softened the ground in which it grew. Extremely mild month, becoming colder towards the end; temp. 30° on 27th, 25° on 28th, and 18° on 1st of March.

BANBURY.—High wind on 19th and 25th; S on 22nd, 26th, and 27th.

CULFORD.—The weather up to the 19th was unusually mild, with much R. The first S of the season fell here on the night of the 19th, and S fell almost daily to the close of the month, and a low temp. prevailed. The month has been remarkable on account of the entire absence of E. wind. The mean temp. of the month was 42°·2, and the rainfall is above the average.

SPROWSTON.—A very mild month, and a very wet one; stormy, with strong gale from N.W. on 20th; frequent S after the 19th.

BODMIN.—During the last 98 days there have been only 10 without R; mean temp. of month, 47°·7.

HAUGHTON HALL, SHIFNAL.—With the exception of last year (when 3·20 in. of R fell) the wettest February since 1848, when 2·81 in. was measured. Almost daily R after the 10th, the temp. falling so much that the latter part of the month was colder than the beginning. The rose, gooseberry, and currant trees so forward as to be injured by the March frost, which proved more severe than any during the winter. Heavy storm on 19th, and again on 25th. Aconite open on 2nd snowdrops open on 6th, blackbird singing on 8th.

ORLETON.—A very warm, dull, cloudy month, with very little sunshine; frequent falls of fine R; the last three days very cold, with slight showers of S covering the ground on the 27th. A sudden fall of the bar. on the 19th, followed by heavy R and violent wind; great wind again on 26th. The mean temp. of the month was more than 4°·5 above the average, but rather less than it was in 1869. Clee Hills covered with S on 20th.

LEICESTER.—First three weeks unusually mild, causing vegetation to be very forward; last week cold; heavy S on morning of 26th, followed by frost. Mean temp. of the month, 42°·9. Much S.W. wind, except during the last week. Eclipse well seen on 27th.

GRIMSBY.—Snowdrops began to flower on 1st, crocus on 3rd, sweet violet on 7th, pilewort on 13th, apricot on 25th, yews shedding pollen on 28th, tortoiseshell butterfly seen on the 14th. Soon after noon on 10th the temp. fell from 53° to 46°. The month remarkably mild till the close, and vegetation I think forwarder than in any year since 1859. There was great visibility of the air on 25th and 26th, with low bar., and the weather became much colder.

MANSFIELD.—Very heavy Snow in the early morning of 26th. February has throughout been damp, mild, and occasionally pleasant month, but the weather has been far from healthy till the close, when winter seemed to come in earnest. The mean temp. for the month is 41° 8.

YORK.—S on 21st, 22nd, and 26th.

ARNOLIFFE.—S and H on 19th, S at night on 25th, and hard frost on 27th.

NORTH SHIELDS.—S on 26th, yellow crocus in flower on 10th, purple crocus on 11th, and blue hepatica on 12th.

SEATHWAITE.—Seven days on which the R exceeded an inch.

WALES.

HAVERFORDWEST.—Frequent but not heavy R during the month, which is the usual character of the month in this locality. The weather has been mild and very stormy—on the 2nd and 3rd very stormy, with T, L, and H; the gales on 20th and 21st were of extreme violence, uprooting three large oaks of some

centuries growth in Picton Park ; the last four days were cold, the mercury down to 25° on stand and 20° on grass on the night of 28th.

ABERDOVEY.—Generally wet though mild ; a great storm of wind from N.N.W. in the night of the 19th ; frost and S at the close, the S being 1 in. deep on the ground on the 28th.

LLANDUDNO.—The month stormy and wet, but mild, the temp. being nearly 2° above the mean, and the rainfall nearly 3·00 in. Feb. here is on the average the driest month of the year, but on this occasion the fall exceeded 4·00 in. and only six days were without R. Snowdrops and palm willow in full flower on 1st, jonquil in open garden on 13th, mazereon in bloom on 8th, thrush singing on 1st and blackbird on 16th.

SCOTLAND.

DUMFRIES.—The month has been moist, though the rainfall is about the average. S fell on 26th to the depth of 3 in., and was followed by a day or two of hard frost. The mean temp. (42°·83) is nearly 3° higher than that of last year. Northerly winds prevailed in the latter half of the month.

HAWICK.—Hurricane on 2nd and 3rd. The month until the last two days was wet and mild, but the temp. fell to 22° and 20° on those days ; so much heat and moisture in the earlier part of the month set the sap of the trees and shrubs early into circulation, and gooseberry trees were just expanding into leaf when they were checked for their forwardness by the frost.

ANNANHILL.—Temperature of the month generally mild, even more so than January, but on the 27th it fell to the exceptionally low temp. of 9°·5. Winds principally W. Hard gale on 3rd from W.S.W. ; ozone very abundant. S fell on 20th, 21st and 27th. Eclipse well seen here on 27th, the evening being very clear.

CASTLE TOWARD.—Wet, stormy month, R falling on every day but three, and the amount being nearly double the average. On the 12th, before daylight, we had the heaviest fall of R this season (1·25 in.), the burns on this estate overflowing their banks, and doing much damage in the way of cutting up roads ; there has not been much S this month. On the 21st frost set in, and continued to the end of the month, the lowest being 16° on 26th ; the ice being three inches thick, and the S from two to three inches deep on 27th. The weather has been very unfavorable for all kinds of out-door labour.

BRAEMAR.—A very severe month, with S and drift. Very violent hurricane from 4.30 to 6 a.m. on 17th.

ABERDEEN.—A month of rather unsettled weather, with rainfall and temp. above the average, and bar pressure below it.

SANDWICK.—February has been very wet and cold, R or S falling on every day but two ; the 26th and 27th were particularly severe, there being a gale of wind, with hailstorm and drift, made the feeling of cold intense, though the temp. had not fallen below 20°. A gale of 60 miles per hour, 10 to 11 p.m. on 2nd, and another from 40 to 50 miles an hour in early morning of 26th. Aurora on 11th and 13th, and large lunar halo on 21st.

IRELAND.

WATERFORD.—Prevailing wind N. ; extremely high wind on 19th ; high wind also on 25th ; slight fall of S on 27th.

KILLALOE.—Month very wet and unfavourable for spring agricultural operations up to the 20th ; gale from W. on 19th ; very severe for about 36 hours ; followed on 24th by another from N. of less severity, but longer continuance, veering back to S.W., and ending on 27th. Eclipse seen on 27th under the most favourable conditions of weather ; same night the heaviest frost of the season, 19°.

MONKSTOWN.—A decidedly mild February, with the exception of the last few days, which were cold and frosty, temp. on the night of the 28th February and 1st March falling to 23°.

BALLYSHANNON.—The month has been a wet one throughout, notwithstanding the heavy rainfall of December and January, February (5·69 in.) has exceeded the

corresponding period last year by 1·09 in. High winds have been prevalent, with an unsteady bar., and mostly high temp. Showers of H, with slight frost, marked the last few days of the month.

WARINGSTOWN.—Rainy and mild, except a few days in the end of the month ; heavy gales on the night of the 19th.

EDENFEL, OMAGH.—With the exception of the last three days, on which there was S and frost, the weather was of the same abnormally mild and wet character as that which has prevailed during the entire winter.

SUPPLEMENTARY TABLE OF RAINFALL IN FEB., 1877.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see Met. Mag., Vol. XI., p. 28., but the list is under revision and further details will be given in a month or two.]

Div.	Station.	Total Rain.	Div.	Station.	Total Rain.
		in.			in.
II.	Acol	1·49	XI.	Llanfrehfa	4·04
„	Hailsham	2·28	„	Castle Malgwyn .....	...
„	St. Lawrence, I. of W....	1·90	„	Heyope .....	...
„	Andover.....	1·35	„	Carno	6·04
„	Strathfield Turgiss	1·42	„	Rhug, Corwen	5·38
III.	Addington Manor	1·87	„	Port Madoc	6·32
„	Oxford	1·59	XII.	Melrose	2·89
„	Northampton	1·79	XIV.	Cessnock, Glasgow	4·84
„	Cambridge.....	1·99	XV.	Gruinart	5·48
IV.	Sheering	2·15	XVII.	Keith	2·45
„	Ipswich	1·83	XVIII.	Dalwhinnie	·77
„	Diss	2·63	„	Auchnasheen	9·64
„	Swaffham	3·00	„	Springfield, Tain	3·80
V.	Compton Bassett	1·50	XX.	Skibbereen	2·74
„	Dartmoor	6·67	„	Glenville, Fermoy	2·48
„	Teignmouth	1·09	„	Tralee.....	3·76
„	Langtree, Torrington ..	4·07	„	Newcastle W., Limerick	3·06
„	Cosgarne, St. Austell ...	3·57	„	Kilrush	3·52
„	Taunton.....	1·48	XXI.	Kilkenny	1·48
VI.	Bristol	2·34	„	Kilsallaghan	1·77
„	Sansaw	2·03	„	Twyford, Athlone	2·48
„	Cheadle	3·66	XXII.	Ballinasloe	2·89
VII.	Coston, Melton Mowbray	1·91	„	Kylemore	8·31
„	Bucknall	2·13	„	Carrick on Shannon.....	2·65
VIII.	Walton, Liverpool	3·23	XXIII.	Rockcorry	3·11
„	Broughton-in-Furness ..	5·04	„	Warrenpoint	2·09
IX.	Stanley, Wakefield	1·99	„	Carnlough, Larne.. .....	...
X.	Gainford	1·52	„	Bushmills	3·75
„	Shap	4·66	„	Buncrana	4·02

S Y M O N S ' S

MONTHLY

METEOROLOGICAL MAGAZINE.

CXXXV.]

APRIL, 1877.

[PRICE FOURPENCE
or 5s. per ann. post free.

GOVERNMENTAL METEOROLOGY.

(Continued from page 25).

RESUMING our consideration of the Report of the Treasury Committee, we have first to deal with the estimate published in our last number. The following are approximately the sums voted a year or two back for purposes of Education, Science, and Art. It is to be remembered that all these sums are irrespective of expenses for printing and stationery. Not being politicians, we do not understand why the expenditure upon publications is not charged to the several departments, so as to show the real cost of each :—

	£
Science and Art Department	296,000
British Museum	117,000
Meteorological Committee	10,000
Royal Observatory	7,000
National Gallery	6,000
Learned Societies	3,000
National Portrait Gallery	2,000

Viewed in this light we are not prepared to say that either the £10,000 hitherto voted, or the £14,500 now recommended, is too large a sum. To the distribution of the amount we, however, object most strongly. Let us, in the first place, re-arrange the items given in the report so as to show precisely what is intended—

Director's Office* and General Control	£2,500	} Direction £3,500
Remuneration of Council	1,000	
Land Meteorology, including self-recording observatories and supply of instruments	3,500	} Land Stations 5,300.
New land stations	1,500	
Inspection of stations (part due to land stations)	300?	

* It is rather rich to find this title retained after the Committee have recommended that no one should be called Director.

Telegraphy and Storm Warnings ...	2,500	} Telegraphy 3,200
Extension of telegraphy on Sundays	500	
Inspection of stations (part due to telegraphy)	200?	
Ocean Meteorology, excluding supply of instruments... ..	1,500	Sea Work 1,500
Special Scientific Researches ...	1,000	1,000

To the charges under the head of Direction, we see no reason to object, although we are slightly amused at the proposal of paying the Council; surely none of those who have recommended such a novelty would accept the paid office which they have proposed to create.

Deducting the charges for direction, which apply in part to all the subsequent heads, the amount left is £11,000, and this is appropriated in the following proportions:—

Land Stations.	Telegraphy.	Ocean Meteorology.	Special Researches.
£5,300.	£3,200.	£1,500.	£1,000.

Would a single reader of this magazine have expected the amounts to have been in the above order? Will anybody show why Ocean Meteorology (for the study of which the office was created) is in the future estimated to cost less than one-seventh of the entire vote? Is the subject worked out? Do the committee consider it a matter of third-rate importance? Or do they wish to imply that, as it is a large subject it had better stand over for the present, and in the interim that matters should just drift on? We cannot guess what the answer is, but we mistake the national feeling if it would approve of so paltry a mode of dealing with the subject. We used to hear tall talk about Britannia ruling the waves, but it is pretty clear that the Committee do not feel much interest in either waves or storms unless they come on the little islands in which they dwell.

Yes, that is about it, £8,500 for Great Britain and Ireland and £1,500 for our share of all the oceans of the globe.

Land stations in the British Isles, £5,300. What results have we had for the £50,000 already spent upon the land stations of the Meteorological Committee? Miles and miles of photographic curves have been produced, reduced, printed, measured, converted into figures, printed and published; but what is the use of that without discussion? There must be between three and four millions of hourly observations. Why is there nothing in the estimates for discussing and utilising them? Is that what the recipients from the Special Research fund are to do for the £1,000 per annum? Why, at a penny an observation the arrears would cost £15,000 to work up. Surely before launching into an additional expenditure of £1,500 per annum, proof should be given that past expenditure has been thoroughly utilised.

We cannot understand the item of "New land stations, £1,500." At present, the Meteorological Committee are receiving from the Meteorological Society perfect records from a number of stations for £5 per station per annum. Are the Committee of opinion that 300 more stations are necessary? or do they recognize the fact that £5 per

annum is far too little? We can give no opinion upon a proposal which is not explained, and are inclined to think the sum must have been specified without consideration, for the following reason: the amount of £1,500 is set down as the annual cost of the new land stations; but these stations have to be created; new stations must have new instruments, and yet there is no item for equipment. This omission is equally puzzling, whether it be regarded as intentional or the reverse.

The last item, "Special Scientific Researches, £1,000," if it is intended to attract to the support of the Council the unattached experts in meteorology must be dispensed with considerable discretion. Really scientific men, rarely care much about money. It is not for it that they live or work, and, therefore, if the Council desire their allegiance, they must not count upon obtaining it in return for money alone. Delicately managed, even this £1,000 a year may yield more important results than all the rest of the grant, or it may yield next to nothing. However, the Committee do not propose to incur any risk in the matter, for the total waste of £1000 of national money would never be felt, and we do not for a moment doubt that some good will result from the proposal.

Before proceeding further we must give the concluding paragraphs of the report:—

22. With reference to the Scottish Meteorological Society, the representations of which have been specially referred for our consideration, we desire to offer the following remarks:—

It seems essential that any grant of public money for the purposes that have been indicated in our recommendations, should be applied under the immediate responsibility of the Council, and that no expenditure should be incurred which those purposes do not absolutely require. There is evidence to show that a large and trustworthy amount of co-operation may be obtained in all parts of the United Kingdom, from observers who do not require remuneration for their services, and it seems very important that such co-operation should be fostered to the utmost. Any system of payment for meteorological registers which was not very strictly limited, would necessarily involve the concession of payments to all observers, and might entail a very large outlay which has hitherto been avoided, and which there is reason to believe is not at present really called for.

We are of opinion, therefore, that only such payments should be made from the grant placed at the disposal of the Meteorological Council to the Scottish Meteorological Society, as are necessary for obtaining observations at stations required for the purposes of the Council; for securing the proper inspection of stations the registers from which are required for the general purposes of the Council; for the needful compilation and check of such registers; and for meeting other charges directly arising from these services; or for special researches conducted by the Society with the approval of the Council; but that no grants should be made to ordinary observers, nor for any general purposes of the Society which lie beyond the scope of the operations to be placed under the Council.

23. We think that the same principle should be applied to all similar local bodies interested in the study of Meteorology; so that, in fact, no payments should be made to them except for results sought for by the Council.

24. We have indicated above in very general terms the functions of the proposed Council, and we do not think it desirable to fetter their discretion by further details. We append, however, to this report a paper by a member of the present Committee of the Royal Society, who is also a member of our Committee, stating what, according to present experience, are, in his opinion, likely to be their duties.

25. The later stages of the inquiry in relation to the transfer of Oceanic Meteorology to the Admiralty have raised some serious questions of expense, which the Government will, doubtless, require time to consider. We think it only just to the Committee which has heretofore had the administration of the annual grant to report our opinion that very good and valuable work is being done by it, and that if funds were provided to admit of the more responsible and more extended action of the Council, as suggested in paragraphs 9 and 22 of our Report, and if, at least provisionally, some assistance were given to the Scottish Meteorological Society, the more immediate objects referred to our Committee would be met, and there need be no interruption of the Committee's operations pending the delay, if any, which may occur, whilst the feasibility of transferring Oceanic Meteorology to the Admiralty is being maturely considered by Her Majesty's Government.

It is important in connexion with this part of the subject, to bear in mind the strong claims which the Superintendent and other members of the existing staff have to continued employment.

26. In recommending the above changes, we feel bound to express our sense of the great value of the disinterested services which, at the cost of much time and labour, have been rendered during so many years by the Committee appointed by the Royal Society.

27. We are aware that what we are proposing is still tentative only, and we recommend, in conclusion, that there shall be a further inquiry and report at the end of (say) five years.

WILLM. STIRLING MAXWELL, *Chairman.*
T. BRASSEY.
T. H. FARRER.
FRANCIS GALTON.
DAVD. MILNE HOME.
JOSH. D. HOOKER.
R. R. W. LINGEN.
RD. STRACHEY.

These paragraphs, especially § 22 and § 25, are very involved, and leave but one distinct impression upon our mind, viz., that the Scottish Meteorological Society closely represent the woman mentioned in the New Testament, who, by her continual coming, obtained that which she wished, and that the Committee have been divided, some desiring, like the unjust judge, to avoid weariness, and others being unmoved by the repeated applications. We may instance as proofs of this the recommendation "at least provisionally, some assistance were given to the Scottish Meteorological Society," and, on the other hand, that no such item appears in the estimate. We think that § 23 is obviously the just summation of the whole matter, provided that the Council is not allowed to become a clique. Two things are, however, evident—(1) that the Scottish Meteorological Society must be treated, as the

Committee say, in the same way as "all similar local bodies," whether it be the Chartered Meteorological Society, Mr. Glaisher's staff, Mr. Symons's rainfall system, or, in fact, any single worker like Mr. Ley, all should be treated with on the terms quoted in § 23. (2) We do not see where the money is to come from—are all such payments also to come out of the special researches, £1,000? If so, the shares would be too small to be worthy of acceptance. It is a pity that the Committee, even if divided, did not give the decision of the majority, instead of contradictory statements which are too indefinite to be criticized.

SYNCHRONOUS OBSERVATIONS, AND WASTED LABOUR.

WE cut the following paragraph from a weekly periodical. Very probably we have the original statement upon our own shelves, but the extract will suffice for our present purpose:—

Weather Observations.—Every day, at precisely 7.35 o'clock a.m., Washington mean time, simultaneous weather observations are taken from 106 stations in the United States, from the deck of every United States naval vessel, no matter in what part of the world she may be, from 8 stations in the West Indies, 28 in Canada, 58 in Great Britain, 6 in Algeria, 13 in Austria, 1 in Belgium, 6 in Denmark, 48 in France, 23 in Germany, 1 in Greece, 30 in Italy, 1 in Japan, 4 in the Netherlands, 4 in Norway, 4 in Portugal, 27 in Russia, 2 in Spain, 6 in Sweden, 2 in Switzerland, and 6 in Turkey. There is now needed only the organised aid of the mercantile marine, which can be given without loss of time, to place the entire northern hemisphere under a system of daily observation."

In case this article may come under the notice of any person who has not been a regular reader of this magazine, we think it may be well to state (1) that from the first we have warmly supported General Myers' scheme of collecting synchronous observations, (2) that we do so still, and (3) that we do not hold him responsible for the absurdity we are going to point out.

The total superficial area of this earth is nearly 200,000,000 square miles, the "entire northern hemisphere" therefore contains nearly a hundred million square miles. The British Isles contain 122,518 square miles, or about one-thousandth ($\frac{1}{1000}$ th) part of the northern hemisphere. We are told above that 58 sets of observations are made daily in Great Britain (meaning, we suppose, the British Isles, for if Ireland be excluded the absurdity is still greater). If all these returns are required, it necessarily follows that something over fifty thousand sets of such daily observations would be needed to render the system complete. Is there any living man or any existing office competent to deal with such a mass of statistics? and if not, why ask observers to supply what cannot be utilised.

Again, the avowed object of the synchronous system is the very excellent one of advancing chartographic meteorology, of teaching us how storms are produced, what courses they take, why they take

different courses at different times, and, in fact generally, by studying the past to learn to interpret the future. No more worthy aim could be set before any office. We wish the United States Government triumphant success in its great undertaking, but we do not wish its office crammed with piles of useless observations.

We suppose that it is intended to publish these synchronous observations on charts like those issued by Captain Hoffmeyer; but whether published or not, the object for which they are collected involves their graphic representation. Now suppose a map is used 5 feet by 3 feet, and as it will often be necessary to compare several days it is obvious that no larger size would be at all convenient. Such a map would contain 2160 square inches, or rather more than two square inches for each thousand miles, and at that rate the British Isles would occupy less than three square inches, and twenty sets of British observations must be entered on one square inch! Even this is by no means the limit of the absurdity. We do not know where these 58 stations are, but we believe that two of them are Kew Observatory and the Royal Observatory, Greenwich—they are not 20 miles apart, a distance represented on such a map as we have suggested by considerably less than a tenth of an inch. In other words, it would be impossible to insert the observations of both. Why, then, should they be sent? Why should the observations be taken?

We regret having to write in this style, for it is scarcely appropriate to such a periodical as we wish ours to be. We, however, are not responsible for the inconsistency pointed out, though if we entered no protest we might perhaps be regarded as participators. We do protest, and we maintain that the proper course is (1) to ascertain from Gen. Myers what is the minimum distance within which he can represent and utilize individual records, and (2) to select for the British Isles those records which—regard being had to (a) the position of the station, (b) its exposure, (c) the quality of the observations—would represent as fully as required the phenomena of which Gen. Myers requires details. We hold that it is not fair to Gen. Myers to burden him with more than he requires, and that it is not fair to observers to allow them to make observations of which not 1 in 100 will ever be used.

POPULAR NOTIONS OF THE WEATHER.

To the Editor of the Meteorological Magazine.

SIR,—I am very glad to see that, amongst the many learned subjects discussed in your magazine, now and then an occasional trite country saying and axiom bearing on the weather is being introduced. Such remarks are a great relief to the ordinary reader, to whom technical terms and high-flown disquisitions on meteorological subjects are not much better known than if they appeared in a foreign language. At the same time, the learned are too apt to treat with contempt the sayings and ideas that most likely had their origin in the unlettered times; but a little consideration ought to produce a more tolerant state of things. The notions of the poor husbandman, ignorant of his A, B, C,

may nevertheless be more really correct as to the weather past, present, and to come, than those of the greatest F.M.S., notwithstanding the advantages the latter possesses, and to whom I fear a certain amount of blame is due for not taking advantage of the information which the ideas of the other convey. A too rigid adherence to the rules propounded by some great authority, not, perhaps, on the case in question, but on something else, would seem to warp the mind of the learned, as much as adherence to old notions does that of the unlettered, and perhaps this state of things is nowhere more clearly shown than in what relates to the weather. The aged ploughman repeats to his younger brethren the axiom he himself learned from his elders, and the saying is perpetuated. How many of these are erroneous it is not easy to say, but the remarks of your able correspondent at page 26 on the temporary outburst of water from a chalky hill which occurs only after very wet periods, shows that our forefathers noticed the phenomenon and made very just conclusions on it long before our day. Other trite sayings relating to other features of the weather we are visited with, will often show an equally correct observance of such things on the part of those long since gone from us. For instance, the saying that "Drought never yet brought dearth" is usually true as regards the most important crops of the earth, cereals, while in some minor ones it is open to question; and there are many who doubt the notion that each spring has its blackthorn winter, and each autumn has its Michaelmas summer. A period of a few days of rough weather, snow, sleet, and frost, usually prevails while the blackthorn and plum are in blossom, to which the term is usually applied, which is not at any particular date, but, as the legend will have it, is sure to come; and the same may be said of a few fine days in October, which are designated the Michaelmas summer. This latter was very marked in 1876, and there was more than one period to which the term, "blackthorn winter," might have been very properly attached last year. The widespread area in which these axioms are regarded, and the general acceptance of them by men who have very little faith in weather predictions in general, prove that such periods are often forthcoming at the appropriate time. Some sayings have also an application to the state of the public health as well as that of the weather: as, "A mild autumn makes a fat churchyard," alluding to the many deaths likely to occur, while a more direct allusion to the weather for the time being is, "An evening red and morning grey is a sure sign of a fine day." Many other sayings and notions having only a local import cannot well be given in a paper on general matters, but one relating to the second month in the year is certainly not borne out by facts, as "February fills the dyke either with black or white" which was not verified by a 20 years' observation of the rainfall which I took from 1855 to 1875, both inclusive, the average rainfall of that period being less in February than in any other month except April; but there are many other observations made by people in humble life which the learned ought to pause ere they condemn as fallacies; however I only give the above as occurring to me at the moment, and hope what I have said

will be supplemented by others better qualified to give a more extended list of such sayings, and not to limit the papers contributed to the magazine to matters of the technical science of which it professes to take notice, but occasionally to descend to those of a more humble nature in which so many are interested.—I am, yours, &c.,

JOHN ROBSON.

Stone House, Linton, Maidstone, 27th March, 1877.

[We are often asked for a specimen of the sort of remarks which observers should make. We could scarcely give a better one than the following ; if it errs it is on the side of being too full, *i.e.*, fuller than we or any existing authority can thoroughly utilize.—Ed.]

RAINFALL, &c., AT ADDISCOMBE DURING MARCH, 1877.

1st.—Hoar frost early morning. Borders in garden frozen from $2\frac{1}{2}$ to 4 in. deep. The min. temps. were lower than any registered during the three previous winter months, being $24^{\circ}\cdot 2$ (Stevenson), $23^{\circ}\cdot 0$ (Glaisher), $18^{\circ}\cdot 0$ and $16^{\circ}\cdot 2$ over grass, and $36^{\circ}\cdot 0$ as temp. of soil (9 a.m.) 1 ft. below surface. Highest observed bar. of month, $30\cdot 409$, at 9 a.m. A bright day, with light westerly and south-westerly airs. Temp. rising to $40^{\circ}\cdot 0$ in shade and $81^{\circ}\cdot 1$ and $51^{\circ}\cdot 8$ in sun. Beginning to rain at 10.30 p.m. Light rain between 6 and 8 a.m. of 2nd. Peach-apricot on south wall in blossom.

2nd.—Quite a sudden change in temp., ther. at 9 a.m. registering $14^{\circ}\cdot 0$ higher than yesterday at the same hour. Mild, damp, and dull, with rapid thaw. Very light sprinkling of rain after 5.30 p.m., and again early morning of 3rd.

3rd.—Drizzling rain at intervals during the day ; continued drizzling rain during early morning of 4th.

4th.—Smoky fog in morning ; quite thick about noon, cleared by 2 p.m. Light rain after about 10.30 a.m. ; steady rain after 12.30 p.m. ; light and intermittent after 3.30 p.m. ; falling steadily again at 6.30 p.m. ; scarcely raining at all at 8.15 p.m. ; light rain falling at 9 p.m.

5th.—Slight fog early morning. Dark clouds rising in W. at 4.30 p.m., and afterwards passing overhead. Nearly dark between 5.15 and 5.30 p.m. ; at 5.30 p.m. could not read newspaper print at W. window ; immediately afterwards a sharp shower fell, lasting 8 minutes, and then the sky began to clear, and it was cloudless overhead at 7.30 p.m.

6th.—Slight fog early morning. Light, misty rain at 10.30 a.m. for a few minutes. Light rain early morning of 7th, with a little snow between 6.45 a.m. and about 7.30 a.m.

7th.—Light snow shower at 10.5 a.m. Snow at intervals till 12.15 p.m., when it began to fall freely in large flakes till 1 p.m., and continued in small flakes between 1 and 1.30, and again for a few minutes at 2 p.m. Small angular pieces of transparent ice fell for one minute at 3 p.m. Driving rain on and off between 3.45 and 4.30 p.m. ; began again at 8.30 p.m. Light driving rain falling at 10.30 p.m. Total velocity of wind for 24 hours, 423 miles ; maximum, 27, at 9 p.m. N.

8th.—Light snow shower at 1.25 p.m. and also at 2 p.m., and again for about 15 minutes at 4.45 p.m. Cloudless at 7 p.m.

9th.—Black frost early morning ; only surface of borders hardened by frost. A sprinkling of fine snow on lawn at 9 a.m.

10th.—Slight frost early morning. Atmosphere particularly clear at 1 p.m.

11th.—Hoar frost. Ice $\frac{1}{2}$ in. thick on pond in our neighbourhood. Absolutely cloudless all day ; lowest temp. of month, $22^{\circ}\cdot 4$ (Stevenson), $20^{\circ}\cdot 6$ (Glaisher), and $14^{\circ}\cdot 3$ and $11^{\circ}\cdot 1$ over grass.

12th.—A few drops of rain about 11 a.m., and another light shower at 3.35 p.m.

13th.—More or less light rain after 2.15 p.m. till about 7.30 p.m. ; short shower at 10.15 p.m. ; beginning to rain again at 12.45 a.m. of 14th. Wallflower in blossom.

14th.—A few drops of rain at 8.15 p.m.

15th.—Light rain falling after 8 p.m.; sharp shower at 10 p.m. for about five minutes.

16th.—A few flakes of snow fell about 4 p.m.

17th.—Slight hoar frost. A little snow fell about 12.30 p.m. A shower of mixed snow and hail fell about 7 p.m., followed by another of hail about 7.30 p.m.

18th.—Hoar frost. Shower lasting about 10 minutes at 2.10 p.m.

19th.—Hoar frost. Thick fog early morning, which began gradually to clear off after 8.45 a.m. Apricot trees in blossom on S. wall.

20th.—Light snow between 1.45 p.m. and 2.30 p.m., followed by light snow and rain, snow falling freely at 11 p.m.; light snow again early morning of 21st till about 7.30 a.m., and occasionally afterwards. Total velocity of wind for 24 hours, 488 miles; maximum, 26 at 1 p.m. N.E.

21st.—A little snow falling occasionally during the day.

22nd.—Hoar frost. Cloudless till 2 p.m. Calm, bright, warm morning, cold, dull, wintry afternoon. Light rain after 3 p.m., followed by light snow shower at 3.25 p.m.; sprinkling of rain at 6.30; rain and snow between 7.15 and 7.35 p.m., afterwards cloudless. Glazed frost at 9 p.m.; rain gauge funnel then lined with ice.

23rd.—Hoar frost early morning. Cloudless till 1 p.m. Light misty rain at 8.30 p.m.; a sprinkling of rain at 9 p.m.; continued rain at 11 p.m.; light rain early morning of 24th, which ceased about 7 a.m. During the night of this day occurred the heaviest fall of rain during 12 and also 24 hours. Lunar halo just visible at 7.30 p.m.; moderately distinct at 7.50 p.m. Bar. fell .365 between 9 a.m. and 9 p.m., and continued to fall rather rapidly until about midnight.

24th.—Bar. falling but slowly after midnight, at 9 a.m. 29.282, 3 p.m. 29.206, 9 p.m. 29.043. Short hail shower at 2.15 p.m.; shower at 3.15 p.m.; continued light rain from 5.30 p.m.; still raining at 11 p.m.; light rain early morning of 25th, which ceased about 7 a.m.

25th.—Bar. at 4 a.m., 28.876; pressure decreased but slightly after this as shown by self-registering aneroid, the indices of which were then set and reading compared with standard, corrected minimum reading 28.871. This low pressure was accompanied here by no particular atmospheric disturbance. Heavy shower for about 15 minutes at 6 p.m.

26th.—Bar. at 9 a.m. 29.158, 9 p.m. 29.171. Light fog, which cleared at 7.30 a.m. A few drops of rain at 10 a.m.; more or less drizzling rain between 11.5 a.m. and 4.30 p.m., followed by light rain till about 6 p.m.; ceased raining by 7 p.m. Indistinct lunar halo at 10.30 p.m. Jefferson plum in blossom on W. wall.

27th.—Continued steady rain between 2 p.m. and 6.15 p.m.

28th.—Light rain for about 2 minutes at 6 p.m. Indistinct lunar halo at 8.50 p.m. Continued rain early morning of 29th.

29th.—Rain ceased about 10 a.m.; light shower at 4.15 p.m., and a few drops of rain again at 6 p.m.

30th.—Highest temp. of month, 55°·2 (Stevenson), 56°·3 (Glaisher), in sun 111°·8 and 72°·7.

SUMMARY.

A rather cold month, with rainfall frequent and somewhat above the average. Noticeable for the few days on which easterly winds prevailed.

Wind.—Generally of moderate strength. Maximum velocities for 24 hours, 423 miles on the 7th, and 488 miles on the 20th. During only 62 hours did the wind take any direction between N. and E.

Temperature.—On the early morning of the 11th was registered the lowest temperature of the month, 22°·4, and over grass 11°·2. On the 1st the minima were 24°·2 and 16°·2. The lowest temperature of the winter was recorded on the previous day (February 28th), 25°·2, and over grass 17°·4. On 10 nights the temperature of the air fell below 32° and on 19° over grass. The highest temperature of the air in the shade was 55°·2 (30th), and the highest in the sun 111°·8 and 72°·7 (30th). The average temperature of the month was also lower than

that of any of the preceding winter months. There were three mild and two distinct cold periods during the month.

Barometer.—Pressure generally high, but very unsteady, within moderate limits, on one night (4 a.m., 5th), however, descending as low as 28·876.

Rainfall.—Rather more than one-third of an inch in excess of the average) (Of this total fall rather more than one-half fell during the six days ending 28th. The heaviest fall occurred on the night of the 23rd, and amounted to 0·324. On 18 days ·01 or more was registered, and on four others smaller quantities. Snow (in all but one instance melting on reaching the ground) fell on nine days, hail on two days, and ice crystals on one day (7th).

EDWD. MAWLEY.

Addiscombe, 4th April, 1877.

Rainfall and Extreme Temperatures at Addiscombe during March, 1877.

Date.	Temperatures.			Rainfall.		
	Stevenson Max.	Screen. Min.	Over grass.	Day 9 a.m. to 9 p.m.	Night 9 p.m. to 9 a.m.	24 hours, ending 9 a.m.
1	40·0	24·2	18·0	...	0·150	0·150
2	52·0	35·5	34·2	0·001	0·013	0·014
3	51·9	45·1	43·0	0·023	0·124	0·147
4	46·0	40·5	38·6	0·245	0·003	0·248
5	44·3	34·5	30·3	0·028	...	0·028
6	40·3	32·8	26·1	...	0·037RS	0·037RS
7	39·8	33·0	30·3	0·040SR	0·025	0·065
8	38·0	31·8	25·5	0·001s	...	0·001s
9	39·0	29·5	23·2	...	...	...
10	38·0	28·6	22·0	...	...	...
11	42·1	22·4	14·3	...	...	...
12	47·7	30·8	27·2	...	...	...
13	48·0	42·7	38·7	0·042	0·003	0·045
14	53·5	45·7	42·0	...	...	...
15	50·8	38·4	33·7	0·012	0·023	0·035
16	46·9	36·1	31·1	...	...	...
17	45·8	31·3	26·0	0·003SH	...	0·003SH
18	49·3	32·0	26·4	0·001	...	0·001
19	47·0	28·7	19·9	...	...	...
20	38·8	32·4	31·0	0·060SR	0·068SR	0·128SR
21	39·3	32·7	26·0	0·002	...	0·002
22	46·9	27·0	19·9	0·048RS	0·005	0·053RS
23	46·2	27·1	22·0	...	0·324	0·324
24	50·7	33·9	31·9	0·051RH	0·201	0·252RH
25	52·2	40·1	35·9	0·026	...	0·026
26	52·0	36·8	30·8	0·069	...	0·069
27	52·9	40·2	35·5	0·190	0·042	0·232
28	53·1	39·4	35·0	...	0·213	0·213
29	52·2	43·0	37·8	0·042	...	0·042
30	55·2	43·6	38·8	...	...	...
31	53·6	40·1	35·0	...	...	...
Totals ...	...	...	...	0·884	1·231	2·115*
Means	46·9	34·8	30·0	...	...	...
Highest ...	55·2	45·7	43·0	0·245	0·324	0·324
Lowest ...	38·0	22·4	14·3	...	...	2·219†

* Total of gauge read twice daily. † Total of gauge read monthly.

THUNDERSTORM AND SQUALL, APRIL 4TH.

To the Editor of the Meteorological Magazine.

SIR,—A thunderstorm of unprecedented violence, at this season of the year, passed over this neighbourhood this afternoon. Thunder was first heard in S. at 2 p.m.; at 3 p.m. the thunder was heavy and almost incessant. From 3.30 to 4.30 the storm was terrific, the lightning being very vivid, and from 3.45 to 4.15 nearly overhead. Very heavy rain fell from 3.45 to 4.20; the amount being .64 in. In Enfield town there was a tremendous fall of hail from 4 to 4.20 p.m., the stones being from a quarter to three-quarters of an inch in diameter; the fall was so heavy that the hail had to be shovelled off the footpaths, &c., and several windows were broken. No hail fell here, little more than a mile from the town. The rain appears to have been very heavy at Edmonton and Tottenham, where a great deal of land was flooded.

The worst of the storm seems to have passed over the town, where it was worse than anything since the great storm of Aug. 7th, 1875.

Yours truly,

THOS. PAULIN.

Enfield Chase, 4th April, 1877.

To the Editor of the Meteorological Magazine.

SIR,—I have just received a letter from a member of our Society—Lieut. R. B. Croft, F.L.S.—giving the following account of a storm which passed over Ware yesterday, the 4th inst. :—

“A very remarkable and destructive storm passed over a part of this town (Ware) yesterday afternoon, destroying everything in its track. It appears to have come from E.S.E. Large trees are uprooted, stone walls blown down, and houses unroofed. Within a quarter of a mile of this (Gt. Cozens) people were hardly aware of there being any wind. It missed my house by about a quarter of a mile, but the house is high and exposed, so I was aware of a violent storm, with much lightning.”

This morning, Lieut. Croft says, he found the track of the storm about a mile N.W., tracing it by uprooted trees and broken branches.

Here (at Watford) it was scarcely felt. At 9 a.m. my barometer (corrected and reduced) stood at 29.163, wind being S.E., and at 9 p.m. 29.101, wind being W.S.W. It has been lower each day from the 31st March, when it was 30.155 at 9 a.m. This morning it was 29.307 (9 a.m.), and now (9 p.m.) it is 29.454. The wind is still bringing heavy clouds from S.W.

Yours truly,

JOHN HOPKINSON.

*Watford Natural History Society and Hertfordshire
Field Club, Watford, 5th April, 1877.*

P.S.—11 p.m. Rain is now falling heavily, with strong wind, and barometer is falling again.

GREENWICH EXTREME TEMPERATURES.

The extreme Shade Temperatures of the month of March at the Royal Observatory, Greenwich, during the past 36 years.

Year.	Maximum.		Minimum.		Year.	Maximum.		Minimum.	
	deg.	date.	deg.	date.		deg.	date.	deg.	date.
1841	66·9	26	29·5	1	1859	63·5	5	28·9	31
1842	60·5	28	29·9	23	1860	59·5	28	23·5	10
1843	63·7	18	26·5	4	1861	61·8	24	29·1	14
1844	60·2	29	24·1	5	1862	63·6	24	22·5	4
1845	59·4	27	13·1	13	1863	64·0	3	28·1	18
1846	58·0	31	26·5	20	1864	58·0	4	25·1	26
1847	64·2	17	16·9	10	1865	50·7	31	23·7	21
1848	71·5	31	28·0	4	1866	64·0	30	22·5	1
1849	60·7	17	27·7	25	1867	58·0	26	24·5	16
1850	58·0	31	20·0	26	1868	57·8	21	28·1	30
1851	58·4	20	29·8	9	1869	53·6	5	27·3	8
1852	68·4	23	21·3	5	1870	61·1	2	23·1	14
1853	60·5	13	20·8	25	1871	70·9	24	28·9	15
1854	64·8	27	24·6	3	1872	60·8	7	26·2	21
1855	57·8	20	24·5	10 11	1873	64·6	29	27·2	14
1856	58·0	31	24·7	30 31	1874	65·4	23	22·6	11
1857	66·2	18	27·7	22	1875	57·4	8	25·5	5
1858	68·7	24	23·6	11	1876	64·7	31	25·5	19

Extremes in 1877, Max. : 59°·4 on 29th ; Min. : 23°·5 on 1st.

	Year.	Max.	Date.	Min.	Date.	Year.
Means of 36 years	...	61·8	21	25·0	15	...
Highest	1848	71·5	31	29·9	23	1842
Lowest.....	1865	50·7	31	13·1	13	1845
Range .....	...	20·8	...	16·8	...	...

ZODIACAL LIGHT, HALOS, &c.

To the Editor of the Meteorological Magazine.

SIR,—This light has been seen 11 times since February 1st, 1877, viz., on the 2nd, 4th, 12th, 16th, 18th, 19th, 26th, 27th, 28th of February, and on the 14th and 19th of this month.

JOSEPH GLEDHILL, F.R.A.S., &c.

Mr. Edward Crossley's Observatory.

Bermerside, Halifax, March 20th, 1877.

Number of Solar Halos, &c., seen in 1876.

	Solar halos.	Lunar halos.	Aurora.	Lightning.		Solar halos.	Lunar halos.	Aurora.	Lightning.
Jan. ...	1	...	1	...	—	...	...	...	...
Feb. ...	0	...	1	...	1	...	...	...	...
March ...	8	...	3	...	—	...	...	...	...
April ...	5	...	2	...	—	...	...	...	...
May ...	10	...	0	...	—	...	...	...	...
June ...	7	...	1	...	1	...	...	...	...
July ...	10	...	1	...	—	...	...	...	...
Aug. ...	4	...	0	...	—	...	...	...	...
Sept. ...	3	...	0	...	—	...	...	...	...
Oct. ...	1	...	—	...	—	...	...	...	...
Nov. ...	0	...	2	...	—	...	...	...	...
Dec. ...	0	...	1	...	—	...	...	...	...

Zodiacal Light not seen during the months of February and March,

LONG WET PERIOD.

To the Editor of the Meteorological Magazine.

SIR,—Yesterday was the first time since November 9th that I have entered a third dry day in succession, *i.e.*, without a fall of 0·01 in.; and only three times have there been two following in these four months and over. A thing, I suppose, almost unprecedented.

Yours truly,

W. H. GAMLEN.

Brampford Speke, Exeter, March 15th, 1877.

SUPPLEMENTARY TABLE OF RAINFALL IN MARCH, 1877.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XI., p. 28., but the list is under revision and further details will be given in a month or two.]

Div.	Station.	Total Rain.	Div.	Station.	Total Rain.
		in.			in.
II.	Acol	2·91	XI.	Llanfrehfa	3·51
„	Hailsham	1·99	„	Castle Malgwyn .....	...
„	St. Lawrence, I. of W....	2·48	„	Heyope .....	...
„	Andover.....	2·07	„	Carno .....	...
„	Strathfield Turgiss	1·68	„	Rhug, Corwen	3·49
III.	Addington Manor.....	2·20	„	Port Madoc	4·58
„	Oxford	1·73	XII.	Melrose	2·82
„	Northampton	2·00	XIV.	Cessnock, Glasgow	2·14
„	Cambridge.....	1·71	XV.	Gruinart	2·76
IV.	Sheering	2·54	XVII.	Keith ...	1·98
„	Ipswich	2·64	XVIII.	Dalwhinnie	·79
„	Diss	2·54	„	Auchnasheen	5·88
„	Swaffham	2·38	„	Springfield, Tain	1·93
V.	Compton Bassett	2·61	XX.	Skibbereen .....	...
„	Dartmoor	5·58	„	Glenville, Fermoy	3·67
„	Teignmouth	2·82	„	Tralee.....	3·35
„	Langtree, Torrington ..	4·59	„	Newcastle W., Limerick	2·22
„	Cosgarne, St. Austell ...	4·16	„	Kilrush	1·88
„	Taunton.....	1·83	XXI.	Kilkenny .....	...
VI.	Bristol	2·45	„	Kilsallaghan	3·49
„	Sansaw	1·46	„	Twyford, Athlone	2·71
„	Cheadle	3·22	XXII.	Ballinasloe	2·13
VII.	Coston, Melton Mowbray	1·58	„	Kylemore	6·72
„	Bucknall	2·23	„	Carrick on Shannon.....	2·86
V III.	Walton, Liverpool	2·57	XXIII.	Rockcorry	2·74
„	Broughton-in-Furness ..	4·81	„	Warrenpoint .....	...
IX.	Stanley, Wakefield	2·78	„	Carnlough, Larne	3·21
X.	Gainford	2·55	„	Bushmills	5·05
„	Shap	1·98	„	Buncrana	3·28

MARCH, 1877.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.						Days on which 1/4 or more fell.	TEMPERATURE.				No. of days in shade.
		Total Fall.	Difference from average 1860-5	Greatest Fall in 24 hours.		Dpth.	Date.		Max.		Min.		
				inches.	in.				Deg.	Date.	Deg.	Date.	
I.	Camden Town	2.38	+ .30	.34	23	20	59.4	29	23.5	1	12		
II.	Maidstone (Hunton Court)...	3.23	+ 1.07	.55	20	16	...	...	...	...	...
III.	Selborne (The Wakes).....	2.94	+ .34	.78	24	22	56.0	29	18.0	1	14		
III.	Hitchin	1.99	— .18	.27	7	17	50.0	2*	22.0	10	18		
IV.	Banbury	2.12	— .08	.26	24	21	54.0	14†	23.0	1	17		
IV.	Bury St. Edmunds (Culford)...	2.62	+ .42	.49	3	23	56.0	27	22.0	10	16		
V.	Norwich (Sprowston).....	2.36	...	.34	23	20	...	...	...	...	...
V.	Bridport	1.84	— 1.03	.49	23	14	58.0	30	21.0	1	12		
VI.	Barnstaple	2.88	— .27	1.03	24	21	59.0	31	29.0	9	...		
VI.	Bodmin	3.56	— .19	.96	24	24	57.0	29	29.0	1	5		
VI.	Cirencester	2.49	— .11	.47	23	17	...	...	...	...	...
VII.	Shifnal (Haughton Hall) ...	2.56	+ .62	.56	24	16	55.0	14	19.0	1	16		
VII.	Tenbury (Orleton)	2.10	— .32	.54	24	24	60.2	30	20.4	1	12		
VII.	Leicester (Belmont Villas) ..	1.84	...	.50	3	20	59.5	29	22.0	1	11
VII.	Boston	1.45	— .34	.24	3	16	56.0	29	22.0	1	12		
VIII.	Grimsby (Killingholme)	2.35	...	.53	29	21	54.0	14	24.0	1	9
VIII.	Mansfield	2.57	...	.76	24	23	61.3	30	15.0	1	14
VIII.	Manchester	2.43	— .26	.33	29	21	59.0	30†	21.0	1	14		
IX.	York	2.93	+ .94	.92	29	17	55.0	31	25.0	2	12		
X.	Skipton (Arneliffe)	4.80	— .01	.60	24	20	...	...	...	...	...
X.	North Shields	1.70	— .65	.52	25	20	55.0	30	22.0	1	17		
XI.	Borrowdale (Seathwaite).....	7.74	— 5.66	1.27	11	23	...	...	...	...	...
XI.	Cardiff (Crockherbtown).....	2.66	...	.55	23	21	58.9	29	23.6	2	7
XI.	Haverfordwest	4.06	+ .61	1.10	24	16	56.0	29	25.5	20	7		
XII.	Aberdovey	3.01	...	...	...	...	65.0	28	27.0	1	10
XII.	Llandudno	2.62	+ .36	.37	9	21	54.5	29	26.3	1	3		
XII.	Dumfries (Crichton Asylum)...	2.21	— .39	.36	9	14	57.3	3	19.0	1	18		
XII.	Hawick (Silverbut Hall).....	1.98	...	.35	25	19	...	...	...	...	...
XIV.	Kilmarnock (Annanhill).....	2.51	...	.35	15	20	54.0	3	24.6	1	14
XV.	Castle Toward	2.92	— 1.67	.45	28	19	55.0	3	22.0	1	19		
XVI.	Mull (Quinish)	2.73	...	.53	3	17	...	...	...	...	...
XVI.	St. Andrews (Cambo Ho.) ...	1.87	...	1.60	31	...	...	...	...	...	...
XVII.	Grandtully	2.33	...	.63	6	11	...	...	...	...	...
XVII.	Braemar	2.19	— .02	.44	27	16	48.0	2	12.0	1	24		
XVII.	Aberdeen	2.24	...	.63	26	23	53.2	2	20.7	1	12
XVIII.	Gairloch	3.12	...	.31	15	24	...	...	...	...	...
XVIII.	Portree	4.18	— 4.86	.52	11	24	...	...	...	...	...
XIX.	Inverness (Culloden)	1.66	— .30	.47	26	21	53.4	2	24.1	1	12		
XIX.	Helmsdale	2.82	...	.36	29	25	...	...	...	...	...
XX.	Sandwick	2.81	— .52	.36	11	27	47.6	10	20.9	19	8		
XX.	Caherciveen Darrynane Abbey	4.81	...	.69	2	22	...	...	...	...	...
XX.	Cork	2.99	...	.77	2	12	...	...	...	...	...
XXI.	Waterford	2.99	+ .10	.70	24	10	...	...	...	...	...
XXI.	Killaloe .....	...	...	...	...	...	...	...	...	...	...
XXI.	Portarlington	3.27	— .04	.91	25	28	57.0	13	27.0	19	11		
XXII.	Monkstown, Dublin	2.64	+ .06	.89	24	15	58.0	11†	21.5	20	10		
XXII.	Galway	2.50	...	.37	24	22	58.0	15	28.0	19	12
XXII.	Ballyshannon	3.04	...	.48	23	26	...	...	...	...	...
XXIII.	Waringstown	3.58	...	.75	25	26	56.0	2	24.0	18	16
XXIII.	Edenfel (Omagh)	2.43	...	.43	25	27	52.0	29	24.0	16*	15

* And 14, 29. † 30. ‡ 31. || 20. § 19. ¶ 21. ** 18

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

MARCH, 1877.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					TEMPERATURE.				No. of Nights below 32°
		Total Fall.	Difference from average 1860-5	Greatest Fall in 24 hours.		Days on which Fall in 24 hours .01 or more fell.	Max.		Min.		In shade On grass
				Dpth.	Date.		Deg.	Date.	Deg.	Date.	
		inches	inches.	in.							
I.	Camden Town	2.38	+ .30	.34	23	20	59.4	29	23.5	1	12 17
II.	Maidstone (Hunton Court)...	3.23	+ 1.07	.55	20	16	...	...	...	...	...
III.	Selborne (The Wakes).....	2.94	+ .34	.78	24	22	56.0	29	18.0	1	14 18
IV.	Hitchin	1.99	— .18	.27	7	17	50.0	2*	22.0	10	18
V.	Banbury	2.12	— .08	.26	24	21	54.0	14†	23.0	1	17
VI.	Bury St. Edmunds (Culford)...	2.62	+ .42	.49	3	23	56.0	27	22.0	10	16 20
VII.	Norwich (Sprowston).....	2.36	...	.34	23	20	...	...	...	...	...
VIII.	Bridport	1.84	— 1.03	.49	23	14	58.0	30	21.0	1	12
IX.	Barnstaple	2.88	— .27	1.03	24	21	59.0	31	23.0	9	...
X.	Bodmin	3.56	— .19	.96	24	24	57.0	29	29.0	1	5 9
XI.	Cirencester	2.49	— .11	.47	23	17	...	...	...	...	...
XII.	Shifnal (Houghton Hall) ...	2.56	+ .62	.56	24	16	55.0	14	19.0	1	16 20
XIII.	Tenbury (Orleton)	2.10	— .32	.54	24	24	60.2	30	20.4	1	12 18
XIV.	Leicester (Belmont Villas) ...	1.84	...	.50	3	20	59.5	29	22.0	1	11
XV.	Boston	1.45	— .34	.24	3	16	56.0	29	22.0	1	12
XVI.	Grimsby (Killingholme)	2.35	...	.53	29	21	54.0	14	24.0	1	9
XVII.	Mansfield	2.57	...	.76	24	23	61.3	30	15.0	1	14 17
XVIII.	Manchester	2.43	— .26	.33	29	21	59.0	30†	21.0	1	14 20
XIX.	York	2.93	+ .94	.92	29	17	55.0	31	25.0	2	12
XX.	Skipton (Arnccliffe)	4.80	— .01	.60	24	20	...	...	...	...	...
XXI.	North Shields	1.70	— .65	.52	25	20	55.0	30	22.0	1	17 23
XXII.	Borrowdale (Seathwaite) ...	7.74	— 5.66	1.27	11	23	...	...	...	...	...
XXIII.	Cardiff (Crockherbtown).....	2.66	...	.55	23	21	58.9	29	23.6	2	7
XXIV.	Haverfordwest	4.06	+ .61	1.10	24	16	56.0	29	25.5	20	7 13
XXV.	Aberdovey	3.01	...	...	...	...	65.0	28	27.0	1	10
XXVI.	Llandudno	2.62	+ .36	.37	9	21	54.5	29	26.3	1	3
XXVII.	Dumfries (Crichton Asylum)...	2.21	— .39	.36	9	14	57.3	3	19.0	1	18 19
XXVIII.	Hawick (Silverbut Hall).....	1.98	...	.35	25	19	...	...	...	...	...
XXIX.	Kilmarnock (Annanhill).....	2.51	...	.35	15	20	54.0	3	24.6	1	14 17
XXX.	Castle Toward	2.92	— 1.67	.45	28	19	55.0	3	22.0	18	19
XXXI.	Mull (Quinish)	2.73	...	.53	3	17	...	...	...	...	...
XXXII.	St. Andrews (Cambo Ho.) ...	1.87	...	1.60	31	...	...	...	...	...	...
XXXIII.	Grandtully	2.33	...	.63	6	11	...	...	...	...	...
XXXIV.	Braemar	2.19	— .02	.44	27	16	48.0	2	12.0	1	24 23
XXXV.	Aberdeen	2.24	...	.63	26	23	53.2	2	20.7	1	12 22
XXXVI.	Gairloch	3.12	...	.31	15	24	...	...	...	...	...
XXXVII.	Portree	4.18	— 4.86	.52	11	24	...	...	...	...	...
XXXVIII.	Inverness (Culloden)	1.66	— .30	.47	26	21	53.4	2	24.1	1	12 24
XXXIX.	Helmsdale	2.82	...	.36	29	25*	...	...	...	...	...
XL.	Sandwick	2.81	— .52	.36	11	27	47.6	10	20.9	19	8 19
XLI.	Caherciveen Darrynane Abbey	4.81	...	.69	2	22	...	...	...	...	...
XLII.	Cork	2.99	...	.77	2	12	...	...	...	...	...
XLIII.	Waterford	2.99	+ .10	.70	24	10	...	...	...	...	...
XLIV.	Killaloe .....	...	...	...	...	...	...	...	...	...	...
XLV.	Portarlinton	3.27	— .04	.91	25	23	57.0	13	27.0	19	11
XLVI.	Monkstown, Dublin	2.64	+ .06	.89	24	15	58.0	11†	21.5	20	10 13
XLVII.	Galway	2.50	...	.37	24	22	58.0	15	28.0	19	12
XLVIII.	Ballyshannon	3.04	...	.48	23	26	...	...	...	...	...
XLIX.	Waringstown	3.5875	25	26	56.0	2	24.0	18	16 23
L.	Edenfel (Omagh)	2.4343	25	27	52.0	29	24.0	16**	15

* And 14, 29.

† 30.

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

METEOROLOGICAL NOTES ON MARCH.

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

ENGLAND.

SELBORNE.—A very retarding month for garden cultivation; frequent white frosts and fogs. S on 7th, 8th, 10th, 16th, and 20th. The max. temp. on 20th only 37°. T at 3 p.m. on 22nd.

BANBURY.—Fine meteor seen at 9.55 p.m. on 17th. S on 7th, 9th, 10th, 17th, and 22nd; soft H on 18th.

CULFORD.—A very wintry month; mean temp. 2° lower than that of February and slightly below that of January. S or H fell more or less on 8 days. T was frequently heard on 22nd and 29th.

BODMIN.—Mean temp. of the month 45°·5, being 0°·9 above the average. The rainfall of the month exactly the average of 28 years.

SHIFNAL.—March came in with R as February had gone out. R fell daily till the 7th, when it changed to storms of S and sleet with bitter cold for 5 days. On the 11th the sun (quite a stranger) re-appeared, and it was fair till the 14th, when a storm (telegraphed from America on the 10th) came on at noon, lasting all the afternoon. From that time till the 24th bitterly cold N.W. and N.E. winds, ending with a fall of R from S.E. (·56) on the night of 24th; temp. then rose, with distant T at 2.30 p.m. on 26th and again at 6.30 p.m., with copious R on the 29th. Rooks building on 6th; colts-foot and dog rose in flower on the 7th; ribes sanguinea and dog-tooth violet in flower on 25th.

ORLETON.—There were no heavy falls of R, the max. being ·54 on 24th, but small falls occurred on a great number of days. The sky was generally cloudy and the air damp and cold. On the 20th there was a solar halo all the morning, and the weather was dry and cold, with frost and strong N. wind. T was heard on 26th, and there was a storm of T and L on the 29th.

LEICESTER.—Total fall 1·84, nearly the whole of which fell in the first and last weeks; there were only 5 days on which the fall exceeded ·10 of an inch. More frost than in either of the three preceding months. Mean temp. 39°·7; average min. temp. 4° below that of February and 3° below that of January.

BOSTON.—T on 18th and 22nd; S on the 7th.

GRIMSBY.—Few days without either R or S. March dust only seen on one day (21st). Farm work backward. Frogs spawning and rooks building on 4th; pied wagtail arrived on 26th. T at 1 p.m. and L at 10 p.m. on 16th; TS in the evening of the 27th. Peach began flowering on 2nd, March marigold on 19th, wych elm on 28th, and cowslip on 29th. Very distinct lunar halo on 23rd.

MANSFIELD.—Mean temp. at 9 a.m. 1°·4 below the average of the preceding five years. This cold kept back vegetation, which has progressed but very slowly during the month.

MANCHESTER.—S on 9th and 17th.

YORK.—S on 5th, 7th, 16th, 17th, and 21st; H on 15th (16th with T), 17th and 21st.

NORTH SHIELDS.—S on 11 days, between 5th and 22nd, on the latter day with a T S.

WALES.

ABERDOVEY.—Prevailing winds N. and N.W., with few exceptions, from the 1st to 17th, after that time S. or E. more frequent. A calm month on the whole; generally cold, though with some warm days.

LLANDUDNO.—Notwithstanding some very fine days, March was rather a stormy and changeable month. There was a heavy gale from the E. on 24th and 25th. R frequent rather than heavy (the greatest fall being only ·37), though the fall during the month was above the average. The mean temp. was 2° above the average, and there were only three nights of slight frost, consequently vegetation is very forward. Hawthorn in leaf in the hedges on 21st; pear tree in bloom on 28th; Harry long legs seen on 30th.

SCOTLAND.

DUMFRIES.—March has been rather damp, though the total fall of R is rather less than the average. Frost very frequent during the first half of the month. S in considerable quantities fell on 9th and 16th. Mean temp. $38^{\circ}7$, being 1° lower than last year. Winds generally light, except on 7th and 14th, when there were strong gales from N.W.

HAWICK.—A very cold month, with keen, frosty nights. Hurricane on 14th, and very high winds on 6th, 11th, 12th, and 24th. The pied and yellow wagtail first seen on the 20th; green linnets heard and seen in the shrubbery on the 21st. The cold and wet weather have kept the birds from building; not a nest has been found belonging to the thrush or blackbird.

ANNANHILL.—Bar. pressure, temp., ozone, and sunlight all below the average. Winds principally westerly and usually light, average rate 12 miles an hour. Day sky generally cloudy, but several cloudless evenings. S on 8th, 9th, 15th, 16th, and 18th. Brilliant sunset over Arran on 19th—the island dark purple, the sea silver, and the sunset gold.

CASTLE TOWARD.—In the first week of the month the weather was very favourable for getting the soil wrought and seeds put into the ground, but from the 10th to 17th we had some stormy and wet weather. On the 18th the ground covered with S with rather hard frost, the ther. falling to 23° , and on to the end of the month we had very few fine days. The spring will be late; there seems little or no growth, and the grass looks quite brown.

BRAEMAR.—An unusually severe March.

PORTREE.—A cold, wet month, S, H, and R alternately through it. Lunar halos on 19th and 22nd; solar halo on 23rd. Strong gale all night of 12th from N.W., and all day of 14th from W.

CULLODEN.—S and boisterous weather from 12th to 24th. Solar halo and mock sun seen between 1 and 2 p.m. on 23rd, and lunar halo at night.

SANDWICK.—March has been cold and stormy. None of the valuable March dust to be had, so I have not heard of farmers getting any seeds sown yet. Wind 40 miles an hour from 4 a.m. to noon on 12th, at times 50 miles; wind 40, 50, and 55 miles an hour from 1 a.m. to midnight on 14th. Ground covered with S on 23rd.

IRELAND.

DARRYNANE.—S on the night of 20th and 21st, the heaviest fall this winter. Farm work very backward from the saturated state of the soil, but progress being made during the last ten days.

MONKSTOWN.—This has been much the coldest month of the winter, the temp. ($21^{\circ}5$) on 20th being the min. since November. There were also an unusual number of frosty mornings. Rainfall, except during the last week, small. Strong easterly gale on 24th and 25th, causing a heavy sea on the coast.

BALLYSHANNON.—The month has been unusually wet for the time of year, and has been remarkable for the entire absence of "March winds;" as a consequence, the ground in many places is so charged with moisture as to retard farming operations.

EDENFEL, OMAGH.—A very harsh and inclement month, with a lower mean temp. than any month in the winter.

SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CXXXVI.]

MAY, 1877.

PRICE FOURPENCE
[or 5s. per ann. post free.]

Re GOVERNMENTAL METEOROLOGY.

[As we have been informed that an opinion exists that the articles which have appeared in this Magazine upon Governmental Meteorology have been partly written for the purpose either of assisting the Meteorological Society in obtaining a grant from Government, or of preventing the Scottish Meteorological Society from obtaining one, we desire to state that the articles were not written on behalf of the Meteorological Society, and were not inspired by its Council or Fellows ; in fact, the Meteorological Society was in no way connected with the articles, for which we alone are responsible. We may also add that we in no way desire to thwart the objects, or detract from the position of the Scottish Society, and are surprised that either inference has been drawn from the articles in question.—Ed.]

EASTER AT THE SORBONNE.

THE pressure upon our space compels us to render our report of the papers read at this réunion shorter than usual, and shorter than we desire. We therefore proceed *in medias res* without further preface.

M. HÉBERT, of Limoges, President of the Meteorological Commission of Haute Vienne, gave a description, and exhibited a series, of charts illustrative of the weather of Western Europe during the exceptional winter of 1876-7, but owing to the short time allowed to each speaker he had only stated whence he had collected his data, and given what may be described as a chronicle of the weather when he was obliged to conclude. He has evidently a valuable collection of facts, and we hope on some future occasion to see his paper printed *in extenso*, and to lay his conclusions before our readers.

PROF. POUSSET, of Poitiers, reported briefly upon the rainfall of the Department of Vienne in 1876. He dwelt especially upon the differences in the *amount* of rain at the fifteen stations, although the *number of days* was nearly the same throughout the Department, and thence he drew the conclusion that the precipitation of rain is a general phenomenon, but that its amount is a local one. He held that the

amount of rain was dependent upon the nature of the soil. Prof. Pousset stated that, contrary to the generally received opinion, he found the rainfall least in the most wooded districts.

M. LE DR. DE PIETRA-SANTA, delegate from the Climatological Society of Algiers, gave an account of the results of an enquiry instituted by the care, and under the direction, of the three provinces of Algeria, in order to ascertain the importance and value of the *Eucalyptus globulus* in relation to public health.

Reports were received from fifty localities, where the aggregate number of blue gum trees is nearly one million.

The following are the principal conclusions :—

- (1) It is incontestably demonstrated that the *Eucalyptus* possesses sanitary influence.
- (2) Wherever it has been extensively cultivated intermittent fever has been considerably decreased in intensity and in frequency.
- (3) Marshy and uncultivated lands have thus been rendered healthy and quite transformed, both to the advantage of private interests and of Algerian colonization.

Similar results have been obtained in Corsica, where, thanks to the initiative and to the perseverance of a single man, Dr. Carlotti, President of the Ajaccio Agricultural Society, it is computed that at the end of this year there will be upwards of 600,000 plants of *Eucalyptus* in full growth.

M. PICHE, of Pau, gave a short description of a form of Meteorological Chart which he had found very useful in forecasting the weather for short periods. He also laid upon the table copies of an eight-page tract upon the subject, which, though in many respects resembling Admiral FitzRoy's Barometer Manual, yet differs so much from it, and is in many parts so instructive, that we hope to give a translation of it at an early date. As a specimen of the difference from what prevails in England, we may mention that in the South-West of France M. Piche states that when the barometer falls the weather is usually fine, when the barometer rises, the sky is usually overcast with wind and rain, or appearance of rain. But the fall of the barometer *announces* the advent of bad weather, although the weather remains fine as long as the barometer is low.

Prof. RAULIN, of Bordeaux, gave a *résumé* of the seasonal distribution of the rainfall in the Alps, from Vienna to Marseilles, and in Italy, based upon the records of about 250 stations, having a mean duration of 10 years. He did not enter upon any discussion of the total amounts, but directed attention to the seasonal distribution. Of these he pointed out four varieties which may be thus represented :—

Per Cent. of Total Annual Fall.							
		Winter.			Spring.	Summer.	Autumn.
Type I.	...	16	...	25	...	36	23
II.	...	11	...	21	...	28	40
III.	...	15	...	41	...	11	33
IV.	...	31	...	20	...	10	39

On the northern slope of the Alps and in Germany, and even towards Carinthia and northern Istria, the maximum falls is in the summer (Type I.)

North of the valley of the Po, and on the northern French Alps, the maximum occurs in the autumn (Type II.)

South of the valley of the Po, and on the Alps of Dauphiné there are two maxima, a principal one in the spring, and a secondary one in the autumn (Type III.)

On the shores of the Mediterranean and of the Adriatic the distribution is almost exactly complementary to that on the northern Alps, for on these coasts the principal maximum is in the autumn, and a secondary one in the winter (Type IV.), so that along the coast of Provence, Liguria and Istria; that is to say, at the head of the Gulf of Genoa and of the Adriatic 70 per cent. of the entire annual amount of rain falls in the autumn and winter. In the discussion it was pointed out that the apparent seasonal distribution largely depended on the method adopted for the measurement of snow.

M. DE ROUVILLE, on behalf of Prof. VIGUIER, of Montpellier, explained a new theory of the formation of hail storms. The author considered that the only requisites for their formation are (1) the existence of beds of air of different temperatures (2) their lateral translation, and (3) the presence of mountains. He has been led to this conclusion, after long study, by noticing that the Mediterranean, although it gives rise to squalls and electric storms, does not usually send hailstorms over Southern France; and that the almost periodic hailstorms of that district come from the west, having previously passed over the Pyrennees and the Central Plateau. Hence it results, according to Prof. Viguier, that we must exclude from the theory of hailstorms all reference to small cyclones and electric phenomena, and regard solely the mechanical movements of the atmosphere and the effect of the inequalities of the soil.

At the final meeting, presided over by M. Waddington, the Minister of Public Instruction, the usual reports upon the works of the members of the learned societies of the Departments were read. We wish that some analogous encouragement were given to English investigators by the English Government; but it is useless to wish, and the only thing for British men of science to do is to work on, and rest satisfied with the approval of their own consciences. Why, the very notion of its being the official duty of a Cabinet minister to preside over a scientific meeting is enough to make an ordinary Englishman smile, though that smile only proves how slow we are to perceive and to recognise that we are being, and shall be, beaten in intellectual progress by our friends across the channel.

The whole of the addresses were most interesting, but we must only quote that portion of M. Blanchard's report which was devoted to meteorology:—"Meteorologists pursue their researches most zealously, some devoting themselves to the observation of current phenomena, others collecting, from all possible sources, the scattered records of the past, and subsequently deducing, by a multitude of comparisons, pre-

cise facts as to the climate of different countries. Prof. Raulin, of Bordeaux, undeterred by the immense labour, has exhausted all documents in order to determine rainfall of France, parts of Europe, Algeria and tropical countries. We know that the rainfall varies in different countries, as it varies also in different seasons. In some countries it is always raining; in others, where the total fall is still greater, it seems to be always fine, because the rain only falls for a short time, but then very heavily. The distribution of rainfall exercises a great influence upon both vegetable and animal life, and it is greatly to the interest of naturalists, engineers and agriculturists to study it carefully. Prof. Raulin has undertaken, on their behalf, an excessively laborious but eminently useful task. His work is the most extensive, and only complete one, upon the rainfall of France, and we owe our thanks to the Academy of Bordeaux, which has done itself honour by publishing it. The Committee have awarded a gold medal to Prof. Raulin.

"Last year we announced the approaching inauguration of the meteorological observatory recently erected on the summit of the Puy-de-Dôme. All being completed, the establishment provided with the necessary instruments, and observations ready to be commenced, the observatory was inaugurated on August 22nd, 1876. It was a fête day for Clermont and the surrounding district. Beholding some hundreds of *savants*, or friends of science, starting for the summit of the mountain, the more lowly inhabitants of Auvergne appeared to regard it as a triumph for their country. Better informed well-wishers had, without doubt, a similar opinion, but they also looked further, to the many questions relative to the physics of the globe, upon which light may be thrown by the observations to be made under these new and especially favourable conditions.

"The Meteorological Observatory of the Puy-de-Dôme is the work of Professor Alluard; it inspires a singular interest in those who reflect upon the exertions, the trouble and anxiety through which alone it has been completed. For many years meteorologists and physicists have declared that it was necessary to observe atmospheric changes at high elevations, but hitherto nothing has been done, except to furnish instruments (generally badly placed) to the monks of Mont St. Bernard and at some stations in the Alps.*

"The Professor of Clermont often watching the beautiful mountain so near to his town, and seeing it suddenly veiled from his sight, said, 'There is the place to study the formation of the clouds, the snow, and the rain; it is there that I should like to build my observatory.' Excellent idea, but its accomplishment seemed almost hopeless. Professor Alluard first spoke of the subject in 1869; he exerted himself to find supporters for his enterprise, and submitted the project to the Minister of Public Instruction.'

"M. Faye was instructed to examine the locality, and report. He was speedily convinced of the advantages which an observatory on the summit of the Puy-de-Dôme might offer, and urged the Minister not

* It would be unjust not to mention here, the efforts of General Nansouty to establish an observatory on the Pic du Midi.

to allow the scheme to be abandoned. In 1870, the Chamber of Deputies passed a vote for the cost of the buildings, and the work was commenced ; but it proved much more expensive than had been expected, and was only completed by the liberal aid of the Conseil Generale of the Department.

"The ground being bought, the roads laid out, the plans decided upon, Professor Alluard has followed up the enterprise with all possible energy. The first stroke of the pick-axe led to a discovery of the highest interest to archæologists, namely, of the remains of an entirely forgotten but magnificent Roman temple, which yields fresh testimony to the love of gigantic works which prevailed among the conquerors of ancient Gaul. Everyone will respect these ruins as they pass to the platform whereon now stands the massive tower of the meteorological observatory, which dominates the vast plain of Limagne and the long chain of the Dômes. I do not give here either any description of the rooms, of the dwelling-house, or of the subway connecting the two, because it has already been given in many periodicals.

"Let it suffice to say, that the arrangements have been considered excellent, the fitting irreproachable, and the instruments as perfect as possible. The Mountain Observatory is in constant telegraphic communication with an observatory in the plain, so that momentary comparison can be made of the phenomena at two stations near together, yet differing nearly 5000 feet in altitude, comparisons which can hardly fail to lead to important results. May the observatory on the Puy-de-Dôme contribute, as we firmly believe it will, to throw light upon questions respecting the physics of the globe, which are important to the whole human race ; but let us not forget that we owe it to Professor Alluard, who not only had the inspiration, but what is more rare, the perseverance to secure success.

"Gentlemen, while retracing the history of the observatory, we feel the shadow of a genius passing before our eyes. We are all reminded of Blaise Pascal and of the experiment whereby on this mountain was first definitely proved the weight of the atmosphere. His shade seems to come to encourage the observers on the summit. Pascal as a savant was full of sagacity and penetration, as a writer he was full of vigour and originality ; he offers to our admiration the union of all the most brilliant mental qualifications, and remains a model for future generations."

It may interest our readers to know that while the Puy de Dôme was the first mountain on which the barometric pressure was shown to be less on the summit than at the base, the beautiful Tour St. Jacques, in the Rue de Rivoli, Paris, was the first building in which Pascal proved the diminution of pressure with elevation. Hence the peculiar appropriateness of the erection of his statue in the base of that very tower.

Those of our readers who are interested in the early history of meteorology may be glad to know where to find the account of the experiment on the Puy de Dôme. It is given in a remarkably pleasantly

and cleverly written letter from M. Perrier, of Clermont, dated Sept. 22nd, 1648, which is printed in a small work published in Paris in 1698, entitled, "*Traitez de L'Equilibre des Liqueurs, et de la Pesanteur de la Masse de l'Air.* Contenant l'explication des causes de divers effets de la nature qui n'avoient point esté bien connus jusques-icy, & particulièrement de ceux que l'on avoit attribuez à l'horreur du Vuide." Par Monsieur Pascal.

SEVERE FROSTS, MAY 2ND-7TH, 1877.

To the Editor of the Meteorological Magazine.

SIR,—The minimum temperatures of the last six mornings have been as follow :—

Date.		Thermometer.	
		In Stand. 4 ft. elevation.	Fully exposed on grass.
May 2nd	.....	34°·9	28°·8
„ 3rd	.....	31 ·1	25 ·0
„ 4th	.....	28 ·8	24 ·0
„ 5th	.....	26 ·8	20 ·4
„ 6th	.....	28 ·4	23 ·1
„ 7th	.....	29 ·8	22 ·8

Taking the mean temperature of the whole 24 hours, May 3rd was really the coldest of the series, the max being only 48°·8, and the mean 38°·2.

Cold E. and N.E. winds, bringing hoar frosts, and much dry, fine weather, were also the marked features of this same month last year. During the first 20 days of it we had no less than 14 frosts on the grass, and a rainfall only on one day (the 15th).

Your obedient servant,

W. F. DENNING, F.M.S.

*Tyndale House, Ashley Down, Bristol,
May 7th, 1877.*

SIR,—As I expect you will mention the very low night temperature during the past week in your next number of the *Meteorological Magazine* I send the following readings :—

Date.	Min. at 4 ft.		Date.	Min. at 4 ft.
May 1st	... 34°·8	.....	May 5th	... 28°·8
„ 2nd	... 36 ·0	.....	„ 6th	... 28 ·8
„ 3rd	... 34 ·0	.....	„ 7th	... 32 ·8
„ 4th	... 28 ·0*	.....	„ 8th	... 35 ·8

* At the Museum the min. at 4 ft. was 28°·5, and the min. on grass 17°·9.

*Belmont Villas, Leicester,
8th May, 1877.*

H. B.

THE CLIMATES OF VARIOUS BRITISH COLONIES.

THE evening meeting of the Royal Colonial Institute was held on Tuesday, March 13th, his Grace the Duke of Manchester in the chair.

Amongst those present we noticed Dr. Risdon Bennett, F.R.S., President of the Royal College of Physicians; Dr. Sieveking, Dr. J. Langdon Down, Dr. Theodore Williams, Dr. Ord (Tasmania), Dr. Buchanan (New Zealand),

Dr. Haviland (Northampton), Mr. Henry Rhodes (British Columbia), Dr. Rae, Mr. Fung-Yee (Chinese Embassy), Mr. Youl, C.M.G., Mr. C. Brooke, F.R.S., Colonel Denison (Canada), Mr. Nind (Queensland), Mr. Alexander McArthur, M.P., Mr. Abraham Hyams (Jamaica), Mr. R. Chamberlaine (Jamaica), His Honour G. Trafford, Chief Justice of St. Vincent; Messrs. J. Campbell (Natal), J. Bruce (Cape of Good Hope), Andrew Stein (Cape of Good Hope), R. Ryall (Cape of Good Hope), R. H. Scott, F.R.S., James Bonwick (Tasmania), J. W. Russell (New Zealand), John Robb, Hugh Muir (Canada), and J. R. Carter (New Zealand).

The following paper was read by Mr. G. J. Symons, F.M.S. :—

ON THE CLIMATES OF THE VARIOUS BRITISH COLONIES.

When a speaker begins with an apology, it is usually found that no apology was needed. I will not, therefore, presume to apologise for the imperfections which appertain to the present paper, but I do ask two somewhat opposite favours. First, that you bear in mind the extreme difficulty of making the working and results of a strictly scientific subject comprehensible and interesting to those who have not previously given it their attention. That is the first request. The second is that all those who detect, or think that they detect, errors or mistakes in what I say, will take notes of them, and call attention to them in the discussion which will follow my remarks. I do not ask this at all in the spirit of a champion, but merely in the interests of accuracy and progress, for which I care infinitely more than for my own status or for my own opinions.

We must consider first what is meant by the word "climatology." Nuttall defines it as "An account of the different modifications relative to heat, wind, moisture, and other meteorological phenomena of the different regions of the earth." That is not bad for a dictionary, but we must go much further. And first as regards heat. Happily, throughout the British Empire, and also throughout the United States, there is no confusion as to thermometric scales. We all use the ordinary English or Fahrenheit's scale (although, by-the-by, Fahrenheit, as the name at once tells us, was not an Englishman, but a German). Two other points are necessary as regards temperature—(1) That the thermometers be everywhere similarly mounted, and (2) that they be read at the same hours of local time. As regards the first point, there is scarcely anything in common to the modes of exposure adopted at the Royal Observatory, Greenwich, and at the Kew Observatory of the Royal Society. With such an utterly discordant practice at home, we can hardly condemn with severity the fact that at many Colonial stations even more discordant methods prevail. The Meteorological Society has, however, decided that for all its stations absolutely similar instruments in absolutely similar conditions shall be used, and I have here a specimen of the Stevenson stand adopted by the Society. It contains four thermometers: a maximum to show the highest temperature in the shade, a minimum to show the lowest, a dry bulb to show at any time the true temperature of the air, and another thermometer with the bulb covered with moist muslin; the difference between the temperature shown by this and by the dry thermometer indicates the amount of moisture in the air. Although I am by no means certain that this is the best arrangement possible, and although I do not suppose that it is adapted for every climate, I am sure of this, that its establishment at all our Colonial observatories would be one great step in advance because it would give uniformity of observation, and without uniformity, comparisons are terribly misleading.

Dr. Neumayer, who was for some years in charge of the Melbourne Observatory, says, in the introduction to one of his excellent volumes, that the thermometer stand is "similar to that constructed by Lawson, save that it is placed upon a platform about five feet high, whereby the bulb of the thermometer is raised nearly ten feet from the ground; a precaution very much to be recommended in a country like this, where the soil assumes so high a temperature." I cannot understand this argument. It has been urged that what we require to know is the temperature of the layer of air which passes into people's lungs; hence we in England always put our thermometers between four and five feet above the soil. Dr. Neumayer says that a thermometer at that height is affected by the radiation

of heat from the hot ground. Probably : but so are the bodies of the colonists ; so, to a less extent, is the air they breathe. By placing his thermometers at ten feet above the ground, Dr. Neumayer undoubtedly obtained lower temperatures during hot periods than that of the air breathed by the inhabitants. Mr. Todd, of Adelaide, whose name is familiar to all the members of this Institute, as that of the successful director of the great Central Australian telegraph, recognises this difficulty, in the Article contributed by him to "Harcus's Handbook of South Australia," and other directors of Colonial observatories have written to the same effect ; but nothing has been done towards securing the precise similarity of the conditions under which the instruments are placed. Moreover, it is a singular fact, that amongst all the papers, books, and reports issued by the various Colonial Governments, which I have seen, there is not one which gives any engraving of the mounting of the instruments, or plan of the place where the observations are made.

The other point in respect of which uniformity of method is necessary, is the time of observation. It neither requires a moment's thought nor a diagram to tell anyone that it is usually hotter at midday than at midnight. Yet through this self-evident fact a large amount of confusion has arisen. I do not like taking up your time with what appear trivial details, and therefore before plunging into this subject, I should like to justify myself by saying that as the aggregate sum expended upon Meteorology in India and the British Colonies is probably considerably more than £20,000 per annum, the expenditure of the money to the best effect is not altogether unworthy of consideration ; and moreover, that I believe that meteorological observations conducted upon strictly uniform methods would lead to results far exceeding, even in money value, the cost of the instruments, and brains necessary to obtain them. One more digression is suggested by the last remark. How is it to be accounted for that individuals and Governments are always more willing to pay for instruments than for brains ? They will buy costly instruments, and by keeping down the number and salary of the observers, prevent the full value being got even out of the instruments they have bought.

Starting from midnight, the temperature falls until about 4 a.m., or half an hour after sunrise ; it then rises rapidly, becomes hottest about 2 p.m., and then falls till sunrise next day. The lowest point is called the minimum, the highest is called the maximum, and the difference between the two the "daily range." Thus far all is easy and obvious. I now come to a point in which, I believe, there are few Colonial Observatory directors who have not done wrong by trying to do too well. I do not hesitate to mention this and other adverse facts, because, if I am wrong, I can easily be corrected, and if I am right, all who care more for science than for their own personal dignity will thank me for performing a generally thankless office. For the criticism of others I do not care one iota.

It is not of much use to know the highest temperature reached each day if we do not also know the lowest, and as it happens that half-way between the two is nearly the true mean temperature, it has become usual to indicate the temperature of different localities by their mean temperature. Unfortunately, there are several ways of ascertaining mean temperature :—(1) The arithmetical mean of the two extremes. As these extremes can be obtained by reading the maximum and minimum thermometers once daily, this is a very easy and simple method. (2) By reading the thermometer every hour, and taking the average of the 24 readings as the mean of the day, (3) By reading the thermometer two or more times a day and applying corrections for the supposed difference due to those being hotter or colder than the average of the 24. The second plan is undoubtedly the best, but it is too troublesome for general adoption. The third plan is only available where the second has previously been carried on for a long time in order to ascertain what the corrections are.

The essential feature in the comparison of different localities being, as I have said, that it must be with similar data, similarly observed and similarly reduced, it is greatly to be regretted that there is no uniformity in the systems adopted in the various Colonies ; and worse still, I find that in some of them (Canada, for instance) various plans are adopted, some at some stations, others at others.

If the Directors of the various Colonial observatories cannot agree to universally adopt one system (which I think they ought to be required to do), it is at least desirable that all their publications should give the mean obtained by the first-mentioned method. That it is not perfect I freely admit, but as long as we rely upon the arithmetical mean of observed facts, and state precisely how the figures are obtained, we shall be providing ourselves with something definite, and our successors will have no difficulty in getting at the absolute truth from our approximations. I am glad to say that for several Colonies this method is adopted, for instance, in New South Wales, New Zealand, &c.

I do not like pointing out an evil without suggesting a remedy. In the present instance I offer two suggestions :—(1) That the attention of the Governments of the various Colonies be called to the fact, that there are scarcely any two of which the official records of the meteorology are strictly comparable, and that they be urged to arrange for a conference of the whole of the Directors, with instructions for them to discuss the method best adapted for universal adoption, and to bind themselves uniformly, universally, and rigidly to carry out the method recommended by the majority. The votes at the conference to be weighed proportionally to the number and equipment of the stations under the direction of each member of the congress. (2) Failing this, which would be the proper course, useful information might be obtained by stipulating that at every principal observatory a Stevenson's screen with the four usual thermometers be erected, and that the instruments be read at 9 a.m. and 9 p.m. daily, and the observations printed *in extenso*, with no corrections except for instrumental error. This would not cost £10 per station, even if freight be added to the cost of the apparatus.

There are many other points of divergent practice which render it impossible to compare accurately the records from the various Colonies, but as they are of less importance than those already named I will only mention one as an illustration. It is well known that on a clear night a grass plot cools down by radiation much more than does the air four feet above it. This radiation minimum is of great importance in connection with vegetation, especially as regards vines. In England we (whether wisely or not is very doubtful) measure this radiation by laying a thermometer on grass; some of the Colonies follow our example, but at Adelaide it is laid upon raw wool, at Melbourne the thermometer is placed in the focus of a reflector, and so on.

In the year 1873, at the request of a member of our Council, Mr. S. W. Silver, I undertook the organization of a series of synchronous meteorological tables from as many as possible of the British Colonies. The directors of the Colonial observatories, with very few exceptions, agreed to furnish the necessary returns without any charge; they have, since January, 1874, been tabulated under my supervision and published monthly in *The Colonies*. Although these records are affected by the causes for whose removal I have pleaded, it is impossible to deny that these monthly tables give a better survey of the climate of the British Empire than any others yet published; thanks are therefore undoubtedly due to the proprietors of *The Colonies* for bearing the cost of their preparation and publication. Instead of occupying time by describing the nature of these tables, I have arranged that copies shall be placed in your hands; and, as it would scarcely be decorous for me to praise my own work, and I do not see how to find fault with it, I leave these tables without further comment.

Another organisation requires notice—namely that of the Army Medical Department. It has 16 stations, besides those in the United Kingdom, viz., one each at Gibraltar, Malta, Scutari, Cape of Good Hope, Natal, Hong Kong, Singapore, Barbadoes, Bermuda, Halifax, two in Jamaica and four in Ceylon.

When these stations were first established, the results (if I may judge of the Colonial stations by the English ones) were not of much value. Latterly, however, I believe that a rigorous reorganisation has been carried out, and the results consequently have been raised in value. I hope that the Department will call upon the officers in charge for full reports and details as to the arrangement and locality in which the instruments are placed. At present nothing is given but

the numerical values, and one cannot tell which are good stations and which are bad. The following table gives an epitome of the results :—

Stations.	Temperature.					Mean Humidity.	Average Rainfall.
	Mean.	Absolute Max.	Absolute Min.	Absolute Range.	Mean daily Range.		
	°	°	°	°	°	0—100	in.
Scutari	58·7	103·6	13·0	90·6	18·0	71	29
Hong Kong	74·1	101·5	38·0	63·5	13·3	71	91
Jamaica, Up Park.	79·6	107·0	50·0	57·0	27·8	60	54
„ Newcastle	69·2	99·0	40·0	59·0	20·2	75	92
Bermuda	70·6	98·2	37·2	61·0	15·3	70	52
Halifax	43·0	93·0	—15·7	108·7	21·3	71	54

On receipt of the request from the Council that I would prepare the present paper, I resolved that I would try to make it not merely the subject of an hour's talk, but a paper which should be creditable to myself, and worthy of appearing in our Transactions.

The first step was to sort out of my own library all works bearing upon the climate of the Colonies, and have lists made of those referring to each Colony. These lists, together with a circular letter, were sent to the Chief Secretary of twenty-eight Colonies. The circular (Appendix A and B) stated that I was preparing this paper, and anxious to render it an accurate guide to what was known respecting the climate of each Colony, and also to show what each was doing to obtain weather records at the present time. Similar circulars were sent to the Agents-General in this country.

I am glad to acknowledge the receipt of very considerable assistance in response to these applications: the details are epitomised in Appendix C.

Lastly, I give in a fourth Appendix (D), a list of the publications consulted for the preparation of this paper. Having a great dislike to incomplete work, I do not call this Appendix by any more dignified title than that of a "List of Works consulted," but it is by far the nearest approach to a complete catalogue of works on the climate of the British Colonies ever compiled. It includes nearly 350 separate works, the aggregate weight of which must be nearly a quarter of a ton. Perhaps the fact of having had to hunt through such a mass of materials entitles me to a little sympathy if my paper is somewhat heavy.

Having thus explained the materials collected, I shall without further preface state in as few words as I can what I have ascertained about each Colony, and I shall take them in the order of the tables in your hands, but with some additions and some omissions: but roughly the order will be England to the Cape of Good Hope, thence to India, Ceylon, Australia, New Zealand, Fiji, the Falkland Isles, West Indies, and Canada.

ST. HELENA.

Observations were made at Longwood, 1,764 ft. above sea level, from 1841 to 1847 inclusive. The observations have been printed *in extenso*, but only the first five years have been discussed. The climate is a perfect type of an insular station. Mean temp. 61°·4, highest 77°·6, lowest 52°·0, range in five years only 25°·6, mean daily range 5°·6, mean humidity 87. The amount of rainfall is very doubtful, for the yearly totals range from 90½ in. to 19½ in., and simultaneous observations of two gauges only one mile apart showed that at the second station the fall was only one-sixth of that above stated. Apparently the average is about 40 in., but the amount is quite uncertain.

CAPE OF GOOD HOPE.

Three sets of observations have been made in this Colony. The first, extending from 1841 to 1846, were similar to those just mentioned at St. Helena, but, although the entire volume of tables was set up and printed more than twenty

years since, I believe, it was never published; at any rate I never saw a copy. This is a glaring, but unfortunately by no means unique waste of national money. The second set is the continuation of the same series at the Royal Observatory. The following are the principal results:—Mean temp. $61^{\circ}2$, highest $97^{\circ}4$, lowest $37^{\circ}7$, range $59^{\circ}7$, mean daily range $10^{\circ}3$, mean humidity 75, mean rainfall 24 in. In the year 1859, while the Hon. Rawson W. Rawson was Colonial Secretary, a commission was appointed by the Government to obtain records of the climate of different parts of the Colony. About £400 worth of instruments were purchased, conveyed to the Cape, and distributed; and about a fourth of that sum was spent in collecting, reducing, and publishing the results. The temperatures above given seem fairly to represent the average climate of the Colony, but the extremes are greater at several stations than at the Royal Observatory. For example, temperatures exceeding 100° are reported from four stations, and at one—Amalienstein $110^{\circ}7$ was reached on January 11, 1868, while sharp frosts occur at Aliwal North. The rainfall varies from 8 in. in Namaqualand to 40 in. near Cape Town. The average over the whole may perhaps be taken at 20 in. The work of this Commission seems to have been suspended between 1868 and 1875, and no results have been printed since the former year. A new Commission has recently been appointed, and the service is now being re-organised. Observations are also made at Cape Town by the Army Medical Department.

NATAL.

The Government of this Colony cannot be complimented upon what they have done for Meteorology. Very full records were kept by Dr. Mann, between 1858 and 1865, but it was, I believe, purely voluntary work on his part, the Government neither furnishing instruments nor assistant. A register is kept at the Botanic Gardens, Durban, but, I believe, therewith begins and ends the Governmental action in the matter. For a Colony aiming at extensive sugar production, it is suicidal not to have accurate knowledge of the rainfall. It is done in Mauritius, it is done in Jamaica, it has been thoroughly done in Barbadoes, but in Natal it has been entirely ignored. The only results I can get are for Pietermaritzburg, 2,100 ft. above the sea—Mean temp. $64^{\circ}6$, highest $97^{\circ}8$, lowest $29^{\circ}0$, range $68^{\circ}8$, mean daily range $18^{\circ}3$, mean humidity 72, mean rainfall 30 in. The temp. is much higher on the coast—at Durban about 69° —and the rainfall larger, but, having only the record for one year, it is useless to quote it. Two private observers have taken the rainfall for some years: Mr. Wilkinson, at Ottawa Sugar Estate, 10 m. N. of Durban, has a mean of 42 in., and Mr. Lamport at Merebank, 8 miles S.W. of Durban, of 44 in., both of them small amounts for sugar cultivation.

MAURITIUS.

Considerable attention has been given to the climate of this island for many years. It has possessed a Meteorological Society for a quarter of a century, and what is still more important, that Society has had a hard-working secretary. The principal observations have been made in the vicinity of Port Louis, and give for it—Mean temp. $77^{\circ}1$, highest 90° , lowest $62^{\circ}8$, range $27^{\circ}2$, daily range $6^{\circ}7$, humidity 71, mean rainfall 56 in. The rainfall is, however, much greater in other parts of the island, reaching 100 or 150 in. in Moka, Grand Port, and some parts of Flacq.

BENGAL.

Before making any special remarks upon the climate of this province, I think it only right to state that, in my own opinion, few actions have been more judicious than that of the Indian Government, in at once acting upon the remarks made in the House of Commons by Mr. Egerton Hubbard, and creating one supreme and controlling Meteorological Department for the whole of India; nor do I fear contradiction when I assert that the present director, Mr. Blandford, is the fittest man for the post, not merely as the best meteorologist in India, but also as a firm administrator, a qualification of great importance. It would be ridiculous to attempt to give here either a summary of the meteorological work done in India, or of its results. I believe that the days when Indian rain gauges

were taken indoors and locked up every night are gone for ever, and that we may implicitly rely on Mr. Blandford, who knows what is necessary, doing all that is possible. However, I ought, perhaps, to give a few figures. At Calcutta the mean temp. is 79° , highest 106° , lowest $52^{\circ}\cdot7$, range $53^{\circ}\cdot3$, daily range $13^{\circ}\cdot2$, humidity 76, mean rainfall 66 in. The rainfall of Bengal varies very greatly, ranging from 37 in. at Patna, to 527 in. at Cherra Poonjee; this last being, as far as is at present known, the wettest spot in the world.

(To be Continued).

GREENWICH EXTREME TEMPERATURES.

The extreme Shade Temperature of the month of April at the Royal Observatory, Greenwich, during the past 36 years.

Year.	Maximum.		Minimum.		Year.	Maximum.		Minimum.	
	deg.	date.	deg.	date.		deg.	date.	deg.	date.
1841	76.5	27	31.8	10	1859	79.0	6	25.3	1
1842	73.7	24	28.0	5	1860	65.0	30	28.2	11
1843	70.8	20	27.2	11	1861	63.5	12	26.8	21
1844	74.9	26	33.4	7	1862	75.0	25	26.7	13
1845	70.3	24	29.5	6	1863	69.3	20	28.3	1
1846	63.0	12	33.3	20	1864	73.8	20	33.4	13
1847	63.8	12	23.0	16	1865	81.5	27	31.9	2
1848	74.6	3	30.3	27	1866	79.0	27	34.2	5, 30
1849	64.3	30	26.8	18	1867	64.8	19, 23	30.5	1
1850	66.9	7	34.0	29	1868	68.9	30	28.9	12
1851	64.1	17	28.6	6	1869	79.1	14	29.3	2
1852	74.7	14	26.7	10	1870	78.7	20	26.0	4
1853	62.0	4	32.3	25	1871	66.5	12	29.1	7
1854	77.5	20	28.3	25	1872	69.9	12	29.6	20
1855	72.8	16	25.9	2	1873	76.8	15	28.7	26
1856	73.0	25	30.6	21	1874	79.7	23	30.5	30
1857	69.0	19	28.2	24	1875	71.5	30	27.8	25
1858	76.0	16	27.2	2	1876	70.2	8	29.2	12

Extremes in 1877, Max. : $66^{\circ}\cdot0$ on 4th ; Min. : $32^{\circ}\cdot1$ on 20th.

	Year.	Max.	Date.	Min.	Date.	Year.
Means of 36 years	...	71.7	19	29.1	13	...
Highest	1865	81.5	27	34.2	5 30	1866
Lowest.....	1853	62.0	4	23.0	16	1847
Range .....	...	19.5	...	11.2	...	...

EDWD. MAWLEY.

Adliscombe, May 4th, 1877.

APRIL, 1877.

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 1860-5	Greatest Fall in 24 hours.		Deg.		Date.	Deg.	Date.	In shade	On grass			
				Dpth	Date.								Max.	Min.	
															inches.	in.
I.	Camden Town	2.59	+ 1.46	.66	9	16	64.0	4	33.4	20	0	0			
II.	Maidstone (Hunton Court)...	2.57	...	.59	8	14	...	...	...	...	...	...
"	Selborne (The Wakes).....	3.43	+ 1.93	.44	9	19	57.8	22	28.7	20	4	7			
III.	Hitchin	3.31	+ 2.31	.75	4	18	59.0	4	28.0	19	6	...			
"	Banbury	2.64	+ 1.48	.45	9	19	60.0	22	30.0	20	4	...			
IV.	Bury St. Edmunds (Culford)...	2.29	+ 1.54	.48	8	12	61.0	20	28.0	19	4	6			
"	Norwich (Sprowston).....	...	...	...	...	...	...	...	...	...	...	...
V.	Bridport	3.90	+ 2.42	.72	15	15	64.0	21	30.0	20	2	...			
"	Barnstaple	3.82	+ 1.81	1.10	20	16	61.0	26*	32.5	20	...	...	
"	Bodmin	5.67	+ 3.97	2.16	15	18	59.0	11	35.0	20	0	1			
VI.	Cirencester	3.32	+ 2.03	.70	4	18	...	...	...	...	...	...
"	Shifnal (Haughton Hall)	2.34	+ 1.19	.51	4	17	57.0	22†	30.0	20	2	10			
"	Tenbury (Orleton)	3.01	+ 1.47	.81	4	19	61.0	22	28.0	20	1	6			
VII.	Leicester (Belmont Villas) ...	3.07	...	.87	9	17	61.0	20	33.0	25	...	...	
"	Boston	3.19	+ 2.22	.57	9	18	64.0	20	33.0	12	0	...			
"	Grimsby (Killingholme)	3.33	...	.68	22	19	58.0	14	33.0	2, 20	0	...	
"	Mansfield	2.90	...	.71	9	22	64.9	22	27.5	27	2	2	
VIII.	Manchester .....	...	...	...	...	...	...	...	...	...	...	...
IX.	York	3.53	+ 2.43	.73	22	13	58.0	4	29.0	20	3	...			
"	Skipton (Arneliffe)	4.33	+ 1.29	.63	12	22	...	...	...	...	...	...
X.	North Shields	3.52	+ 2.22	.82	9	18	53.0	4	30.0	20	3	8			
"	Borrowdale (Seathwaite).....	5.43	- 1.47	1.68	3	16	...	...	...	...	...	...
XI.	Cardiff (Crockherbtown).....	2.90	...	.52	20	20	61.0	10	33.0	20	0	...	
"	Haverfordwest	5.92	+ 4.06	1.11	20	15	59.9	14	31.5	19	1	10			
"	Aberdovey	2.54	...	.50	21	16	68.0	10	28.0	17	3	...	
"	Llandudno	2.60	+ 1.10	.48	8	15	59.8	22	34.5	20	...	...	
XII.	Dumfries (Crichton Asylum) ..	2.93	+ 1.26	.78	4	13	56.7	20	28.5	11	8	9			
"	Hawick (Silverbut Hall).....	3.39	...	1.27	9	15	...	...	...	...	...	...
XIV.	Kilmarnock (Annanhill).....	...	...	...	...	...	...	...	...	...	...	...
XV.	Castle Toward	3.80	+ 1.30	.98	23	12	55.0	7, 19	26.0	11	14	...			
XVI.	Mull (Quinish) .....	...	...	...	...	...	...	...	...	...	...	...
"	St. Andrews (Cambo Ho.) ...	2.55	...	...	...	...	...	...	...	...	...	...
"	Grandtully	3.79	...	.41	3	11	...	...	...	...	...	...
XVII.	Braemar	1.93	+ .53	.50	9	12	53.0	19	19.8	12†	13	24			
"	Aberdeen	3.03	...	.74	10	13	51.7	4	29.5	12	5	9	
XVIII.	Gairloch	1.45	...	.39	3	8	...	...	...	...	...	...
"	Portree	1.77	- 3.50	.39	2	10	...	...	...	...	...	...
"	Inverness (Culloden)	1.88	+ .31	1.06	11	13	56.0	4	27.2	18	9	16			
XIX.	Helmsdale	2.16	...	1.08	10	11	...	...	...	...	...	...
"	Sandwick	1.44	-- .30	.31	3	11	51.5	4	28.3	14	5	11			
XX.	Caherciveen Darrynane Abbey ..	6.34	...	.80	7	23	...	...	...	...	...	...
"	Cork	6.45	...	1.25	27	21	...	...	...	...	...	...
"	Waterford	5.85	+ 3.62	1.58	15	22	61.0	21	30.0	24	1	...			
"	Killaloe	3.55	+ 1.42	.96	22	21	65.0	11	29.0	24	3	...			
XXI.	Portarlington	3.56	+ 1.54	.58	21	28	59.0	14	34.0	23	0	...			
"	Monkstown, Dublin	5.08	+ 3.44	1.17	15	19	58.0	1	31.0	20	4	4			
XXII.	Galway	3.34	...	.68	11	20	63.0	11†	31.0	6	2	...	
"	Ballyshannon	1.77	...	.31	5	14	...	...	...	...	...	...
XXIII.	Waringstown	3.76	...	1.16	8	18	58.0	22	29.0	23	7	12			
"	Edenfel (Omagh)	1.92	...	.49	8	17	57.0	25	28.0	18§	8	...	

* And 27. † 23. ‡ 14 § 22.

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

METEOROLOGICAL NOTES ON APRIL.

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

ENGLAND.

SELBORNE.—Prevailing wind S.W. till the middle of the month, then variable, last week N.E.; R measured on 81 days this year, January 1st to April 30th. TS on 11th, extremely dark 3.30 to 4.30 p.m., with H and R; frost on the grass on 13th; cuckoo first heard on that day, and the first swallow seen on the 14th; R, H and T at 2.30 p.m. on 23rd.

HITCHEN.—Terrific TS and H on 4th.

BANBURY.—High winds on 15th, 16th and 17th; T on 4th, 22nd and 23rd; hawthorn bursting at the beginning of the month, and in leaf at the end; the latter half of the month unusually cold, with E. winds.

CULFORD.—T on 4th, 6th, and 7th, with hailstorms on the two latter days and on the 17th; high wind on 15th and 16th. The weather during the entire month has been cold, N.E. winds having prevailed from the 12th until the end of the month; max. temp. was 61°, the min. 28°, and the mean 44°·2. The song of the nightingale was heard as early as the 5th, but has been silent ever since, and the cuckoo has not yet been heard, nor a swallow seen.

BODMIN.—Mean temp. of the month 51°.

SHIFNAL.—A wet, cold, ungenial spring; R daily, with five exceptions, till the 24th, from which time to the close it was dry with wind as before, from N. or N.E.; only four days (2nd, 10th, 22nd and 23rd) when the temp. was above 55°; only two nights with frost above the grass, whereas there was frost on grass on ten nights. A single distant clap of T in S.W. at 4.30 p.m. on 10th, no R; more T again, with R, at the same hour, on the 22nd, the wind each time shifting to S.W., afterwards returning to its old point N.E. Willow-wren arrived on 20th; ring dove first cooed on 22nd; cuckoo first heard, and swallow first seen, on 27th.

ORLETON.—A very cold, ungenial month, with a rainfall above the average, and very little sunlight; up to the 24th there were only five days without measurable R; on that day a dry, cold wind set in from the N.E. and continued. The mean temp. of the month was about 4½° below the average, but it was uniform, with only a few frosty nights. The cuckoo was generally heard about the 26th; the chiff-chaff was first seen on the 4th, the white-throat on the 12th. Plum trees were in full blossom on the 8th, and damson about the 13th. No T heard or L seen.

LEICESTER.—A very heavy R during the night of the 9th ('87) the max. fall of the month; a severe TS on the evening of the 10th; T and L incessant from 7.15 to 8 p.m.; also a slight TS on evening of 22nd. Temp. generally low for the season, only two days above 60°; mean max. 53°·6; mean min. 39°·2; mean temp. 44°·9. Much E. and N.E. wind during the latter half of the month, during which time vegetation has made very little progress.

GRIMSBY.—At the beginning of the month the wind backed frequently. The whole month was cold, wet, and gloomy, with E. wind prevailing. The wettest (3·33 in.) April for many years; TS with vivid flashes on 4th; L at 1 p.m. and T at 4 p.m. on 5th; distant T at 3.30 p.m. on 23rd; chiff-chaff heard on 11th; lesser white-throat seen on 12th; swallow seen on 15th, and redstart on 22nd; cuckoo heard on 27th.

MANSFIELD.—The month has been cold and dull, and in consequence vegetation is very backward; mean temp., 9 a.m., 44°·2, which is 8°·1 below the five years' average; the highest recorded temp. is 64°·9, on the 22nd, and the lowest, 27°·5, on the 27th; heavy R, H and TS at 6 p.m. on 4th.

NORTH SHIELDS.—TS on 4th; solar halo on 12th and on 20th.

SEATHWAITE.—Only one day on which the fall reached 1·00 in.; only three on which half an inch fall.

WALES.

HAVERFORDWEST.—Hail of very large size and destructive to glass and tender vegetation on the 6th and 7th; the mountains were covered with S on the 4th; from the 7th to the 14th the weather was fine, mild, and dry, after which a very wet, stormy, and cold period set in continuing (except the interval 24th to 26th) to the end of the month. The blackthorn blossomed unusually this April; wind easterly during the greater part of the month; temp. below 40° on 16 nights; vegetation very backward.

ABERDOVEY.—A cold month on the whole; very stormy towards the close.

LLANDUDNO.—Hail showers at 1 p.m. and at 7.30 p.m. on 5th; a splendid double rainbow from 5 to 6 p.m. on 7th; blackthorn in blossom on 11th; plane in leaf on 19th; apple trees in flower on 22nd; cuckoo heard on 28th; showery and unsettled for the first three weeks; weather dry and steady, with persistent E. winds from the 23rd; swallows seen on the 24th, and cuckoo heard on 28th. Rainfall an inch above the average, and temp. more than 2° below it.

SCOTLAND.

DUMFRIES.—A cold, ungenial month, the wind easterly, though light, nearly every day during the month; white frosts frequent, and S fell on three days; severe TS on 5th; mean temp. 41°·9, 2° or 3° below the average.

HAWICK.—The most unpropitious April for gardening or farming ever remembered; the strong cold E. wind which prevailed on 23 days had a most chilling effect on young lambs, and on vegetation; the hills have been either entirely white or piebald with S the whole month. The rainfall is an inch above the average. There was some T on the night of the 4th, and a heavy fall of S and R on the 9th. The cuckoo has not yet been heard, nor a swallow seen.

BRAEMAR.—A month of very low temp. throughout, with prevailing sharp N.E. winds. Hills still entirely covered with S; vegetation dormant.

ABERDEEN.—A month of cold, bleak, unseasonable weather, with an excess of rainfall, though on a smaller number of days; the heaviest rainfall here, fell as S on Deeside. Mean temp. 2°·4 below the 20 years' average, rainfall above it.

PORTREE.—A dry and very cold month, wind generally from N. or E.; frost nearly every day. Solar halo on four days, the one on 20th continued all day. Gale all day on 15th from the S.E. Pastures burnt up by the bright sunshine and the frosty nights. The driest April on record, except in 1873. Rainfall more than 3 in. under the average of the last 16 years.

CULLODEN.—L on night of 4th; frequent sharp frosts, S 2 inches deep on the Moor (400 ft. above sea level) on 23rd.

SANDWICK.—April has been very cold, stormy, and very dry since the 12th, so vegetation is very backward. There were gales on 1st, 5th, 15th, 16th, 21st, and 22nd, from 40 to 50 miles an hour, that on the 15th was even 60 miles an hour; ground white with S on 10th, 11th, 12th, 13th, but thawed during the day; aurora on 17th.

IRELAND.

DARRYNANE.—A wet, cold, ungenial month, and the wettest April registered here; the total fall (21·72 in.) for the four months is also in excess of the corresponding period since 1870, when my register begins.

WATERFORD.—Very heavy H for a short time on 5th. Fine meteor seen on 6th. Owing to the prevalence of S.E. and N.E. winds, and consequent low temp., vegetation is very backward; chesnuts partly nipped with the frost. Country greatly flooded, as much so as in the wettest part of the winter.

KILLALOE.—Scarcely any frost this month, but low temp. during the last week; very sharp E. and N.E. winds; vegetation much in advance of last year, but now checked by the E. wind.

MONKSTOWN.—An unusually wet April; the latter part of the month very dry and cold, with easterly winds.

BALLYSHANNON.—The month has been very favourable throughout for the agriculturist, though rather cold, with frequent showers in the first half of the month, and a prevailing E. and S.E. wind in the latter part, which has left the ground very dry.

WARINGSTOWN.—Very wet and cold. Spring backward, and labour very much behind what is usual; ground quite saturated.

EDENFEL, OMAGH.—A most backward and inclement month. Though the wind blew strong from the E. (usually a dry point) on 23 days, it was accompanied by cold E in the first half, and cold drought in the latter half of the month. Swallows appeared on the 8th, but left immediately, and have not yet returned. Hedges are still almost brown, and vegetation generally is a month late.

SUPPLEMENTARY TABLE OF RAINFALL IN APRIL, 1877.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see Met. Mag., Vol. XI., p. 28., but the list is under revision and further details will be given in a month or two.]

Div.	Station.	Total Rain.	Div.	Station.	Total Rain.
		in.			in.
II.	Acol	2·58	XI.	Llanfrechfa	4·56
„	Hailsham	2·11	„	Castle Malgwyn	3·31
„	St. Lawrence, I. of W....	2·56	„	Heyope .....	...
„	Andover.....	2·05	„	Carno	3·02
„	Strathfield Turgiss	2·48	„	Rhug, Corwen	2·50
III.	Addington Manor.....	3·04	„	Port Madoc	3·64
„	Oxford	1·96	XII.	Melrose	3·75
„	Northampton	2·40	XIV.	Cessnock, Glasgow	3·21
„	Cambridge.....	2·35	XV.	Gruinart	2·11
IV.	Sheering	2·47	XVII.	Keith	1·78
„	Ipswich	1·96	XVIII.	Dalwhinnie	2·62
„	Diss	1·75	„	Auchnasheen	1·43
„	Swaffham	2·39	„	Springfield, Tain	1·35
V.	Compton Bassett	3·47	XX.	Skibbereen .....	...
„	Dartmoor	9·16	„	Glenville, Fermoy	5·70
„	Teignmouth	6·42	„	Tralee.....	3·27
„	Langtree, Torrington ..	4·06	„	Newcastle W., Limerick	3·41
„	Cosgarne, St. Austell ..	5·02	„	Kilrush	2·21
„	Taunton	3·58	XXI.	Kilkenny	4·40
VI.	Bristol	3·14	„	Kilsallaghan	4·29
„	Sansaw	2·92	„	Twyford, Athlone	3·72
„	Cheadle	2·23	XXII.	Ballinasloe.....	3·25
VII.	Coston, Melton Mowbray	3·08	„	Kylemore	5·77
„	Bucknall	2·84	„	Carriack on Shannon.....	2·28
VIII.	Walton, Liverpool	1·91	XXIII.	Rockcorry	2·25
„	Broughton-in-Furness ..	2·37	„	Warrenpoint	4·41
IX.	Stanley, Wakefield ..	2·97	„	Carnlough, Larne.....	4·75
X.	Gainford	3·80	„	Bushmills	1·72
„	Shap	3·01	„	Buncrana	1·95

SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CXXXVII.]

JUNE, 1877.

[PRICE FOURPENCE
or 5s. per ann. post free.]

THE FRENCH AGRICULTURAL STORM-WARNING SYSTEM.

WE do not profess to give a perfect history of the above system ; but, as it is often mentioned, we purpose combining the facts stated in several circulars which M. Le Verrier has placed at our disposal, with others derived from various sources, chiefly our own personal knowledge.

A decree, dated February 13th, 1873, charged the Paris Observatory with the duty of sending storm warnings to the ports, and to agriculturalists, but although the warnings to the coasts have been long established and have worked well, the agricultural service was at first not appreciated, and very little was done until last autumn.

In December last, by arrangement with the Administration of Telegraphs, the Council of the Observatory decided that a forecast of the weather should be sent gratis daily to every commune which provided itself with a barometer, called an agricultural barometer, placed in a public position.

In order to obtain an agricultural barometer for one of these stations it is only necessary to send a note of the altitude of the place where it is to be used, and a post office order for 16s., to the Accountant of the *Association Scientifique de France*, 113, *Boulevard Saint-Michel*, à Paris. This sum is paid over to the Optician, and the barometer (adjusted for the height of the place above the level of the sea) is, after verification at the Observatory, and without further charge, sent as quickly as possible by the Optician to the Mayor of the Commune. For a further sum of 12s. an oak box, with open work front and lock and key will be sent, which is convenient for the protection of the barometer, and for the exhibition of the dispatches.

It seems rather a pity that the sum was not fixed at 25 or 30 francs instead of 20, and a rain gauge added at each station ; and it is rather strange, because in one of M. Le Verrier's circulars he says, "It is necessary to follow the distribution of rain, not only as regards quantity, but also to notice its progress across the cantons and departments when a dry period is in turn succeeded by a wet one."

This circular, however, (dated March 29th, 1877) aims at much more than any of the others, and at more than we believe has yet been accomplished. We will epitomize a few other paragraphs, for they are very suggestive.

"The study of storms will be attentively resumed. When a storm reaches the extremity of a department the capital should at once be warned, and the message should be sent on to Paris ; by this means it will often be possible to warn threatened departments.

"The study of hailstorms is most important ; it is necessary to learn what influence is exercised by woods, hills and water courses upon these frequently devastating phenomena.

"The frosts which occur late in spring cause great loss to agriculturists. It has often been said that their injurious effect may be prevented by smoke. This ought to be ascertained. The losses which it is desired to lessen, amount in some departments to millions of francs ; it would, therefore, doubtless be easy to collect the funds necessary for experiments on a large scale, and they must be on a large scale, say over a whole valley, to be conclusive. Those who have assisted at the burning of weeds on the summit of a hill are always struck by the speedy disappearance from view of all parts of the valley, and one cannot help believing that such a course would, by diminishing dangerous nocturnal radiation in spring, be decidedly advantageous.

"Warnings relative to inundations are of great importance, but this has been so prominently brought before every one recently that it is unnecessary to insist upon it, and as this special duty has been charged upon the engineers of the *Ponts et Chaussées*, it is only necessary to bespeak their assistance to the Meteorological Commissions."

Before concluding, we must say a few words as to the barometers and the mounting. Those who visit Paris may see a specimen in a gateway either on Quai Voltaire or Quai Malaquais, we forget which. For the benefit of others we may state that we saw at Redier's factory a room half full of these barometers and their boxes, and the conclusion at which we arrived was that either Messrs. Redier must be making the barometers out of sheer generosity, or that aneroid selling under ordinary circumstances must be very profitable. They are well made instruments of about 4 inches diameter, in lacquered brass cases, and many of them with very small temperature corrections. Of course, the lowness of price is partly due to the fact that the cost always decreases with any increase of numbers, and the charge in proportion for 500 or 1000 aneroids will be much less than for one, and, moreover, as it is a condition that these instruments be publicly exhibited, each is a permanent advertisement for the makers. It seems to us to be a good bargain both for the *Association Scientifique* and for Redier's.

We are not aware of the precise number of these barometers distributed, but at the end of March there were more than 600, we believe that there are now considerably more than 1000.

It has been urged that the establishment of these stations by no

means involves the advancement of Meteorology, but we think that it does. It is quite true that these barometers will not give precise results, and that these stations will only rank as third-order stations, but we believe that the erection of these public barometers, and the publication of the bulletins from the Paris Observatory, will lead a few people to think, and if only one person is induced by each public barometer to study Meteorology, how grand an assemblage of thinkers will France possess ! Real thinkers, workers and students of Meteorology, are as rare in France as in England, and if Le Verrier's 1000 barometers kindle a thirst for Meteorological knowledge in a thousand breasts, our science will make such progress as it has never made before, and Le Verrier's latest will be among his most useful labours.

THE CLIMATES OF VARIOUS BRITISH COLONIES.

(Continued from page 60).

BOMBAY.

The meteorology of this Presidency is now being carefully observed. Observations have now been made at the Colaba Observatory for more than a quarter of a century ; the results are—Mean temp. $79^{\circ}0$, the highest $93^{\circ}5$, lowest $58^{\circ}0$, range $34^{\circ}5$, daily range $9^{\circ}7$, mean humidity 76, mean rainfall 71 in., nearly all of which falls in June, July, August and September. Respecting the climate of other parts of the Presidency, it is scarcely safe to say more than that there has been lavish expenditure of money for instruments in the past ; but that, owing to the absence of trained supervision, the results hitherto published are of doubtful value. Mr. F. Chambers has been appointed meteorological reporter for Bombay, Rajputana, &c., and has commenced his duties by a tour of inspection, which will lead to accuracy and uniformity. I may perhaps quote his report upon one station as an instance of the paramount importance of personal supervision and inspection :—

“Vingorla is one of the places along the coast from which telegraphic weather reports are sent to Bombay during the south-west monsoon, and I was wishful to see what provisions existed there for procuring trustworthy meteorological information. They were found to be of the most meagre description. A pair of common bath thermometers hung against a thick wall in the porch of a house, and a small iron flag, fixed on the top of a tree, but not in action at the time of my visit, were the only instruments available for the purpose. The position of the building where the observations are made is very objectionable, as it is protected from the winds by hills on all sides, except to the south and south-west, and it is very doubtful whether wind observations made at such a place are not more misleading than informing. If it is at all worth while having telegraphic weather reports sent to Bombay from stations along the coast, it is surely advisable that steps should be taken to make that information really trustworthy.”

MADRAS.

I have not received from the Madras Government any information as to the condition of meteorology in that Presidency, and my own knowledge is limited. Observations have been made at Madras Observatory for a great many years, and several thousand pounds have been expended in printing huge volumes of figures ; but in the whole of the books I cannot find a single trustworthy abstract of the climate of Madras. I believe the mean temp. is about 80° , the highest 110° , the lowest $57^{\circ}6$, range $52^{\circ}4$, mean daily range $16^{\circ}6$, and the rainfall 48 in. ; but I do not at all bind myself to those values. Observations are made at about a dozen subsidiary stations, and the rainfall is recorded at 215 Revenue Board stations, but where the results are to be found I do not know. Probably the explanation of this unsatisfactory condition of affairs lies in the attempt to make one man discharge the duties of Government astronomer and meteorological superintendent.

CEYLON.

The arrangements in this Colony seem generally satisfactory ; the results are published promptly and regularly, there are a fair number of stations, and the chief obvious desideratum is information as to the position, &c., of the instruments and stations. A compact annual report would be a valuable supplement to the present series of separate sheets. The mean temp. of Colombo is $80^{\circ}7$, highest 95° , lowest $68^{\circ}3$, range $26^{\circ}7$, mean daily range 9° , mean humidity 83, mean rainfall 76 in. On the mountains the temp. is much lower, *e.g.* in February, 1875, when 95° was recorded at Colombo ; the temp. at Nuwara Eliya did not exceed 73° , and sharp frost was reported on the grass, although at Colombo the grass minimum was 55° . The rainfall varies very much, the average for the island must be nearly 100 in. ; it ranges from 34 in. at Hambantota to 209 in. at Ambagamuwa. It seems as if nearly all the data necessary for determining the precise conditions adapted for the successful cultivation of coffee have been collected, and a report, with maps of the rainfall, elevation, geology, and produce of the island, would be of immense value to other Colonies.

STRAITS SETTLEMENTS.

With the exception of Singapore, I believe no observations are at present made in this district. An annual report is, however, submitted by the principal civil medical officer (Mr. H. L. Randell), which gives a good summary for Singapore, and the rainfall at eight other stations in the vicinity. Mean temp. $79^{\circ}8$, highest 93° , lowest 65° , range 28° , mean daily range $12^{\circ}8$, mean rainfall 95 in. Mr. Randell pleads earnestly for a good water supply, and remarks that it seems that "anything less than 25 in. of rainfall during the dry season is pretty certain to be followed by some epidemic."

QUEENSLAND.

The meteorological system of this Colony is under the Registrar-General's department, and appears to be efficiently worked. Extending, as this Colony does, about 1,000 miles from east to west, and about 1,300 from north to south, it naturally has different climates. There are, I believe, only three fully-equipped stations, *viz.*, Brisbane, Cape Morton, and Toowoomba, and they are all in the south-east corner of the Colony. There is, therefore, no information as to the temp. of the northern or western part, but it must be very high. At Brisbane the mean temp. is 70° , highest 108° , lowest $34^{\circ}5$, range $73^{\circ}5$, mean daily range $20^{\circ}9$, mean humidity 76, mean rainfall 51 in. There are fifty-one rainfall stations in the Colony—most of them within 100 miles of the coast ; along the coast the rainfall is between 30 and 100 in. ; fifty miles inland it does not average 40 in., and further inland it appears to be from 10 to 20 in.

NEW SOUTH WALES.

The organisation of the meteorological service of this Colony appears to be very satisfactory ; the fully equipped second order stations are numerous ; the publications, though neither bulky nor costly, contain all the data required for climatological purposes, and the daily weather reports published in the local newspapers provide ample data for chartographic meteorology. At Sydney the values are—mean temp. $62^{\circ}4$, highest 107° , lowest 36° , range 71° , mean daily range $14^{\circ}7$, humidity 72, rainfall 50 in. The coast rainfall may be taken as about 40 in., but it is very much less inland ; in fact, years with no rain at all are reported to have occurred ; but in such a climate it is not remarkable that even Mr. Russell has not succeeded in obtaining any regular observers.

VICTORIA.

This Colony has a fair number of fully-equipped stations ; but a few more are needed in the north and west. The mean temp. of Melbourne is $57^{\circ}5$, highest $111^{\circ}2$, lowest $27^{\circ}0$, range $84^{\circ}2$, mean daily range $18^{\circ}8$, mean humidity 72, mean rainfall 26 in. Excessively high temperatures are said to occur in the north-west (where there are no regular stations), and mention is made of shade temp.

peratures of 123° to 125° for several days together. In other respects, however, the temp. of Melbourne fairly represents that of the Colony generally. There is no part in which the mean rainfall appears to reach 40 in. ; it seems generally to be from 20 to 30 in., and less than 20 in. in the north-west. The sketch-map issued with the Melbourne reports is a feature which should be imitated by every other Colony.

SOUTH AUSTRALIA.

This Colony has always struck me as the most energetic of all our Australian Colonies. Nothing but tremendous energy would have induced the comparatively small population of South Australia to attempt the most difficult telegraphic enterprise ever undertaken ; and certainly none but men of great energy would expect *one* man efficiently to discharge the duties of Postmaster-General, Superintendent of a land telegraph nearly 2,000 miles long, Government Astronomer, and Director of the meteorological system of the Colony. Yet this is what Mr Todd is expected to do, and does do well. In his article upon "South Australia : Its Observatory and Meteorology," Mr. Todd truly remarks that "in a young Colony, where a mere handful of people have to bring vast wastes under cultivation; build new homes, construct roads and railways, and carry out other extensive public works necessary for the development of the country they have traversed the ocean to occupy, it is not to be expected that much time, thought or money can be devoted to science or art." Yet the South Australians have not only kept up perfect second-order stations at Adelaide, and four or five other stations in the South, but they have fifty-five rainfall stations, besides the fifteen, which are perhaps the most important set in the world, viz., those which run like a chain through the very centre of Australia. Neither Queensland, New South Wales, nor Victoria have penetrated to the inland boundaries of their own territories ; South Australia has pierced through the very heart of the continent. The Adelaide results are as follows : Mean temp. $63^{\circ}\cdot1$, highest $113^{\circ}\cdot5$, lowest $34^{\circ}\cdot2$, range $79^{\circ}\cdot3$, mean daily range $20^{\circ}\cdot6$, humidity 60, rain 21 in. In the southern part of South Australia the temp. and rainfall are fairly represented by the above figures ; in the centre it is hotter and drier—in fact, according to the short period that the telegraph stations have been established, the rainfall seems to be only 4 or 5 in. In the extreme north the temp. is uniform and high, the air is very damp, and the rainfall about 50 in.

WEST AUSTRALIA.

I am not aware that the government of this Colony ever spent a shilling upon investigations of its climate. Except lighthouse registers, which are rarely true exponents of local climate, I do not know of any records being kept in this vast Colony (it is nearly twelve times as large as Great Britain). In Silver's "Hand-book to Australia" it is stated that the coast rainfall is about 30 in., and the mean temp. of Perth 63° . I know that the Colony is poor, but so it will continue if energy is not displayed, and a grant of £50 judiciously expended would repay itself ten times over.

TASMANIA.

Having received no reply to the circular sent to this Colony, I have only my own knowledge upon which to rely. I am not aware that the government has done anything towards ascertaining the climate of Tasmania. A very full and accurate journal has been kept (in continuation of that kept in connection with the Magnetic Observatory) by a private gentleman, Mr. F. Abbott, F.R.A.S., for a quarter of a century, at Hobart Town, and during 1862 he also established stations at the lighthouses round the north and east coasts, but I do not know that they were continued. I have no records for any length of time, except for Hobart Town, of which the mean temp. is $54^{\circ}\cdot4$, highest 105° , lowest 29° , range 76° , mean daily range $17^{\circ}\cdot9$, humidity 75, rainfall 23 in.

NEW ZEALAND.

The New Zealand Government has always appeared to me to be very judicious in its treatment of scientific matters. Certainly, as regards meteorology, there

is little to complain of. They have a reasonable number of stations, very well distributed, provided with full sets of instruments, which appear to be similar and similarly mounted—in fact, just such as I exhibit here. Their publications are, on the whole, well arranged, and distributed liberally but not lavishly. The only deficiency in the publications which I have noticed is the absence of a compact table of extremes of shade temperature. The following are the values for Wellington: Mean temperature $55^{\circ}6$, highest 83° , lowest 30° , range 53° , mean daily range 12° , humidity 68, rainfall 47 in. At some of the hill stations, and on the west coast, the rainfall exceeds 100 in., but apparently the wet stations are also colder than Wellington.

BRITISH GUIANA.

Careful observations were made at Georgetown Observatory from 1846 to 1856, inclusive, and in 1857 a rather extravagantly printed volume was published, giving daily values; owing, I suppose, to the cost of this publication, the second volume, which was to have contained abstracts of the results, has not been published. As it would be a serious undertaking to reduce the whole book (275 4to pages) for the sake of obtaining the values, which the Colony should have done, I merely offer the following as apparently approximations to the truth: Mean temperature 79° , highest 89° , lowest 68° , range 21° , mean daily range 10° , mean rainfall 94 in. I do not know that any records are now kept in the Colony.

TRINIDAD.

I have received no reply to the application to the Government of this Colony, and do not know that any official attention has ever been given to the subject. I am glad, however, to have recently found that the Rev. H. G. Wall has been making regular observations at Couva Rectory for fourteen years, but I have not at present any of his results. It would be creditable and judicious for the Government to offer to have Mr. Wall's observations examined by some competent person, and, if found satisfactory, to have them printed at the expense of the Colony.

BARBADOES.

During the Governorship of Sir Rawson Rawson great attention was paid to the climate of this Colony, and especially to its rainfall, which is by no means uniform throughout the island. Governor Rawson's work on the relation of rainfall to the sugar crop will ever remain a proof at once of his industry and of the close co-relation of science and practice. At Binfield accurate observations have been made for 25 years, but I have not seen any general summary; the mean temperature is, however, about 75° , highest 85° , lowest 64° , range 21° , mean daily range $6^{\circ}8$, mean humidity 83, mean rainfall 67 in. It is greatly to be regretted that since the departure of Sir Rawson Rawson the whole subject has been neglected by the Government, and I believe there would be no observations at all were it not for the private exertions of Dr. Walcott.

ST. KITTS.

No reply received, and no data known to be in existence.

JAMAICA.

No regular observations have been established in the Colony (except those made by the Army Medical Department), and no papers upon the subject have been published. About 20 rain gauges have been in more or less regular use for three years, and indicate a rainfall varying from about 37 in. at Kingston to upwards of 100 in. at the Cinchona Plantation in the parish of St. Andrew.

BRITISH HONDURAS.

No regular meteorological station has ever been established in this Colony, but from such fragmentary data as I have been able to collect it appears that at Belize the mean temperature is about 80° , highest 88° , lowest 58° , mean daily range 3° , mean rainfall 71 in. The steady high temperature, 84° by day and 80° or 82° by night during several months must be very trying to Europeans.

BERMUDA.

Several sets of observations have been made at different times, and in different parts of Bermuda, but the results have never been collected together or properly discussed, and I rather doubt if they are worth much expenditure of time or trouble. The present Governor (Major-General Lefroy, F.R.S.) might perhaps use his influence to see one station properly equipped, and arrangements made for the discussion and publication of the results. From a pamphlet upon agriculture by the Governor, and several fragmentary records, we believe that the mean temperature is 71° , highest 95° , lowest 46° , range 49° , mean daily range 14° , mean humidity 80, mean rainfall 48 in.

CANADA.

The climate of the vast territory (nearly as large as Europe) now known as the Dominion of Canada, is far too large a subject to be dismissed in a few words, and yet no other course is open to me. The separate publications on the climates of the various provinces are neither numerous nor important, and, except for Toronto, I know of no publication of observations or results for any considerable number of years. In 1871, Professor Kingston, of Toronto Observatory, was appointed to the directorship of the then newly-created meteorological office of the Dominion of Canada, and since that time the results from the various stations, both public and private, have been published in his annual reports. In the course of time these volumes will become of great value; but at present, being strictly confined to a statement of the facts observed in each year, without a word of comment, and without a single comparison with previous years, they are not in a form available to any but a strictly scientific investigator, and even he would have much work to do which ought to be done by the Canadian Meteorological Office. At present it would appear that the funds or staff at Professor Kingston's disposal are inadequate.

Under these circumstances, I have had to fall back for data for the present noted upon other publications, and I only claim for the following that they are the best readily attainable:—

Toronto: Mean temperature $44^{\circ}\cdot1$, highest $99^{\circ}\cdot2$, lowest $-26^{\circ}\cdot5$, range $125^{\circ}\cdot7$, mean daily range $16^{\circ}\cdot6$, mean humidity 77, mean rainfall 36 in.

St. John's, Newfoundland: Mean temperature 40° , highest $92^{\circ}\cdot5$, lowest $-21^{\circ}\cdot0$, range $113^{\circ}\cdot5$, daily range $14^{\circ}\cdot4$, rainfall 55 in.

Spence's Bridge, British Columbia: Mean temperature $46^{\circ}\cdot3$, highest 100° , lowest $-29^{\circ}\cdot0$, range $129^{\circ}\cdot0$ daily range $19^{\circ}\cdot3$, humidity 62, rainfall doubtful.

Manitoba, Winnipeg: Mean temperature $31^{\circ}\cdot3$, highest $95^{\circ}\cdot0$, lowest $-43^{\circ}\cdot1$, range $138^{\circ}\cdot1$, daily range, $23^{\circ}\cdot2$, humidity 84, rainfall 22 in.

The necessary limits of time and space have compelled me to pass over some of our minor Colonies, although in some of them (notably in the Falkland Isles) good work is being done.

And now I should like to sum up the results, but it is impossible to do so in any reasonable space. I therefore throw the figures into a table, and merely quote a few of the salient features.

Colombo, Ceylon, has the highest average temperature, $80^{\circ}\cdot7$, but Madras and British Honduras are nearly as hot.

The highest point reached in the shade at any of the stations quoted is at Adelaide, $113^{\circ}\cdot5$, but still higher temperatures are reported from the district near the junction of the Murray and Darling rivers.

The lowest temperature— $43^{\circ}\cdot1$, 75° below freezing, is reported from Winnipeg, Manitoba. This station is in lat. $49^{\circ}53'N.$, and is, therefore, nearer the Equator than any part of England, yet the cold is so intense as to freeze mercury nearly every winter.

The range of temperature, or the difference between the very highest and very lowest temperatures, and which may be regarded as the exponent of the amount of change between summer and winter, varies greatly, viz., from 21° at Barbadoes and British Guiana, to $138^{\circ}\cdot1$ at Manitoba, thus illustrating in an extreme manner the difference between tropical and insular and continental climates.

The difference between night and day, which averages 16° in London, is only 3° at British Honduras, and below 7° at St. Helena, Mauritius, and Barbadoes, all insular stations.

The driest climate seems to be Adelaide, the wettest is uncertain. The largest rainfall in the table is 95 in., at Singapore, but, as already mentioned, the actually largest known fall is at Cherra Poonjee, 527 in. The least is 21 in., at Adelaide, but it is much less, perhaps only 4 or 5 in., in Central Australia.

Leading Climatological Features of the Principal British Colonies.

Name of Colony and Station.	Temperature.					Mean Humidity.	Average Rainfall.
	Mean.	Absolute Max.	Absolute Min.	Absolute Range.	Mean Daily Range.		
	deg.	deg.	deg.	deg.	deg.	0—100	in.
London	49.0	95.0	5.0	90.0	15.6	82	25
St. Helena, Longwood	61.4	77.6	52.0	25.6	5.6	87	40
Cape of Good Hope	61.2	97.4	37.7	59.7	10.3	75	24
Natal	64.6	97.8	29.0	68.8	18.3	72	30
Mauritius	77.1	90.0	62.8	27.2	6.7	71	56
Bengal, Calcutta	79.0	106.0	52.7	53.3	13.2	76	66
Bombay	79.0	93.5	58.0	34.5	9.7	76	71
Madras	80.0	110.0	57.6	52.4	16.6	—	48
Ceylon	80.7	95.0	68.3	26.7	9.0	83	76
Straits Settlements	79.8	93.0	65.0	28.0	12.8	—	95
Queensland, Brisbane	70.0	108.0	34.5	73.5	20.9	76	51
New South Wales, Sydney	62.4	107.0	36.0	71.0	14.7	72	50
Victoria, Melbourne	57.5	111.2	27.0	84.2	18.8	72	26
South Australia, Adelaide ...	63.1	113.5	34.2	79.3	20.6	60	21
Tasmania, Hobart Town	54.4	105.0	29.0	76.0	17.9	75	23
New Zealand, Wellington ...	55.6	83.0	30.0	53.0	12.0	68	47
British Guiana	79.0	89.0	68.0	21.0	10.0	—	94
Barbadoes	75.0	85.0	64.0	21.0	6.8	83	67
British Honduras, Belize.....	80.0	88.0	58.0	30.0	3.0	—	71
Bermuda	71.0	95.0	46.0	49.0	14.0	80	48
Canada, Newfoundland	40.0	92.5	—21.0	113.5	14.4	—	55
" Toronto	44.1	99.2	—26.5	125.7	16.6	77	36
" Manitoba	31.3	95.0	—43.1	138.1	23.2	84	22
" British Columbia ..	46.3	100.0	—29.0	129.0	19.3	62	—

Although not a medical man, I should have been glad of the opportunity of saying a little respecting the effect of Colonial climates on the health of Englishmen; but time forbids more than a few words. As regards excessive heat, the hottest which has come under our notice is Central Australia, and there Mr. Todd says he has ridden fifty miles in the day with the temperature as high as 112° without much inconvenience or distress, because these high temperatures are always accompanied by such extreme dryness that perspiration affords instantaneous relief. Damp heat is what tells upon white men; and though a good deal of the injury ascribed to tropical climates is due to irregularities of life, there seems to be little doubt that to the majority of men continued damp heat is seriously injurious. In 1744 one John Peter Purry wrote a pamphlet with the title "Method for Determining the Best Climate of the Earth," in which he demonstrated to his own satisfaction that Eldorado was to be found on the 33° of attitude, both N. and S. He induced a sufficient number of people to believe in him to start with a party for South Carolina and establish a little Colony called Purrysburgh, but the only relic is the small town now called Parisburgh, near the

shore of the Savannah. I do not think that we are nearer the discovery of this terrestrial Paradise than John Purry was, but a pamphlet by Dr. Phillipps, recently lent to me, almost implies that it must be in the Blue Mountains of Jamaica.

I must say one word respecting consumption, and the great benefit of a voyage to Australia or to the high lands of the Cape of Good Hope. In consumption, it seems to me that prompt action is the essential point; and if I were a medical man I should soon lessen my circle of patients, for immediately that I was satisfied that phthisis was imminent, I should insist on a voyage, not to any of the fashionable lounges on the Mediterranean, but right away to Australia, and not to hurry back.

The application of meteorological data to agricultural practice is an almost untrodden field. It is in reality the key-stone of all attempts at acclimatization, and I much regret that so very little harmonious co-operation has existed between the respective leaders of meteorology, acclimatization, and agriculture; the subjects are mutually inter-dependent, and it is simply extravagance to carry on acclimatization or agriculture without due regard to climate. I had better illustrate this with an example. In a journal usually very well informed there was a note respecting acclimatization, in which it was stated that "the *Eucalyptus globulus*, or blue gum tree, would be a valuable acquisition for England, because of its remarkable effects in counteracting the malaria of marsh lands or swamps, and its enormous power of absorbing water." The errors in this statement are more numerous than the lines it occupies, but the one which affects us is the fact that the *Eucalyptus* cannot stand a hard frost, and only survives an English winter when it is as exceptionally mild as that of 1876-77, or when planted in a warm and sheltered corner. Under the influence of almost universal drainage, the "malaria from marsh land and swamps" in England is not a wide-spread evil, and where it exists the cold would soon settle the fate of any number of *Eucalypti*.

Although I do not think that acclimatization has hitherto been conducted on sufficiently scientific principles, I believe that it has been of great benefit, and may be of still greater.

Can anybody say why all the world should depend for its supply of currants upon one part of Greece? Mr. William Sowerby has shown that they can be grown, with a little winter shelter, in London. Why should not Australia grow its own? The keeping quality of the fruit depends chiefly upon its being properly dried. This, in the vicinity of Patras, is effected by the hot sun, and a shower seriously injures it; but are there not hot and dry periods in New South Wales?

I must not trespass further upon your time. I have tried to show you how little and how much we know of the subject I have brought before you. I have shown you that while some Colonies are working zealously and well, others ignore the subject altogether. I have explained that the fatal blot of want of uniformity prevails throughout the Empire, and I conclude by asking you to demand that uniform action be adopted to arouse the lethargic Colonies which are doing nothing, and to take such steps as to you shall seem fit to secure the promotion of investigations into the relation between climatology and agricultural produce.

UPPER CURRENTS AND CYCLONE AXES.

To the Editor of the Meteorological Magazine.

SIR,—You have already, by publishing in your columns my requests for assistance in the work of Cirrus observation, obtained for me so much valuable aid, that I am tempted to ask you to become the medium of another appeal to your readers.

And, first, I want the help of a larger number of Cirrus observers, especially in the north and west of the British Isles, and in France.

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I shall gladly continue to supply forms for the entry of observations to any who will undertake the task of making and recording them.

Secondly, I wish once again to direct especial attention to a particular point, which it is possible some of those persons who cannot afford time for keeping continuous records of the upper currents, may yet feel an interest in examining. In opposition to the views entertained by the majority of meteorologists, I have always maintained that the axis of a progressive cyclonic circulation is so inclined that the centre at the earth's surface is considerably in advance of the centre at the elevation of the cirri. On the accuracy or inaccuracy of this conclusion, an important part of the theory of the movements of the atmosphere will be found to depend. Fortunately there is little difficulty in testing that accuracy under many atmospheric conditions. I will instance two. If my conclusions be correct it will follow that,

1st.—Immediately after a wet and rough S. or S.S.W. wind, when first the wind veers, and the sky begins to clear in the west, the edge of the bank of cirro-stratus will be found to move from a S. or S.W. point, being then from a more southerly quarter than the wind near the earth's surface, and from a much more southerly quarter than the upper current which had been observed immediately previous to the rain. In other words, the upper currents continue to back until after the under currents have begun to veer.

2nd.—Immediately after thunder-rains in summer with E. or S.E. winds, when a fall of the barometer has just ceased, and a S.W. or W. surface-wind has commenced, the upper current will be observed to move from S. or S.E., being then from a more south-easterly point than the surface-wind, and from a much more south-easterly point than the upper current observed previously to the fall of the barometer.

It will be borne in mind that (as all observers are agreed) the upper currents in our district of the globe are, as a general rule, from a point on the left of the surface winds. Instances like those I have mentioned form striking exceptions to this rule. Theorists suppose that the inclination of a cyclone-axis is the opposite of what I maintain it to be, on the ground that the inferior part is detained by friction with the earth's surface. It is obvious that if this were the case the upper currents in the right-hand segment would veer *before* instead of *after* the surface winds.

It is to be hoped that this subject will receive more study. Personally I have no shadow of doubt as to the result of such study. I anticipate indeed a great reward. Probably in about four years' time, Mr. J. A. Broun, or some other meteorological authority, in a kindly postscript to a paper on the atmospheric circulation in cyclones, will draw attention to my conclusions as singularly corroborating some discovery of his own made three decades since. Meanwhile I shall continue to ask for assistance, invite criticism, and work out still further the results of the observations made.

Yours truly,

W. CLEMENT LEY.

June 8th, 1877.

BAROMETRIC TIDES.

To the Editor of the Meteorological Magazine.

SIR,—Eight months ago I sent the following to Mr. A. Buchan, and he promised a reply : but as it is not yet forthcome, will you or any of your readers favour me with a criticism.

Bushy Hill, Cambuslang, 1st June, 1877.

“ 30th October, 1876.

“ SIR,—In looking over your article “ Atmosphere ” in the *Encyclopædia Britannica*, the following occurred to me. Perhaps you will kindly favour me with one or two of the most telling objections to the hypothesis I assume, and think, that there can be little doubt that our atmosphere has persistingly a changing portion of it in a state of elongation in the direction of the sun—heaped upwards as in a cyclone—but in the form of a huge crescent-shaped wave, higher and larger towards the equator, shifting northwards and southwards with the summer, following the sun in a westerly direction like the aqueous tidal wave, and like it some hours behind the body occasioning the surge ; that this crescentic wave decreases in volume to mere cusps, and lags farther behind in higher latitudes, being at the same time subject to local disturbances, occasioned by irregularities of surface and other variations in the physical and chemical qualities of the regions traversed. Now, it appears to me that this lifting up of a portion of the air—this dragging it away to a certain extent from the earth—by relieving the lower stratum of the atmosphere from some of the superincumbent pressure, will occasion at the earth's surface below the relatively minimum barometric pressure occurring after 3 p.m. While, when the lifted-up mass of air is no longer upheld, then the previously suspended wave settling down and flowing over the recently less dense region will, from the increased barometric pressure thus occasioned, show as the maximum which occurs after 9 p.m. Again, as the body of the earth, like the heaped up wave of air, tends towards the sun, it will thus tend to move away from the air on the remote side, inducing an analogous minimum pressure after 3 a.m., followed in like manner by a maximum at 9 a.m., or later after the earth ceases to move away from the minished region. On the above hypothesis the aerial tides will be greatest, and therefore most obvious within the tropics, though even in this zone there will, as stated above, be disturbing influences as there are to the aqueous tides ; and those of a more numerous and varied character. It will of course be asked, when, as we see in the case of the water tides the moon has the greater sway and the sun the lesser, why is it that in the case air tides the influence of the moon seems almost, if not altogether, non-existent ? I imagine that if the effects of the moon in producing aerial tides be carefully and systematically sought after with sufficiently delicate instruments, they will be detected, spring and neap tides in air as in water being among the number. I should say, however, that the question ought not to be put in the above fashion, but rather in this form : admitting that the

presence of the sun may influence both air and water, why is it that the effect of the moon on the tides of the ocean is greater than the effect of the sun is, although he has greater general influence, as is evident from both earth and moon being compelled to travel round him? This is because the smaller but nearer body acts more locally on the more localized waters, while the sun's influence is obviously immensely more general, and thus it acts more than the moon on the air which surrounds the earth everywhere.

“HENRY MUIRHEAD.”

GREENWICH EXTREME TEMPERATURES.

The extreme Shade Temperature of the month of May at the Royal Observatory, Greenwich, during the past 36 years.

Year.	Maximum.		Minimum.		Year.	Maximum.		Minimum.	
	deg.	date.	deg.	date.		deg.	date.	deg.	date.
1841	82·8	27	41·2	13	1859	77·0	30	33·1	6
1842	74·7	29	36·4	9	1860	76·5	23	32·5	7
1843	69·5	12	35·4	6	1861	80·2	23	33·4	9
1844	77·4	14	33·9	17	1862	81·5	6	37·8	3
1845	69·5	31	34·4	10	1863	79·7	29	31·4	1
1846	84·3	31	38·3	15	1864	81·0	18	33·4	30
1847	86·2	28	36·1	2	1865	78·5	21	31·4	1
1848	83·0	15	34·5	1	1866	73·1	28	32·6	4
1849	75·0	5	36·4	12	1867	83·6	7	31·9	24
1850	76·5	31	31·7	3	1868	87·0	19	33·9	7
1851	74·2	29	33·5	5	1869	70·5	26	33·3	2
1852	73·4	16	29·3	3	1870	85·4	21	29·8	9
1853	78·8	27	32·6	11	1871	79·5	25	34·0	12
1854	70·5	17	34·8	19	1872	73·2	28	32·6	20
1855	81·5	26	28·3	5	1873	70·9	26	34·0	20
1856	72·0	11	29·8	5	1874	77·6	22	31·1	10
1857	80·2	16	31·5	4	1875	81·9	15	36·6	31
1858	81·2	31	32·1	7	1876	73·6	21, 30	31·5	3, 5

Extremes in 1877, Max. : 67°6' on 26th ; Min. : 28°·1 on 4th.

	Year.	Max.	Date.	Min.	Date.	Year.
Means of 36 years	...	77·8	22	33·5	9	...
Highest	1868	87·0	19	41·2	13	1841
Lowest	1843*	69·5	12	28·3	5	1855
Range .....	...	17·5	...	12·9	...	...

* In 1845 the same max. occurred on the 31st.

The Mean Temperature of May, 1877.—The Astronomer Royal kindly informs me that the mean temp. of this month was 48°·9, or 3°·9 below the average (1841–1876). Since 1841 it has never before been so low. In 1845 it was 49°·4 ; in 1855, 49°·0 ; in 1876, 49°·5 ; and in 1876, 49°·4.

EDWD. MAWLEY.

Addiscombe, June 6th, 1877.

TEMPERATURE OF RAIN.

To the Editor of the Meteorological Magazine.

SIR,—Will any of your correspondents give me a hint as to the best method of obtaining the temperature of rain, before it touches the earth. I have been observing it for some time past, thinking it might throw light upon the vexed question of “Difference of rainfall with elevation,” but am inclined to think it is not so simple a matter as at first sight it appears.

The temperature of the rain as it falls from the roof is often considerably in excess of that of the air at the same time.

I can only come to the conclusion that the rain drop is *sensibly* warmed by the sudden stoppage of its motion when it reaches the ground. If this be true, some slight compensation is rendered back to the earth for the loss of the heat, which ascends (in a latent state) with vapour into the atmosphere, and is radiated into space when that vapour is condensed.

G. DINES.

Woodside, Watton-on-Thames.

SUPPLEMENTARY TABLE OF RAINFALL IN MAY, 1877.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see Met. Mag., Vol. XI., p. 28., but the list is under revision and further details will be given in a month or two.]

Div.	Station.	Total Rain.	Div.	Station.	Total Rain.
		in.			in.
II.	Acol	2.48	XI.	Llanfrechfa	4.40
„	Hailsham	2.07	„	Castle Malgwyn	3.67
„	St. Lawrence, I. of W....	2.20	„	Heyope .....	...
„	Andover.....	2.28	„	Carno	5.14
„	Strathfield Turgiss	2.04	„	Rhug, Corwen	4.24
III.	Addington Manor	3.34	„	Port Madoc	3.45
„	Oxford	2.22	XII.	Melrose	2.12
„	Northampton	2.06	XIV.	Cessnock, Glasgow	1.98
„	Cambridge.....	1.44	XV.	Gruinart	1.60
IV	Sheering	2.97	XVII.	Keith	3.06
„	Ipswich	1.73	XVIII.	Dalwhinnie	1.33
„	Diss	2.03	„	Auchnasheen	3.42
„	Swaffham	1.59	„	Springfield, Tain	2.49
V.	Compton Bassett	3.08	XX.	Skibbereen .....	...
„	Dartmoor	7.58	„	Glenville, Fermoy	4.36
„	Teignmouth	4.01	„	Tralee.....	2.90
„	Langtree, Torrington ..	3.63	„	Newcastle W., Limerick	3.18
„	Cosgarne, St. Austell ...	5.66	„	Kilrush	2.16
„	Taunton	3.20	XXI.	Kilkenny	2.68
VI.	Bristol	2.24	„	Kilsallaghan	2.76
„	Sansaw	2.48	„	Twyford, Athlone	3.28
„	Cheadle	3.42	XXII.	Ballinasloe.....	3.45
VII.	Coston, Melton Mowbray	2.47	„	Kylemore	8.70
„	Bucknall	1.70	„	Carrick on Shannon....	2.85
V III.	Walton, Liverpool	2.58	XXIII.	Rockcorry	2.58
„	Broughton-in-Furness ..	3.97	„	Warrenpoint	3.56
IX.	Stanley, Wakefield	2.01	„	Carnlough, Larne.. ..	3.15
X.	Gainford	2.28	„	Bushmills	1.91
„	Shap	4.36	„	Buncrana	2.22

MAY, 1877.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which 41 or more fell.	TEMPERATURE.				No. of Nights below 32° On grass
		Total Fall.	Difference from average 1860-5	Greatest Fall in 24 hours.		Deg.		Date.	Deg.	Date.		
				Dpth	Date.							
I.	Camden Town	1.91	— .49	.28	19	15	68.0	26	29.2	4	4	
II.	Maidstone (Hunton Court)	2.26	+ .02	.77	12	12	...	...	...	...	...
III.	Selborne (The Wakes)	3.25	+ .77	.56	16	19	63.0	8	26.5	5	6	
IV.	Banbury	2.52	+ .59	.34	16	19	63.0	31	23.0	3, 4	6	
V.	Bury St. Edmunds (Culford)	3.31	+ 1.09	1.00	16	19	65.0	27*	27.0	5	6	
VI.	Norwich (Sprowston)	1.54	— .62	.31	28	16	70.0	31	22.0	4	6	
VII.	Bridport	1.91	...	.47	19	14	...	...	...	...	...
VIII.	Barnstaple	2.10	+ .07	.72	16	13	...	...	...	...	...
IX.	Bodmin	2.95	+ .51	.65	16	13	66.0	26†	34.0	6	...	
X.	Cirencester	6.02	+ 3.56	1.28	31	16	63.0	26	37.0	7	0	
XI.	Shifnal (Haughton Hall)	2.55	+ .27	.77	16	15	...	...	...	...	...
XII.	Tenbury (Orleton)	2.32	+ .06	.39	16	15	68.0	31	28.0	4	7	
XIII.	Leicester (Belmont Villas)	3.32	+ .44	.68	14	15	66.0	31	26.0	5	6	
XIV.	Boston	2.15	...	.41	31	16	72.2	31	28.0	4	3
XV.	Grimsby (Killingholme)	1.41	— .53	.32	17	17	70.0	31	27.0	4	4	
XVI.	Mansfield	1.34	...	.39	18	12	63.0	27	29.0	5	2
XVII.	Manchester	3.40	...	.69	10	17	71.0	31	23.2	6	5
XVIII.	York	2.76	+ .10	.49	10	15	67.0	18	26.0	6	3	
XIX.	Skipton (Arncliffe)	2.29	+ .34	.66	17	13	64.0	31	26.0	6	2	
XX.	North Shields	3.73	+ .38	.82	27	14	62.0	26	...	...	...
XXI.	Borrowdale (Seathwaite)	2.23	— .41	.42	11	15	59.5	26	30.0	4, 5	2	
XXII.	Cardiff (Crockherbtown)	10.92	+ 1.38	3.35	24	13	...	...	...	...	...
XXIII.	Haverfordwest	2.47	...	.99	16	14	67.0	26	32.5	4	0
XXIV.	Aberdovey	4.42	+ 1.70	1.54	27	10	66.0	26	28.3	4	4	
XXV.	Llandudno	3.32	...	.90	28	12	74.0	26	34.0	5	0
XXVI.	Dunfries (Crichton Asylum)	2.32	— .06	.55	10	13	68.5	8	34.0	5	...	
XXVII.	Hawick (Silverburn Hall)	3.20	+ .77	.83	27	14	60.6	15	25.0	5	8	
XXVIII.	Kilmarnock (Annanhill)	2.66	...	.68	27	15	...	...	...	...	...
XXIX.	Castle Toward	2.14	...	.52	17	16	61.5	9	28.0	4	5
XXX.	Mull (Quinish)	1.71	— 1.68	.40	28	8	63.0	21	26.0	8	8	
XXXI.	St. Andrews (Cambo Ho.)	2.63	...	.73	27	9	...	...	...	...	...
XXXII.	Grandtully	1.55	...	...	...	...	...	...	...	...	...
XXXIII.	Braemar	2.62	...	1.06	31	10	...	...	...	...	...
XXXIV.	Aberdeen	1.89	+ .09	.57	17	14	56.8	7	23.0	3, 5	8	
XXXV.	Gairloch	2.96	...	.51	17	18	59.2	30	30.6	3	3
XXXVI.	Portree .....	...	...	...	...	...	...	...	...	...	...
XXXVII.	Inverness (Culloden)	3.57	— 2.08	.89	26	16	...	...	...	...	...
XXXVIII.	Helmsdale	2.37	+ .81	.94	19	17	62.7	16	27.1	3	7	
XXXIX.	Sandwick	2.39	...	.72	17	15	...	...	...	...	...
XL.	Caherciveen Darrynane Abbey	2.73	+ .47	.79	26	19	59.0	27	29.6	3	2	
XLI.	Cork	3.52	...	.90	31	15	...	...	...	...	...
XLII.	Waterford	3.80	...	1.27	31	13	...	...	...	...	...
XLIII.	Killaloe	3.31	+ 1.06	.81	27*	15	68.0	21§	30.0	6	3	
XLIV.	Portlanning	3.48	+ .30	.50	11	15	71.0	26	31.0	6, 9	3	
XLV.	Monkstown, Dublin	1.86	— 1.34	.29	28	17	63.0	26	28.0	4	2	
XLVI.	Galway	2.10	+ .19	.31	16	15	67.0	27	29.0	5	2	
XLVII.	Ballyshannon	3.53	...	.70	14	18	64.0	21	31.0	5	2
XLVIII.	Waringstown	2.66	...	.37	15†	15	...	...	...	...	...
XLIX.	Edenfel (Omagh)	3.21	...	.79	10	17	72.0	19	27.0	4	4
L.	...	2.46	...	.43	31	13	61.0	14||	26.0	3, 4	5

And 31.

+ 10

* And 31.

† 18.

‡ 27.

§ 25.

|| 16, 26.

¶ 5, 6.

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

METEOROLOGICAL NOTES ON MAY.

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

ENGLAND.

SELBORNE.—No R during the first week, but several white frosts; prevailing winds N. and N.E. T and L about the middle of the month.

BANBURY.—Thunderstorms on the 16th and 18th, with H and high wind on the first day; high wind also on the 27th and 31st.

CULFORD.—The first week of the month was decidedly winterly, with considerable depression of temp. each night. On the nights of the 3rd, 4th and 5th the temp. fell to 23°, 22°, and 24° respectively, the minimum being a lower temp. than was experienced here during the month of January last, and one of the results in this neighbourhood is the entire destruction of the fruit crops. Easterly winds prevailed until the 17th.

SPROWSTON.—Several sharp frosts during the month; barley yellow and unable to grow; grass very short; season backward. T on the 10th and 18th; high wind on the 27th and 28th.

HAUGHTON HALL.—No R for the first 8 days, during which time there were frosts nightly; R daily, with two exceptions (12th and 13th), from 8th to 20th, inclusive, with warmer temp., which at length started the bare pastures; R again copiously and daily from 27th to the close; winds variable, but strong throughout the month. Apple trees in blossom on 19th, hawthorn on the 30th, cuckoo heard on the 4th, swift seen on the 10th.

ORLETON.—Another very cold, ungenial month, with a prevalence of N. and E. winds, and very little sunshine. The first 8 days were dry, with frosts every morning and cold wind. The frosts on the 4th, 5th, and 6th were very severe, and destroyed all the early fruit. A TS occurred at 2.30 p.m. on the 9th, and the weather was showery and unsettled till the 20th, when it became dry but cloudy again, and remained so till the 27th; the remainder of the month was very rainy; T was heard on the 9th and 16th, and L was seen on the 9th; the wind was violent on the 27th, 28th, and 29th. The mean temp. of the month was about 4° below the average, and was lower than that of any month of May for more than 20 years.

LEICESTER.—Temperature generally low; severe frosts during the first week, the ther. readings on the 4th, 5th, and 6th being lower than any in January; mean temp. 48°·3, considerably below the average.

GRIMSBY.—Very cold, cloudy month; foliation very slow and backward, the ash, oak, and black poplar have only just begun to open their leaves; very few migratory warblers appear to have come to us this season. T and L on the 16th, and T on 18th.

MANSFIELD.—A cold month, with cold rains in the middle; a total change on the 25th, from which time till the end of the month the weather was warm; everything very backward, no lilac in flower, though buds just bursting. T and L on the 10th and 16th.

ARNcliffe.—Cold, ungenial weather till the 24th, when the wind changed from E. to W., followed by a rapid fall in the bar. TS on the 16th.

WALES.

HAVERFORDWEST.—Notwithstanding the very wet April and an almost equally wet May, in consequence of the severe frosts of this month vegetation is more backward than it has been for years, nearly as much so as in May, 1876, when the rainfall was only '33 in. for the whole month. The whitethorn not yet in blossom. A very severe gale with heavy rain (1·54 in.) on the 27th; there were also gales on the 19th and 31st.

ABERDOVEY.—E. and N.E. winds have prevailed during the month, which have been very fertile in producing congestion of the lungs, &c.

LLANDUDNO.—Polar winds prevailed for two-thirds of the month, and the

mean temp. is more than $2^{\circ}\cdot5$ below the average, though vegetation is rather backward the ground is in a favourably moist condition for the rapid growth of plants when warm weather ensues.

SCOTLAND.

DUMFRIES.—The winds have been easterly nearly all the month, and hence the temp. has been about 5° below the average; white frosts have been frequent, and S was observed on the hills on the 4th. Winds generally light, but a heavy gale from S.W. was registered on the 28th.

HAWICK.—During the first half of the month cold, easterly winds prevailed, and the last day of the month was the only one that could be said to be truly summer-like, and the deciduous trees, with the exception of the hawthorn, looked more than half afraid to expand their foliages; everything here is more than three weeks late.

ANNANHILL.—A cold month, mean temp. $3^{\circ}\cdot3$ above average; winds generally easterly and south-westerly, very high on the 27th, 28th and 29th, the gale of the 29th reaching 68 miles per hour. During the last half of the month foliage of all kinds much improved, also pastures.

CASTLE TOWARD.—In the beginning of the month we had pretty severe frosts, the temperature falling as low as 26° , which was a great check to vegetation. There was also a great deal of E. wind with strong sunshine, which scorched everything up; on several days the wind was very strong and cold. There were very few of what might be termed good growing days in this month, we had only two or three towards the latter end, and they were always followed by cold nights, which checked the growth. In general, farmers calculate on being three weeks later this season than the last, and it was a pretty late spring also.

BRAEMAR.—A cold, ungenial month, with the exception of a few days at the close. T was heard on the 16th at 2 p.m.

PORTREE.—The coldest May on record, frost every night till the 25th; ice $1\frac{1}{2}$ inch thick on 5th, and 1 inch thick on the 2nd and 8th. S showers on the 2nd, 3rd and 4th; the pasture grass was completely burned up with the frost and sharp E. wind at night, together with bright sun during the day; the R of the last few days improved the pastures greatly.

SANDWICK.—May continued very dry till 17th, but then above half-an-inch of R fell, and since the 23rd there has been some R every day, and more than enough. N.E. winds prevailed till the 26th, but since then there has been a change of wind and temp. for the better; on the 3rd, 4th and 5th the ground was covered with S in the morning, but it was thawed by the sun at midday. Aurora coruscating to zenith on 2nd.

IRELAND.

DARRYNANE.—A cold, ungenial month, with almost constant E. winds; vegetation very backward.

KILLALOE.—A wet and windy May; very little frost, but temp. rather lower than the average, mean being $52^{\circ}\cdot5$, 1° less than May, 1876, in which there were five nights of frost; the month closed with squalls and heavy R.

BALLYSHANNON.—The month was very changeable throughout, from 4th to 9th there were sharp frosts, cutting down potatoes to the ground; 11th and 12th very cold; from 14th to 17th fine, seasonable weather; 18th, heavy gale from N.W., and from 26th to the end of the month very heavy gales from W. and N.W., doing much injury to fruit.

WARINGSTOWN.—The latest spring in the memory of the oldest inhabitant; lime trees only just budding and ash perfectly bare yet, grass good, however, and most crops promising well.

EDENFELL, OMAGH.—First week dry and parching, with strong easterly wind by day, and keen frosts at night; second week rainy, humid and favourable for vegetation; from 19th to 26th, dry and clear, remainder of month rainy and inclement; vegetation still very backward owing to the continued low temperature.

SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CXXXVIII.]

JULY, 1877.

[PRICE FOURPENCE
or 5s. per ann. post free.]

SEA TEMPERATURE AND THE HERRING FISHERY.

It is not at all easy to understand why so few observations are made upon the temperature of the sea round the coast of England. Attention has been repeatedly called to the subject in these pages*, but with, we believe, very little effect. English observers never seem to think of observing the temperature of the sea, and even the telegraph stations of the Meteorological Office, though mostly on the coast, do not report sea temperatures. We have an impression that it was stated at a meeting of the Meteorological Society that arrangements were in progress for a few sets of observations being made under some branch of Government, but we cannot find any record in the Society's publications, and do not know what, or whether anything, is being done. In either case there is plenty of room for private enterprise, and we trust that English observers will cease compelling investigators to rely solely on the records of their Scottish *confrères*.

We have been led to these remarks by the following note from one of the Scotch Fishery Commissioners, A. S. Finlay, Esq., of Castle Toward, which we desire to support in every way in our power :—

SEA TEMPERATURE.

To the Editor of the Meteorological Magazine.

DEAR SIR,—Allow me to suggest that it might help to increase our knowledge of the meteorological phenomena of this country if the temperature of the sea on the British coast, as well as in the Northern seas, could be registered. The Fishery Board of Scotland keep such registers of the sea temperature off the Scotch coasts, as it is found to influence the motions of the herrings, and I have no doubt the secretary, the Honble. W. F. Primrose, Fishery Board, Edinburgh, would let you have such information on the subject as he possesses.—Yours faithfully,

ALEX. S. FINLAY.

Castle Toward, Argyllshire, 6th July, 1877.

* See especially *Meteorological Magazine*, vol. V., p. 11, 12.

What number of stations, or what class of observations the Scotch Fishery Board may have, we do not know, nor whether or not any English Board is at work upon the subject. At present we believe that there is not one English meteorological station where sea temperature is observed. In December, 1875 (our Scotch friends are rather behindhand, for we cannot find any later records), sea temperature was regularly recorded at Sandwick and Barry, and also at Stykkisholm in Iceland, and Thorshavn in Faroe. In the previous month observations are also reported from Stornoway, but even this gives the Scottish Society only three sea temperature stations in Scotland.

HAILSTORM IN NORTH LONDON.

[Although part of the following communication appeared in *The Times* of July 4th, we hope that in its completed form it is worthy of insertion.—ED.]

A hailstorm occurred here at 8.4 p.m. to-day, July 3rd, which has had no equal since I commenced recording meteorological observations more than 20 years ago. Nay, more; it has not, I believe, been equalled in London since the great storm on August 1st, 1846, when skylights were broken in all directions, notably those of the picture gallery in Buckingham Palace.

Before stating what I have been able to ascertain respecting its limits (and fortunately those of hailstorms are generally narrow), I will state what occurred here; but, as the whole duration was only three minutes, the observations were necessarily hurried, and, but for Pastorelli's storm rain-gauge, matters would have been much worse.

Rain had fallen at intervals during the day, and up to 8 p.m. a little more than a tenth of an inch had been recorded. At 8.2 it began to rain, at 8.3 a little hail fell, and a confused rushing or rattling sound was plainly audible. In about 10 or 15 seconds the storm was full upon us, and by 8.7, or in three minutes and a half, or thereabouts, the mingled hail and rain amounted to more than half-an-inch deep. In point of quantity and time combined I do not know that such a fall has ever been measured in this country. It was at the rate of nearly eight inches an hour. The hailstones were not excessively large, but they were remarkably uniform in size, shape, and composition. They were almost wholly crystalline ice, with a little speck of opaque in most of them; they were very symmetrical, and about intermediate between true spheres and the shape of acidulated drops, their average diameters were 0.3 in. by 0.2 in., but they ranged from that of large peas to that of large cherries. I measured several which were more than $\frac{3}{4}$ -inch across. The effect upon my garden has been very severe. I enclose a riddled leaf as a specimen, and I may also mention that it has broken two solar radiation thermometers, one of which has been exposed to all weathers since 1860.

It is not easy to define the precise boundaries of a hailstorm, except where the hail falls with such impetus as to break all the glass ex-

posed to it. This local storm fell with remarkable gentleness, considering the size of the stones, and hence it was only practicable to trace it by verbal description, and by comparing the effect upon a few definite and almost universal plants. From this it appears that the limits which I assigned to it the same night were substantially correct. The worst of it was about 200 yards S.E. of this station, and this is partly confirmed by the line of rain gauges which, going from S.W. to N.E., gave—

ROYAL BOTANIC GARDNS. Regent's Park.	CAMDEN SQUARE.	CAMDEN ROAD. No. 235.	CAMDEN ROAD. No. 277.
·28 in.	·64 in.	·39 in.	·37 in.
Distance from Camden Sq. 1·35 mile.	0 mile.	0·45 mile.	0·70 mile.

Very little hail fell west of the Tottenham Court Road, and the heaviest line was parallel with the North London Railway from Camden Town Station to Barnsbury.

G. J. SYMONS.

Camden Square.

THE THUNDERSTORM OF JUNE 11TH, 1877.

WE have not received so many notes as usual respecting the above storm, and this is rather remarkable, as it was, we believe, an exceptionally severe storm, and the rainfall in some places very unusual—for instance, the fall of 2·97 in. at the very dry station of Acol, near Margate, is altogether an unusual fact; and 2·40 in. and 1·71 in. at two Hastings stations are large amounts. Slightly more than an inch is reported from Benenden, Tenterden, and Hailsham, but the average over the S.E. counties seems to have been under half an inch.

OBSERVATIONS MADE DURING THE STORM AT HASTINGS, 11TH JUNE, 1877.

6.30 P.M.—Wind N.E.; clouds S.W.; heavy thunder, with vivid lightning over the sea; rain just commenced.

9.10.—*Memo.* A little before six, heavy clouds were noticed over the sea, and the rolling of thunder heard. By 6.30 the thunder was more distinct, and lightning began to be seen, and rain in heavy drops to fall, which continued till 8.30, but the amount was not great. From 7 till 8 the storm seemed almost stationary over us, perhaps a little to the northward; the lightning was most vivid, flashing apparently chiefly between clouds, but some flashes reached the earth, and many extended certainly a quarter of a circle, although at some distance off. The thunder was very heavy. At 9, there was lightning nearly all round, especially in the S.S.W. and W. The clouds came from S.—S.S.W., but the wind the whole time blew from the N.E.; eight and nine there was very little, but soon after eight it freshened. At nine, there were distinct streamers from S., but although in all probability the motion was from there, it could not be told.

9.25.—Barometer rising slightly, had been falling rather fast.

10.30.—Almost constant lightning to southward, with occasional thunder.

10.40.—Heavy squall from southward.

11.0.—Tremendous rain from northward, with incessant lightning and thunder. Thunder not very loud; most of the lightning appeared to be high up. Barometer had risen rapidly. Wind N.N.E.

11.35.—Heavy thunder, lightning, and rain, since last observation, and still continues. Barometer has fallen fast.

11.45.—Heavy rain just commenced from about S.W. Barometer rising very rapidly.

11.52.—Barometer still rising.

12.15.—From 12 to the present time the storm has been worse than before, the lightning being more brilliant and nearer. Raining, but little wind. Barometer falling.

12.30.—Raining, but little wind. Lightning still bad, but flashes not so frequent. Barometer falling. Wind back to about N.N.E.

12.45.—Wind E.S.E. Raining heavily, lightning vivid, thunder still heavy. Barometer rising.

12.55.—Lightning very much less frequent, but still bright, more distant. Barometer steady.

1.15.—Lightning now only at long intervals.

Rainfall at 9 a.m. next morning, 1.710.

ALEX. E. MURRAY.

GROVE, ST. LEONARDS-ON-SEA.

The rainfall at this place (about 100 feet above sea level) between 6.30 p.m. on June 11th, and 6.30 a.m. on June 12th, was 2.40 in.

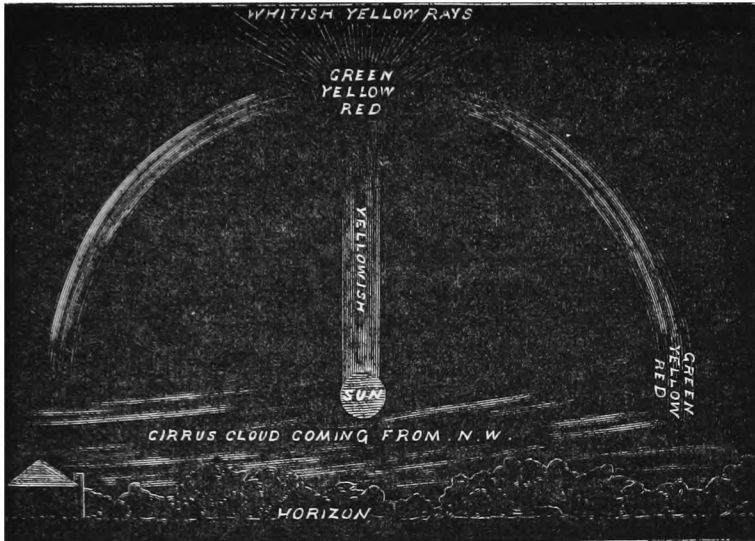
WM. B. YOUNG.

HALOS, PARHELIA, AND A PARASELENA.

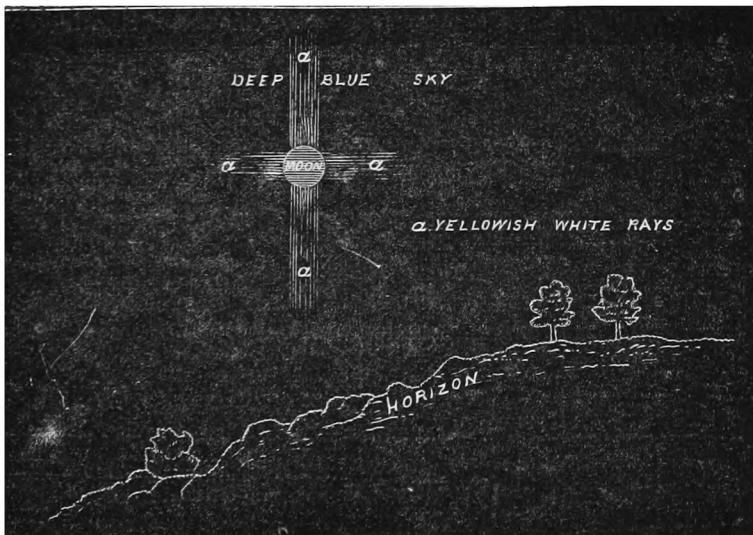
To the Editor of the Meteorological Magazine.

SIR,—Yesterday evening (June 24th) I observed both parhelia and paraselena here.

From 7.30 to 8.30 p.m. the sun was setting in the W.N.W., and a low bank of cirrus cloud extended from the W. to the N. horizon, in which the sun became enveloped after 8 p.m.; elsewhere the sky was clear, though rather greyish blue. During this time a faint yellowish ray extended upwards from the sun about 15° , and above this, at $22\frac{1}{2}^\circ$ above the sun, a bright prismatic coloured patch appeared; a similar one was also visible $22\frac{1}{2}^\circ$ on the right hand of the sun (towards the N.W.). This latter only lasted till 7.50 p.m., but the former one continued till 8.30 p.m. Both patches were reddish towards the sun, and greenish yellow outside. There were faint signs of a circle 45° diameter round the sun about 8 p.m. Annexed is a slight sketch of the appearance at 7.45 p.m., looking W.N.W. :—



The nearly full moon rose in the S.E. about 8.30 p.m., and from 9.10 to 9.45 p.m. formed the centre of a cross of yellowish white rays, extending about 5° on either side. After 9.30 p.m. the lower rays became longer (about 7°), changing what was at first a Greek cross into a Latin one. Annexed is a sketch of the appearance about 9.30 p.m., looking S.S.E. :—



The horizontal rays faded away about 9.45 p.m., but the vertical ones remained more or less visible till 11.30 p.m. Between 11.15 and 11.30 p.m. a bright whitish patch (paraselena) was visible $22\frac{1}{2}^\circ$ above the moon, and a circle of whitish light, 45° diameter, surrounded the

moon at all but the lower part. The sky was then partially covered with cirrus cloud coming from and radiating to the N.W.

The evening was cold for the season, temp. at 9.14 p.m. (Greenwich time) being, dry $49^{\circ}5$, wet $45^{\circ}3$, and barometer at 32° , and sea level 30.230 in., with a very light air from S.W. Temp. fell in the night to $44^{\circ}6$ in the air, and $37^{\circ}1$ on grass.—Yours sincerely,

EDWIN E. GLYDE.

Kirkham, Babbacombe, Torquay, June 25, 1877.

REMARKABLE HAILSTONES.

To the Editor of the Meteorological Magazine.

SIR,—During a thunderstorm of some severity to-day, hailstones of a remarkable shape and size, fell here. They closely resembled a peg-top in shape, the upper part being formed of transparent ice, clear as crystal, while the lower part was composed of non-transparent ice like ordinary hailstones. We weighed a dozen of them, and found them in the aggregate to equal an ounce in weight.—Yours truly,

HENRY A. COSGRAVE, M.A.

Corrstown House, Kilsallaghan, Co. Dublin, July 3, 1877.

TEMPERATURE OF RAIN.

To the Editor of the Meteorological Magazine.

DEAR SIR,—I see a letter in your last issue about the temperature of rain, and asking for information on the subject.

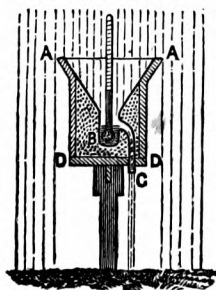
I send you the accompanying from the proceedings of the Edinburgh Royal Society.—Yours very truly,

T. STEVENSON.

Chambers, 84, George Street, Edinburgh, June 20th, 1877.

Proposed Method of ascertaining the Temperature of Falling Rain. By THOMAS STEVENSON, F.R.S.E., Civil Engineer.

A FRIEND informed me some time ago that the late Principal J. D. Forbes had often noticed that a long continuance of rain resulted in a track of cold weather. Principal Forbes attributed this fact to the rain having a lower temperature than the atmosphere through which it fell. It does not appear, however, that he made any observations to determine the truth of his hypothesis, and as the subject is of considerable importance in other meteorological questions, it occurred to me that a simple instrument could be made for ascertaining the temperature of falling rain.



This instrument, a rough model of the funnel of which was lately shown at a meeting of the Scottish Meteorological Society, is represented in the accompanying diagram, in which A B C is a conical funnel of thin glass, terminating in a small tube deep enough to contain the bulb of a thermometer, and recurved so as to form an off-let or waster. A D D A represents a box of wood into which the glass funnel is inserted, the space between the glass and the wood being carefully filled with sawdust or any other bad conductor of heat. The rim of the funnel should be bent over the upper edges of the box,* so as to

* It may be found better to carry the tube, at the second curve, horizontally through the side of the box instead of downwards.

prevent the possibility of rain lodging itself among the sawdust. The rain-drops intercepted by the funnel will pass off through the bottom of the box by the tube C.

By this or some such simple arrangement the temperature of any heavy fall of rain may be ascertained with tolerable accuracy. It is, of course, necessary that a dry bulb thermometer, properly protected by a louvre boarded box, should be observed simultaneously with the *rain thermometer*.

The difference of temperature between the air and rain could also be ascertained by means of an instrument on the principle of Leslie's differential thermometer, one bulb of which would be placed at the bottom of the glass funnel, while the other would be protected from the rain. In this way the differences of temperature would be constantly shown by means of a single instrument.

[A report upon this subject by the Rev. J. Chadwick Bates, some of his observations *in extenso*, and a description of his apparatus, will be found in *British Rainfall*, 1865, pages 10 to 12. The article is too long to reprint here.—ED.]

GREENWICH EXTREME TEMPERATURES.

The extreme Shade Temperatures of the month of June at the Royal Observatory, Greenwich, during the past 36 years.

Year.	Maximum.		Minimum.		Year.	Maximum.		Minimum.	
	deg.	date.	deg.	date.		deg.	date.	deg.	date.
1841	78·5	18	40·3	15	1859	81·3	26	43·5	25
1842	87·4	12	44·7	2	1860	74·0	24	43·5	6
1843	77·8	27	42·9	4	1861	81·8	19	42·9	10
1844	87·6	24	43·4	2	1862	73·5	2	43·4	10
1845	86·0	13	43·8	28	1863	84·0	3	42·1	1
1846	91·1	20	49·4	1	1864	78·4	7	42·3	2
1847	80·4	2	41·4	8	1865	87·6	23	41·2	12
1848	79·0	15	39·7	3	1866	86·5	27	42·2	17
1849	80·7	5	38·6	14	1867	82·1	12	40·5	29
1850	85·1	23	36·2	16	1868	88·0	20, 27	44·7	1
1851	87·0	27	38·5	1	1869	87·5	7	35·6	1
1852	72·7	25	41·0	1	1870	90·2	22	41·4	6
1853	81·0	11	39·9	4	1871	77·2	15	38·7	5
1854	80·0	25	41·4	1	1872	86·0	17	40·6	7
1855	83·5	6	39·3	3	1873	81·2	27	42·0	7
1856	83·1	27	41·1	6	1874	83·7	2	37·5	13
1857	92·7	28	38·8	14	1875	83·3	4	41·0	1
1858	94·5	16	45·3	28	1876	83·9	21	40·1	11

Extremes in 1877, Max. : 85°5' on 29th ; Min. : 44°·2 on 7th and 25th.

	Year.	Max.	Date.	Min.	Date.	Year.
Means of 36 years	...	83·3	17	41·4	9	...
Highest	1858	94·5	16	49·4	1	1846
Lowest.....	1852	72·7	25	35·6	1	1869
Range .....	...	21·8	...	13·8	...	...

EDWD. MAWLEY.

A WHIRLWIND.

To the Editor of the Meteorological Magazine.

SIR,—I must send you a short account of a whirlwind which I witnessed yesterday afternoon (July 5th).

At 1.50 p.m. I observed some men, who were haymaking in a meadow a short distance below the house, looking up in the air. On my looking up also, I saw some hay whirling round and round in the air. Some of the hay kept falling, turning round and round as it fell, but a considerable portion flew off at a great height, high above the trees, to the N.E., and I lost sight of it. The hay was evidently whirled up from the field in which the men were at work. The wind was S.W., and light at the time, the clouds being rather stormy.

Nothing remarkable happened afterwards; but about 3 p.m. a storm appeared in the south, and distant thunder was heard several times. Rain began at 3.30, and it looked threatening, the wind also being very gusty, but we only had here a steady rain till 5.30 p.m. (0.12). At 10 p.m. there was bright lightning and slight thunder in the N.W.—Yours faithfully,

EDWARD C. MORRELL,

Broughton Lodge, Banbury, July 6, 1877.

MODERN METEOROLOGY.

“A mere glance at the proceedings of a meteorological observatory of the present will suffice to convince one who is familiar with the old methods that this branch of science has been greatly extended of late in its range of observation. To make daily note of the temperature of the air and the ground, the atmospheric pressure and moisture, the state of the sky, the direction and force of the winds, and the quantity of rain or snow that may fall; this might fairly represent the work of former meteorologists, but it is far from being equal to the requirements arising out of the fuller knowledge now possessed of the significance of natural phenomena. He who would acquire scientific notions regarding what is termed the weather cannot now afford to neglect a domain that was formerly reserved for the physicist proper, including the phenomena of terrestrial magnetism, atmospheric electricity, ozone, the action of solar rays, &c. Who among the earlier meteorologists would have thought of foretelling changes in weather from the delicate motions of a magnetic needle, or the changes of colour in a piece of paper? But, according to M. Marié Davy, certain changes in the declination of the needle will indicate nearly always, and several days in advance, the passage of a squall in the north-west Atlantic, or the coming of rainy winds. And the chemically-prepared papers which colour under the influence of atmospheric ozone have been found to announce the approach of a storm almost as surely as the barometer. They colour, more or less, every time the centre of the whirling motion passes to the north of the place of observation, whereas they remain nearly unaltered if the centre passes to the south. The recent publications of the French Observatory of Montsouris (which is under the enterprising directorate of the *savant* just named) are highly instructive as indicating some of the new directions in which meteorologists are working; and we will here invite attention more especially to two of these. The labours of Montsouris have elucidated the important bearings of meteorology at once on agriculture and on hygiene.

“The proper object of agricultural meteorology is obviously to determine the influence of the various conditions of climate on vegetation. Everybody knows that heat, light, and water are indispensable to a plant; but it is desirable to ascertain and define what part is played by each of these elements individually in the development of each plant, in each of its phases of vegetation, and in the

formation of the various organic principles—starch, sugar, gluten, &c.—which it furnishes. On this problem the observers at Montsouris are busily at work, noting the phases of vegetation, making ‘chemical analyses’ of plants, taken periodically, so as to compare the progress of vegetation with the climatic conditions throughout the year, and analysing the air and the rain with regard to the products they furnish to vegetation. This last point has excited no little interest lately. Nitrogen, of course, forms a large proportion of our atmosphere; but in this free state it does not appear capable of being assimilated by plants. It has to be offered them in a state of combination, as in manures. Now, the air often contains small quantities of natural manures of this character, viz., nitrogen compounds, which are supplied by the air to the ground; such are ammonia, nitrous acid, and nitric acid. Whence they come seems still to be doubtful. There is some reason to believe that the ammonia of the air comes from the sea, and the traces of nitric and nitrous acid are said by M. Thenard to arise from electric discharges which traverse the air either in a silent and continuous manner, or in the form of sparks. Then M. Berthelot has shown that under the influence of atmospheric electricity the nitrogen of the air may be fixed directly in organic compounds of the ground, and that this fixation is favoured by the development of certain microscopic plants. There is evidently here a wide field for scientific research, from which the art of agriculture may be expected to reap great benefit. The rain, too, is an instructive teacher. At Montsouris it is carefully analysed from time to time, and (as an example of the results) it has been calculated that during the year September, 1875, to September, 1876, a total quantity of 1·363 grammes of ammonia was poured in rain on each square metre of the park of Montsouris, or more than 13 kilogrammes per hectare. The quantity of other gaseous constituents carried down by the rain, and the irregular impurities it washes out of the atmosphere, are also recorded. The mention of impurities in the air naturally suggests the valuable services which meteorological research appears destined to render to the public health. If air be drawn for some days through a tube containing carded cotton, the cotton will be found to have turned grey, through the powdery matters it has intercepted. Now these powders are well worthy of being studied. Their nature is very varied; they contain such mineral matters as carbonate of lime, carbon, iron, also the *débris* of fires, spores of cryptogamic plants, pollen, grains of starch, &c., and excessively minute grains which are probably the germs of living creatures. For more than a year these powders of the air have been subjected, at Montsouris, to daily microscopic analogy [analysis ?], and, in relation to the germ-theory of disease, which now engages so much thought, the results can hardly fail to prove of great value. It will be seen whether there is really a strict correlation between endemic or epidemic disease, and the frequency, local or general, of germs borne in the atmosphere. Perhaps it will be possible by and by to say what kind of germs produce particular kinds of disease, and to take protective measures accordingly. Indeed, not a little has been accomplished in this direction already, through the researches of Beale, Sanderson, Klein, and others.

“One of the means employed at Montsouris for collecting the organisms of the air consists in directing a slow current of air, produced by a small bellows, upon a drop of glycerine. In this way are especially caught the spores, pollens, particles of meteoric iron, starch grains, and *débris* of all kinds carried about by the wind. But the fine germs, which are of more importance, are apt to escape notice among the larger corpuscles; and, besides, in glycerine they lose the mobility which they show in water. So they are better observed in drops of water resulting from the condensation of atmospheric vapour, in night dew, in the first drops of rain, or in the dew which forms on the outside of a vessel with a freezing mixture in it; or, again, after washing the air with water from a spray-producing apparatus. Moving organisms, as has been stated, are often met with in such water, and their rotatory or irregular movements leave no doubt as to the real nature of these minute corpuscles; they are vibrations and bacteria. Sometimes, chiefly in February and March, minute colourless corpuscles, with a circular motion, are observed, which are thought to be mostly zoospores. Germs of infusoria are also frequently present. The spores of cryptogami become more abundant towards May.

"Last year, the municipal authorities of Paris having decided that meteorological researches with reference to public health should be carried on in various quarters of the city, charged Montsouris to make arrangements for this purpose, and promised an annual grant of 12,000fr. The new system, inaugurated this year, comprises at present 21 stations distributed over Paris. The principal object of the inquiries will obviously be the investigation of the relations between the general state of the public health, and the impurities found in the atmosphere and in drinking water. The epidemic of typhoid fever which prevailed in Paris last autumn furnished the occasion for some preliminary researches of this kind, which M. Marié Davy has described to the Paris Academy. The experiments were chiefly made at the Prince Eugène barracks, which the War authorities had caused to be evacuated for disinfection. The water of an artificial dew got in the infirmary, which was inhabited several days before, was found very pure; but on scratching the floor of this infirmary, and of the rooms at different heights, a dark powder was detached, which on being brought into water showed a multitude of threadlike vibrions, having a slow, undulatory movement and vibrating points which were rapidly displaced. The window-sills of certain halls particularly gave an abundance of microscopic algæ, vibrions, bacteria, and monads. It is clear that when the troops were in the building these powders, raised by the tramping of feet and other causes, must have got mixed with the air that was breathed, and with the food and the drink. Similar vibrions in considerable quantity have been found in some of the houses in course of demolition for the Boulevard de l'Opera. The ground of certain quarters in Paris contains them also, but in less quantity; but no trace of them has been met with in the subsoil, and the rooms of the Montsouris Observatory are also exempt. M. Marié Davy attributes the epidemic in question to such living powders accumulated during summer on the ground and walls, and producing their morbid effects when the change of season rendered the conditions favourable."—*The Globe*.

REVIEW.

Annual Report of the Chief Signal Officer to the Secretary of War for the year 1875. 8vo, 475 pages, 76 plates. Washington: Government Printing Office, 1875.

GENERAL MYER's reports are extremely interesting. They contain an immense mass of facts, excellent charts, and many valuable remarks. We need not on the present occasion give any details of the general arrangements, and we shall, therefore, select three or four special subjects.

The most valuable feature in this volume (which, by the bye, sadly needs an index) is Sergeant Calver's report on the Tornadoes of March 20th, 1875. It occupies about 40 pages of small type, is copiously illustrated, and is in every respect creditable to its author and to the service. Although rigidly confined to facts, it contains statements exciting enough for any novel, and numerous enough for a small library. We quote the record of what became of one farm house:—

"S. D. Massey was the next person who suffered from this terrible visitor. His house stood directly in its path, and he thus had a good front view of the approaching black cloud. Its apparent width was 200 yards, or half as wide as the track of destruction. Knowing the dangerous character of the storm, Mr. Massey made a frantic effort to get his family out of the house, but before he could do so it was upon them with a deafening roar and midnight darkness. The house was strongly built of heavy hewn timbers, dovetailed together at the corners, ceiled within and weather-boarded without. For a few seconds it resisted the

fury of the storm. Mr. Massey stated that the south-east side of the house was first crushed in. Then the whole structure was moved 10 feet eastward and torn to fragments. The house was 31 by 40 feet, with an exposed surface of about 600 square feet on each side, including the roof, and 475 on each end. Nothing could be more complete than the picture of destruction at this place."

"The gin-house, standing 100 yards south-west of the dwelling, was literally blown away, the timbers having been scattered for hundreds of yards eastward. The cotton-gin was torn into fragments, and the saws scattered in all directions, two of them having been hurled with such force against the trees, 200 yards eastward, as to remain sticking into the wood. Mr. Massey's wife, child, and a young lady cousin were instantly killed. The child, a boy of five or six years, was found about 30 yards east of the house, half covered with dirt, which had been blown up from the wheat-field. The young lady was thrown some 18 yards eastward among the branches of a fallen tree. Massey was buried beneath the timbers of the house, and was badly injured. His shoes, which he assured me were tight-fitting, were torn from his feet, as were also his stockings. The lower portions of his pantaloons were likewise carried away by the fury of the blast. Nearly the entire contents of the house suddenly took flight on the wings of the storm. The cotton mattresses from the beds were strewn upon the bushes and broken trees in the woods hundreds of yards eastward. The ground presented the appearance of having been swept by a rushing torrent of water. Even the bark was torn from the broken trees that remained. This looked more like the effect of the drift of the *débris* than the direct effect of the wind. I noticed sand and gravel-stones in the trunks and limbs of the trees in this vicinity as in other places. Dead chickens and quails, nearly stripped of their feathers, were found after the storm; also rats, cats, and rabbits, with nearly every bone broken. So terrific, indeed, was the force of the wind here, that nothing could live long when exposed to its fury."

We next pass to Sergeant Calver's summary of

THE VELOCITY OF THE WINDS.

"I found it almost impossible to get any reliable data upon which to base calculations that would give accurate results, showing the full force of the winds. In the track, where the storm raged in its full fury, everything was completely swept away, and it was only in the edges of the storm-path that I could find such objects as buildings, &c., moved without being torn to pieces. I collate below a few examples of the force of the wind given in the foregoing pages:—

"1. A house exposing 700 square feet of surface, and weighing probably 50,000 pounds, was moved six feet.

"2. A bale of cotton exposing 18 square feet, and weighing 550 pounds, was carried 50 yards.

"3. Cotton-press exposing 70 square feet to the winds, and weighing 12,000 pounds, was torn from its foundation and thrown 15 feet.

"4. Oak log weighing 700 pounds, and exposing 26 square feet, was moved 40 yards.

"5. Cotton-press thrown 13 feet. Weight 10,000 pounds, surface 60 square feet.

"6. West wing of Taylor's house, surface 160 square feet, weight 10,000 pounds. Twisted round.

"7. Academy, weighing 35,000 pounds; greatest exposure in any one direction, (including roof,) 600 square feet. (Hypotenuse of square of 25 feet = $35 \cdot 3 \text{ feet} \times 12 + \text{roof} = 600 \text{ square feet.}$) Building moved.

"8. Gravel-stones driven into trees.

"9. Pine log weighing 1,200 pounds, exposing a surface of 37 square feet, carried quarter of a mile.

"10. Rock weighing 18,000 pounds, moved 7 feet. Greatest exposed surface 35 square feet.

"11. Massey's house moved 10 feet. Weight estimated at 60,000 pounds, and greatest exposed surface at 750 square feet.

"12. Timber carried 100 yards. Weight 560 pounds, and surface 20 square feet.

- "13. Five freight-cars were overthrown at Canak.
 "14. Pine board was driven through a telegraph-pole.
 "15. Cow carried twenty yards.
 "16. Gin-house executes a somersault under the influence of the wind.
 "17. Pine board driven 3 inches into the trunk of a pine tree, cutting the grain of the wood.
 "18. Church thrown over endways.
 "19. Horse blown half-a mile.
 "20. Bale of cotton weighing 500 pounds, and exposing 16 square feet, carried a quarter of a mile.
 "21. Horses carried away. Part of a wagon carried a mile.
 "22. A pine shingle was driven 2 inches into an oak sapling.
 "Many other similar examples are given which it is unnecessary to recapitulate. In many of these cases it will readily be seen that an upward as well as a horizontal current operated on the objects. In the following examples, if we estimate the static friction at one-third the weight of the buildings, we get the following results as to horizontal velocities :—
 "1. Pressure per square foot, 95·2 pounds. Velocity, 139·9 miles per hour.
 "6. Pressure, 83·3 pounds. Velocity, 129 miles.
 "7. Pressure, 77·7 pounds. Velocity, 124·6 miles.
 "11. Pressure, 114·2 pounds. Velocity, 151·1 miles.
 "19. Pressure, 685 pounds. Velocity, 370 miles.
 "This last instance was near the centre of the storm. The others were near its edges. In the following cases only a force sufficient to balance the attraction of gravitation is considered. Of course a much greater power was necessary at first to lift the bodies from the ground. The figures, therefore, represent a force less than the minimum :—
 "2. Pressure, 30·5 pounds. Velocity, 78·1 miles.
 "4. Pressure, 26·9 pounds. Velocity, 73·3 miles.
 "9. Pressure, 32·4 pounds. Velocity, 80·4 miles.
 "12. Pressure, 28 pounds. Velocity, 78·4 miles.
 "20. Pressure, 31·2 pounds. Velocity, 79 miles.
 "But what can be said in regard to examples 8, 14, 17, and 22? Here an incalculable force was exerted. A velocity of wind sufficient to produce such results could not have been less than that of a cannon-ball, or somewhere between six and eight hundred miles per hour."

DISTANCES TO WHICH OBJECTS WERE CARRIED.

"Many instances are given in the foregoing pages where objects were indisputably carried for immense distances, a few of which, with some others, I will give here :—

- "1. A bonnet was brought from a distance of thirty miles.
- "2. Shingles and pine-tops fell after passage of tornado twelve miles south.
- "3. Basket carried fourteen miles.
- "4. Door of dining-room carried eight miles north-eastward.
- "5. Negro child blown away, and never found.
- "6. Door of church carried seven miles."

A short, but good, paper on the best plans for recording earthquake shocks is contributed by Cleveland Abbe, and we may also mention with praise that great attention is being paid both to the temperature and *régime* of the principal United States rivers, but hitherto we have not noticed any investigations as to the ratio of their rises to the rain-fall producing them.

We have five maps on the polar projection constructed from the synchronous observations, and from them we find that the strictures which we felt compelled to publish in *Met. Mag.*, vol. XII., p. 37, far from being too severe, are the reverse. The British Isles occupy

rather less than three-fourths of a square inch, and there are 70 stations; even if these were equally distributed, they would only be a tenth of an inch apart. Roughly, therefore, the scale is 700 miles to an inch, and equi-distant stations should be 70 miles apart, yet we find in the list, taking London as a centre, six stations within a 35 miles radius, and three of them within a five mile radius. We feel bound to protest against the following paragraph in Gen. Myer's report:—"The charts herewith exhibit the locations of the stations from which the series are received."

We should be delighted to see such a chart, not for its utility, but as an object for the microscope. Joking apart, this British list ought to be reduced to one fourth, several bad stations should be expunged, and then not a word could be said against it.

The report as a whole is at least equal to its precursors, and our high appreciation of them has already been expressed.

SUPPLEMENTARY TABLE OF RAINFALL IN JUNE, 1877.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see Met. Mag., Vol. XI., p. 28., but the list is under revision and further details will be given in a month or two.]

Div.	Station.	Total Rain.	Div.	Station.	Total Rain.
		in.			in.
II.	*Acol	4.33	XI.	Llanfrehfa	2.54
"	Hailsham	1.25	"	Castle Malgwyn	3.16
"	St. Lawrence, I. of W....	0.76	"	Heyope .....	...
"	Andover.....	0.60	"	Carno	1.78
"	Strathfield Turgiss	1.41	"	Rhug, Corwen	1.02
III.	Addington Manor.....	1.03	"	Port Madoc	3.11
"	Oxford	0.89	XII.	Melrose	2.59
"	Northampton	0.74	XIV.	Cessnock, Glasgow	2.82
"	Cambridge.....	1.32	XV.	Gruinart	2.28
IV.	Sheering	1.10	XVII.	Keith	3.97
"	Ipswich	0.69	XVIII.	Dalwhinnie .....	...
"	Diss	1.68	"	Auchnasheen	7.15
"	Swaffham	1.86	"	Springfield, Tain	3.07
V.	Compton Bassett	0.80	XX.	Skibbereen .....	...
"	Dartmoor	4.92	"	Glenville, Fermoy	4.77
"	Teignmouth	1.38	"	Tralee	2.67
"	Langtree, Torrington	1.57	"	Newcastle W., Limerick	1.71
"	Trevarrick	2.16	"	Kilrush	1.77
"	Taunton.....	0.70	XXI.	Kilkenny	2.39
VI.	Bristol	1.30	"	Kilsallaghan	1.71
"	Sansaw	1.55	"	Twyford, Athlone	3.13
"	Cheadle	1.96	XXII.	Ballinasloe	3.75
VII.	Coston, Melton Mowbray	1.74	"	Kylemore	7.12
"	Bucknall	1.03	"	Carrick on Shannon.....	2.92
VIII.	Walton, Liverpool	1.51	XXIII.	Rockcorry	3.32
"	Broughton-in-Furness	3.72	"	Warrenpoint	3.20
IX.	Stanley, Wakefield	1.27	"	Carnlough, Larne	3.47
X.	Gainford	1.30	"	Bushmills	3.84
"	Shap	4.42	"	Buncrana	2.89

* Excessive rain on 11th, 2.97 in. falling in 24 hours.

JUNE, 1877.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.						Days on which "1 or more fell.	TEMPERATURE.						No. of Nights below 32°
		Total Fall.	Difference from average 1860-5	Greatest Fall in 24 hours.		Dpth.	Date.		Max.		Min.		In shade On grass		
				in.	Dpth.				Deg.	Date.	Deg.	Date.			
I.	Camden Town .....	.42	— 2.63	.21	11	6	84.7	19	44.7	7	0	0		
II.	Maidstone (Hunton Court)...	.77	— 1.95	.67	11	3	...	...	...	...	0	0
III.	Selborne (The Wakes).....	.73	— 2.50	.30	6	6	80.0	18	41.7	15	0	0			
III.	Hitchen .....	.98	— 1.66	.51	30	8	75.0	29	40.0	23	0	0		
IV.	Banbury .....	.89	— 2.39	.21	26	8	81.0	18	41.0	7, 24	0	0		
IV.	Bury St. Edmunds (Culford).	1.53	— 1.05	1.01	30	10	82.0	29	37.0	23	0	0			
V.	Norwich (Sprowston).....	1.57	...	.50	30	11	...	...	...	...	...	...
V.	Bridport .....	.81	— 2.43	.22	11	7	...	...	...	...	...	...
"	Barnstaple	1.42	— 2.70	.57	11	9	86.0	19	49.0	8	0	0			
"	Bodmin	2.11	— 1.93	.69	19	12	74.0	19	46.0	7	0	0			
VI.	Cirencester	1.05	— 2.33	.34	22	8	...	...	...	...	...	...
"	Shifnal (Haughton Hall) ...	1.06	— 2.05	.21	1	12	76.0	18†	42.0	7, 8	0	0			
"	Tenbury (Orleton)	1.27	— 2.25	.55	1	10	81.5	18	36.5	24	0	0			
VII.	Leicester (Belmont Villas) ...	.83	...	.24	22	9	81.8	18	41.5	24	0	0
"	Boston	1.17	— 1.02	.36	22	9	82.0	4	43.0	25	0	0			
"	Grimsby (Killingholme)	1.50	...	.39	22	12	74.0	3	44.0	8	0	0	
"	Manfield	1.57	...	.57	1	9	82.4	4, 5	40.0	25	0	0	
VIII.	Manchester	2.35	— .99	.81	1	12	88.0	20	42.5	10	0	0			
IX.	York .....	...	...	...	...	...	...	...	...	...	...	...
X.	Skipton (Arncliffe)	3.47	— .63	.75	1	17	81.0	18	30.0	16	...	...	
X.	North Shields	1.09	— 1.65	.37	22	10	73.0	3	42.0	24	0	0			
"	Borrowdale (Seathwaite).....	10.51	.00	1.79	24	17	...	...	...	...	...	...
XI.	Cardiff (Crockherbtown).....	1.48	...	.41	1	12	82.5	18	44.0	25	0	0	
"	Haverfordwest	2.21	— 1.44	.57	1	14	80.0	18	43.0	28	0	0			
"	Aberdovey	3.69	...	1.05	1	11	86.0	17	46.0	24	0	0			
"	Llandudno	1.59	— .70	.33	18	11	80.9	21	47.0	24	0	0			
XII.	Dumfries (Crichton Asylum)	2.66	— .17	.42	6	17	80.0	18	37.6	24	0	0			
"	Hawick (Silverbut Hall).....	2.17	...	.76	22	14	...	...	...	...	...	...
XIV.	Kilmarnock (Annanhill).....	3.76	...	.65	6	20	78.2	19	42.7	12	0	0	
XV.	Castle Toward	5.63	+ 2.14	1.21	20	16	78.0	17	36.0	4	0	0			
XVI.	Mull (Quinish)	7.33	...	1.23	20	20	...	...	...	...	...	...
"	St. Andrews (Cambo Ho.) ...	3.10	...	...	...	...	...	...	...	...	...	...
"	Grandtully	4.26	...	1.03	26	17	...	...	...	...	...	...
XVII.	Braemar	5.76	+ 2.32	1.11	21	20	76.8	17	35.3	12†	0	4			
"	Aberdeen	3.68	...	.78	28	18	69.2	11*	41.7	13	0	0	
XVIII.	Gairloch	6.50	...	.94	23	21	...	...	...	...	...	...
"	Portree	8.47	+ 3.69	.95	28	23	...	...	...	...	...	...
"	Inverness (Culloden)	3.18	+ 1.26	.84	23	13	73.1	17	42.0	13	0	0			
XIX.	Helmsdale	3.05	...	.87	22	16	...	...	...	...	...	...
"	Sandwick	3.38	+ 1.84	.97	21	16	66.9	17	42.8	22	0	0			
XX.	Caherciveen Darrynane Abbey	2.39	...	.57	4	14	...	...	...	...	...	...
"	Cork	3.88	...	1.30	5	11	...	...	...	...	...	...
"	Waterford	3.25	+ .26	.63	5	15	82.0	15	37.0	4	0	0			
"	Killaloe	4.34	+ .71	1.03	21	16	86.0	20	35.0	4	0	0			
XXI.	Portarlington	2.97	— .28	.86	22	19	78.0	18	41.5	3	0	0			
"	Monkstown, Dublin .....	.96	— 1.65	.32	6	9	82.0	20	41.2	12§	0	0		
XXII.	Galway	2.11	...	.59	7	18	83.0	18	38.0	6	0	0	
"	Ballyshannon	3.32	...	.60	21	19	...	...	...	...	...	...
XXIII.	Waringstown	2.58	...	.53	5	19	81.0	20	39.0	23	0	0	
"	Edenfel (Omagh)	3.46	...	1.10	20	13	77.0	18	39.0	3	0	0			

* And 17.

† 16.

‡ 29.

§ 13.

|| 24.

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

METEOROLOGICAL NOTES ON JUNE.

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

ENGLAND.

SELBORNE.—An exceptionally dry month; prevailing wind during the first half of the month S.W., then variable, but closing with S.W. TS at 2 a.m. on the 1st, with high S.W. wind; TS at 8 p.m. on 11th; max. temp. 76°, min. temp. 60°. Occasional rumbling T on 21st.

BANBURY.—High wind on 1st, and with L on 4th.

CULFORD.—High wind on 1st, 2nd, and 21st; T on 11th (distant) and 20th; dry weather until the last day, when the rainfall exceeded an inch. Mean temp. of the month above the average, being 60°·9.

SPROWSTON.—A fine month; very warm from the 14th to the 20th; TS in the afternoon of 1st.

BODMIN.—A remarkably genial month; mean temp. of the month 63°·3; rainfall considerably below the average of 28 years.

SHIFNAL.—On the whole a delightful month, just enough R to encourage vegetation and wonderfully improve all crops, whether of grass or grain; no nearer approach to frost at night than 42° on 7th, 8th, and 24th. After westerly winds during first 12 days they changed to E., with bright sun, from 14th to 22nd, on which was the hottest night, 59°; from that day to the close westerly winds again, rather high temp. and growing weather. Quite a sirocco wind on 22nd; no T. White butterfly first seen on 2nd, sulphur ditto on 7th, orange-tipped ditto on 14th; hollies white with blossom; dog-rose and fox-glove in flower on the 19th.

ORLETON.—The first half of the month was generally cold with a few bright warm days; on the 15th the weather set in fine, hot and very dry, and so continued to the 22nd; the remainder of the month was variable but dry, with a few warm days at its close. Distant L was seen on the night of the 4th, but no T was heard; the rainfall was not half the average quantity; the mean temp. of the month was rather more than 1° above the average.

LEICESTER.—A very fine month, temp. at times very high; hay-making very general at the end of the month; crops heavy.

GRIMSBY.—A fine month, but more R. wanted on the heavy lands. Garden crops, carrots, onions and beet have suffered much from the cold spring, and from slugs. The meadows and pastures look flourishing, but the corn crops (unless in the case of beans) will not be heavy; fruit scarce. Stormy night on the 1st; L at night on 4th, and TS at 4.30 p.m. on 22nd. Wild rose in flower on 16th. Sudden fall of temp., and shift of wind from W. to E.S.E., in afternoon of 28th.

MANSFIELD.—The month has been a fine one, with little R; forked L *without* T occurred on the evening of the 4th. From 14th to 21st the days were very calm, with cloudless skies; the highest temp. in sun was 128°·3 on 19th.

NORTH SHIELDS.—Distant solar halo on 27th.

SEATHWAITE.—Only two days on which the fall exceeded an inch, but as there were falls of 70 in. or more on eight days, and R fell on 17 days, the average for June (10·51 in.) was exactly reached.

WALES.

HAVERFORDWEST.—Uniformly warm nights throughout the month have produced their effect on vegetation; a splendid hay crop, if weather is granted to save it. Great heat prevailed from the 14th to the 21st, otherwise the day temp. has been very moderate; temp. at or above 70° on 11 days.

ABERDOVEY.—A warm month, varied by some days of genial R, which was very acceptable; wind ranged from S.W. to S.E., but generally calm.

LLANDUDNO.—Altogether a very fine month, the temp. being 2°·5 above the average, culminating in a max. of 80°·9 on the 21st. Rainfall nearly $\frac{3}{4}$ of an inch below the average, but pretty equally distributed throughout the month. Elder

in flower on 10th; wild rose in flower and grass cut on 14th; honeysuckle in flower on 15th; privet in flower on 23rd; corn shot on 25th; T at 6 p.m. on 26th: sea fog on 4th till 10.30 a.m.; high gale from S.W. in the night of 5th; a thick exhalation over the sea and hills on 19th; a sea fog passed over the hills from noon to 3 p.m. on 20th.

SCOTLAND.

DUMFRIES.—June has been a fine month for vegetation; the rainfall, though light, was distributed over 17 days, and the mean temp. ($55^{\circ}4$) about the average. Ten days of very warm weather, ended with a TS, about the middle of the month; the remaining days being breezy, moist and cool. Winds chiefly from S.W., and light.

HAWICK.—The first eight days, which were showery, were followed by twelve warm ones. The hay crop in this district is early, and will bulk more largely than that of last year. Gooseberries are a very unequal crop, while apricots, pears and apples, notwithstanding the great display of blossom are a comparative failure. There were T showers on 21st, 22nd and 23rd. Hornets and wasps seem to have been drowned out by the winter rains, as they have not been seen here this season.

CASTLE TOWARD.—Much R at beginning and close of the month; very fine in the middle, bringing vegetation much more forward than was anticipated.

QUINISH.—First ten days very stormy; great heat till the 20th, when we had a TS and wild weather to the close.

BRAEMAR.—A very seasonable month; more rapid growth of grass rarely seen. TS at 7 p.m. on 21st.

ABERDEEN.—Bar. pressure and estimated wind pressure below the average; rainfall above it. A month of dull, quiet, wet weather, with an average temp.

PORTREE.—The wettest June on record, and cold, with the exception of seven days, 12th to 18th inclusive, which were extremely hot and sultry; on the 16th the ther. in sun reached 110° . Gale from N. on 22nd; TS on 21st and 22nd.

CULLODEN.—Fine warm summer weather from 13th to the 17th inclusive, otherwise cold, windy and rainy for the season. Very high S.S.W. to S.W. wind, with slight showers on 2nd; strong gale from S.S.W. on 3rd. Fogs on 18th, 19th and 20th. Distant T to S.W., between 5 and 6 p.m. on 21st.

SANDWICK.—June has been 1.42 in. wetter, and 0.7 colder than the mean of the previous 50 years; there has also been 1,023 miles more wind than the mean, but the weather is a great improvement on that of May, and the crops are progressing favourably, though late.

IRELAND.

DARRYNANE.—First few days wet and foggy; rest of month fine, but not very warm. Winds variable and moderate. Blight showing slightly on potatoes last ten days, harvest otherwise promising, and hay crop good. There has been more R during the past six months than even in the wet year 1872; the figures are—1872, 27.54 in. on 145 days; 1877, 27.63 in. on 129 days.

KILLALOE.—A very favourable month; abundance of rain, with high temp., has produced abundant vegetation. Mean temp. 61° , being 3° above 1876.

BALLYSHANNON.—High wind from N.W. on 1st and 7th. TS at 11 p.m., in S.W., on 4th. Distant T on 19th; heavy T on 20th at 3 p.m., and again at 1 p.m. and 8 p.m. on 21st.

EDENFEL.—Beginning of the month rainy and unsettled, but from 9th to 20th there followed a magnificent spell of clear hot weather, which, following the previous R, resulted in a vegetation almost tropical in its rapidity and luxuriance, and replaced what seemed to be the certainty of a deficient by that of an abundant harvest. On the evening of the 20th the greatest TS within memory burst almost over this house, which, although the highest in the neighbourhood, was not injured, but within a radius of two miles, horses and cattle were killed, and considerable damage done to property; during $1\frac{1}{2}$ hours of its continuance, upwards of 1 in. of R fell, the heaviest fall ever recorded here.

SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CXXXIX.]

AUGUST, 1877.

[PRICE FOURPENCE
or 5s. per ann. post free.]

METEOROLOGY IN PARLIAMENT.

THE real discussion upon the vote for the new Meteorological Council is, we believe, intended to be taken upon the vote in the Supplementary Estimates. But as there was a long conversation upon the subject on July 17th, when the usual vote of £10,000 was asked for, and the opinions of the various hon. members who took part in it are of importance, we report it as fully as we are able:—

The House then resolved itself into Committee of Supply on the CIVIL SERVICE ESTIMATES.

On the vote to complete the sum of £12,550 for grants to certain learned societies in Great Britain and Ireland,

Dr. L. PLAYFAIR pointed out that a previous Government and two commissions of inquiry had expressed the opinion that some aid should be given to the Meteorological Society of Scotland, and the present Government had appointed a council of the Royal Society to distribute an increased vote of £10,000. Under the regulations made by the new council, the Meteorological Society of Scotland would receive from this grant only the most insignificant aid, and he asked whether the Chancellor of the Exchequer would not advise the council to allow a certain portion of the grant for national purposes connected with meteorology, such as the Scotch Society had been engaged in, and not merely for weather forecasts.

The CHANCELLOR of the EXCHEQUER said he was not at all disposed to undervalue the services rendered by the Meteorological Society of Scotland, but the Government had to bear in mind that the assistance which Parliament did or could give to scientific investigations must necessarily be limited, and that it was not every good or desirable object for which it would be their duty to propose a vote to Parliament. He was quite aware that those at the Treasury had continually to show themselves hardhearted, and perhaps they would be thought blind to the interests of science, as they were under the necessity of turning a deaf ear to applications in themselves worthy of attention, but which if they admitted they would be obliged to go further than

would be justifiable in the way of asking aid from Parliament. It was desirable that the Committee should understand precisely what the nature of the grant was. A good many years ago the collection of Meteorological observations was undertaken partly by the Board of Trade and partly by the Admiralty, under the direction of the late Admiral FitzRoy. When he died it was thought better that some scientific society should determine what sort of investigations should be carried on, and take the direction of them. With this view the Royal Society was applied to, and a small sum—£10,000—was for some years placed at their disposal. The question then arose whether some modification should not be made in the system. Representations were made by the Council of the Scottish Meteorological Society, that encouragement should be given to that Society by the Government. The Government had every desire to recognise the importance and the work of the Scottish Meteorological Society. A departmental committee was appointed, with Sir W. Stirling Maxwell as chairman, who presented a report, in consequence of which some changes were made in the Meteorological Committee of the Royal Society. It was replaced by a Meteorological Council, not necessarily consisting of members of the Royal Society, but of gentlemen designated by the Royal Society with the addition *ex officio* of the Hydrographer to the Admiralty. The Scottish Society was found to have done a good deal of work which was of use to the Government in the prosecution of their inquiries. They had received no remuneration for that work, and £1,000 was recommended and awarded to them, in respect of the past; and as to the future, it would be for the new Council to consider how far they could avail themselves of the services of the Scottish Meteorological Society in the conduct of their business, and on what terms that assistance should be rendered. The English Meteorological Society stood on precisely the same footing as the Scotch Society. Then came the question whether there should be a direct rate in aid of the Meteorological Council as a scientific body. They all desired to recognise the claims of scientific bodies to assistance from the national funds, but it was very difficult to draw a line and say where that assistance should begin and where it should end. It was one of the most perplexing questions with which successive Governments had to deal—how national aid could best be given for the promotion of scientific research. All the Treasury could do was fairly to consider the applications brought before them; and, looking to the very large amount contributed by the Government to the promotion of science, they could not undertake to extend that assistance in the way desired by the representatives of the Scottish Meteorological Society. There was an impression among some that the Government were indifferent to the interests of Scotland, but that certainly was not the case. The fact was, they were unable to enlarge indefinitely the assistance given to scientific societies. He therefore hoped the Committee would agree to this vote of £10,000 to the new Meteorological Council as now constituted, and would not press them

either to weaken the hands of the Council or to add to the sum now proposed to be granted.

Mr. M'LAREN thought the answer of the Chancellor of the Exchequer extremely unsatisfactory. Nothing could be more unjust than the constant effort to keep down all votes and grants to Scotland as compared with England and Ireland. It was hard that when Scotland contributed its full share to the Imperial Exchequer, it should be denied assistance for its learned societies, the proceedings of which were published for the general benefit, proportionate to that given to the English societies.

Mr. RYLANDS would base these grants entirely on the value of the services rendered to the public, and did not think that this or the preceding Government had shown any disposition towards extravagance in the encouragement of scientific research.

Mr. W. H. SMITH said it was gratifying to the Government to find themselves in accord with the hon. member, who would soon have an opportunity of supporting a supplemental estimate for scientific objects, for the Committee referred to had recommended an expenditure of £4,000 a year by the new Meteorological Council, and, in the judgment of the Treasury, the recommendation was one that ought to be adopted. As to the tests that ought to be applied in such cases, special regard ought to be paid to two points. The object to be attained ought to be distinctly national, and not one in which particular individuals or classes were concerned, and security should be taken that the persons who sought assistance were contributing largely to promote the object in view. The Government ought not to give to any society four or five times as much as the members themselves contributed.

Mr. BELL assented to these conditions, providing they did not tie too tightly the hands of those who had to determine what a national object was. He hoped that a board such as that spoken of by the Chancellor of the Exchequer would soon be established.

Dr. L. PLAYFAIR said all he asked was that the Government should intimate to the new Council that it was quite within their power to give a portion of the increased sum now about to be voted for meteorological purposes to the Scotch Meteorological Society, which was engaged in inquiries into matters affecting national interests. For example, inquiries into the climatic condition of the herring fishery, and the manner in which temperature affected the health of the population, were matters of national importance. If the Treasury could not agree to that suggestion, he hoped they would allow the Fishery Board, which made a large profit out of the herring fishery brands, to aid the Meteorological Society of Scotland in making the inquiries to which he referred. If this question were reserved, and if a satisfactory case were made out a Vote could be introduced into the Supplementary Estimates when they were brought in.

Mr. M'LAREN said that the Scottish Meteorological Society would be

quite content with a grant equal to that which the members had themselves contributed.

Mr. RAMSAY said that the work done by the Meteorological Society of Scotland was for the benefit of the whole community, and it was therefore entitled to assistance from the Treasury. He thought it was reasonable that the Treasury should contribute an equal sum to that raised by the Scotch Society. The Scotch members had not hitherto combined to carry their objects like the Irish members, but if right hon. gentlemen on the Treasury bench continued to treat Scotland in this manner, Scotch members might be trained to fight like the Irish members, and might be quite as successful in obtaining justice by obstructing business, and in other ways. They did not desire to set up a Home Rule agitation, but if the claims of Scotland were to be continually ignored in this way, he did not know anything better calculated to create a feeling in Scotland in favour of Home Rule. (Hear, hear.)

The CHANCELLOR of the EXCHEQUER protested against the doctrine they had just heard. Grants of this kind ought only to be given on account of some public benefit to be desired, and not on account of any supposed share being due to Scotland. When the papers connected with this matter were laid on the table it would be seen that the grants were made for strictly national objects, and that the committee appointed consisted of gentlemen thoroughly competent to deal with the question. He could assure the committee that if the new Council recommended that a further extension should be given to meteorological inquiries the Government would consider what could be done to meet the fair claims of Scotland.

Sir J. LUBBOCK said that, having appointed a competent body of gentlemen on the new Council, it would be much better to leave to them the disposal of the funds. It was a novel doctrine to say that every scientific society ought to receive from the Treasury a sum equal to its own subscriptions. The question ought not to be looked at from either an English, Irish, or Scotch point of view, but simply how the money should be spent in the best manner.

Sir G. MONTGOMERY hoped that before the Supplementary Estimates were brought in, the Government would see their way to giving greater liberty to the new Council, so that they might afford assistance to the Scotch Society if they thought it desirable.

Mr. M'LAGAN said that the Vote was already too small, but he should move to reduce it still further unless the claims of Scotland were recognized. (A laugh.) The Committee had been told that the new Council would have the power to recommend a grant to the Scotch Society for meteorological purposes. If they had not this power he should be under the necessity of moving to reduce the grant.

Captain HOME inquired whether any Scotchman would be proposed as a member of the new Council? If the grant was to be national, so ought the Council to be.

Mr. W. H. SMITH doubted whether it would be convenient for a representative from Scotland to attend the meetings of the Council in

London at his own expense. The names of the proposed Council would be laid on the table before the Supplementary Estimates was moved.—The Vote was then agreed to.

To the foregoing we add the following article from our contemporary *Nature*, although with some of the remarks we do not quite agree.

THE NEW METEOROLOGICAL COUNCIL.

"The final stage of the labours of the Treasury Committee, to which we have made frequent reference, has now been reached. The Royal Society has been appealed to to nominate the new council; they have done so, and the Government has accepted the nominations, which are as follows:—Prof. H. J. S. Smith, Savilian Professor of Geometry in the University of Oxford and Keeper of the University Museum (Chairman); Prof. Stokes, Lucasian Professor of Mathematics in the University of Cambridge, and Secretary of the Royal Society; Dr. Warren de la Rue, Mr. F. Galton, and Gen. Strachey, Member of the Indian Council. In addition to these there is Capt. Evans, the Hydrographer of the Navy, as an *ex-officio* member.

"The new Meteorological Council, then, like the old Meteorological Committee, is composed of Members of the Royal Society, who severally hold distinguished positions in special departments of science, and who collectively represent considerable administrative ability. The addition to the new Council of two distinguished mathematicians and physicists such as Professors Smith and Stokes, will be generally regarded with satisfaction, particularly when it is considered that it is to the mathematician and physicist that meteorologists must always look for information and guidance on many matters affecting the intricate and difficult problems with which they, in the position the science has attained, must now deal.

"It is, however, matter of general surprise among meteorologists, or we should rather say of wide-spread regret, that the New Council will resemble the old Committee in having no meteorologist upon it. The omission, so far as concerned the Meteorological Committee, was a serious one, and led to mistakes; so far as concerns the new one it will be well if it does not seriously mar its usefulness and retard the foundation of the future science of physical meteorology. At the same time it is only just to point out that because the science is of the future, the choice of the Royal Society was small, and that considerations not on the surface may have had to be borne in mind. However this may be, there is no doubt that the Royal Society and the new Council have accepted a great responsibility, and that the action of the latter will be most keenly watched. The Royal Society, in a report to the Government, has stated:—

"'The Council of the Royal Society is of opinion that the most practical method of advancing meteorology is to endeavour by research and experiment to place that science on a firm basis. They are also of opinion that this can be done only by the devotion of the time of scientific men to the necessary research and experiment.'"

"Men of science, therefore, will be justified in looking both for research and experiment from the new Council, in addition to the dreary piles of observations which have cumbered all scientific libraries for the last half-century.

"And here is the rub. Will the busy—not to say already over-worked—members of the Council adopt this "practical method," and conduct researches? or do they propose to content themselves by going into the market with the £1,000 which is given for *research*, and, be it remarked, not for mere *observations*? In the latter case it is to be hoped that their advances will be met in no narrow spirit; for if the new Council only fosters research and experiment, it will be a great gain.

"While, on the one hand, then, we have a right to expect results of a high order from the new Council, on the other we are glad to see they are to be no longer an unpaid body. Besides the £1,000 devoted to research, there is another £1,000 devoted to the payment of the members. This sum is to be spent partly in retaining fees and partly in payment for attendance.

"The vote asked for the present year and agreed to on Tuesday is £10,000, and the Secretary of the Treasury then stated that the Committee had recommended an expenditure of £4,000 a year by the Meteorological Council, and, in the judgment of the Treasury, the recommendation was one that ought to be adopted. A supplementary vote will be asked for this at an early date.

"As regards the meteorological societies, on whom must devolve the practical working out of the large problem of the comparative climatology of the various districts of the United Kingdom—the working out of this problem being beyond the scope of the operations of the New Council, just as certainly as it is beyond the resources originally placed at its disposal—we cannot but suppose that the Government have, in handing over the administration of the meteorological grant to the New Council, made provision that a portion of the additional £4,000 will be spent in adequately aiding these societies in doing important national work which they are in a position to do so economically, and which, judging from the past, they can do so effectively.

"This now seems to be the Treasury view, for in the warm debate very properly raised by the Scotch members in favour of the claims of the Scottish Meteorological Society, Mr. W. H. Smith stated that, as to the tests that ought to be applied in such cases, special regard ought to be paid to two points. The object to be attained ought to be distinctly national, and not one in which particular individuals or classes were concerned, and security ought to be taken that the persons who sought assistance were contributing largely to promote the object in view. There is no doubt that the Scottish Society satisfies both these requirements.

"The Chancellor of the Exchequer also stated that it would be for the Council to consider how far they could avail themselves of the services of the Scottish Meteorological Society in the conduct of their business, and on what terms that assistance should be rendered.

"The Council have lost no time in entering upon their duties, and it is devoutly to be wished that some sign may soon be given that if its constitution is not what was generally looked for, it is still well qualified to discharge its functions and to merit the confidence of meteorologists, although they have had so little to say to its appointment."

ST. SWITHIN'S RAIN IN 1877.

WE cannot give a full report of this rain until we receive the whole of our returns at the end of the year. In the meanwhile, we give a few extracts from letters, and a table, respecting which we desire to draw prominent notice to the fact that a blank (...) denotes *no information*, and '00 *no rain*.

The fall seems to have exceeded three inches in a period of about 40 hours at most stations in an oval area, whose extreme points were near Richmond, Yorkshire, and near Oswestry, Salop, but, probably, these limits will be modified when full information is received.

Rainfall, July 13th—16th, 1877.

DIV.	STATION.	DATE.				DIV.	STATION.	DATE.			
		13th.	14th.	15th.	16th.			13th.	14th.	15th.	16th.
II.	Bournemouth...	...	1·95	...	...	VIII.	Fox Hill, Frodsham	...	1·95	2·80	...
"	Selborne	·09	1·11	·42	·64	"	Walton, Liverpool ..	·02	2·02	1·33	·20
"	Alton	·07	1·15	1·33		"	Crooke Hall, Chorley	...	1·03	2·32	·54
V.	Pewsey	·06	1·60	·40	·42	IX.	Arncliffe	·09	1·90	1·72	·74
"	Mildenhall .....	...	1·98	...	...	"	Buckden	·05	1·38	1·25	·49
"	Compton Bassett	·17	1·73	·28	·25	"	Mickley	·00	1·02	·52	·92
"	Holne Vic.	·60	·98	·58	·40	"	East Layton	·00	1·20	·37	·87
"	Dartmoor	1·10	1·58	1·35	1·14	X.	Gainford	·04	1·03	·20	·99
"	Tavistock	·57	·88	·45	·77	"	Seathwaite	·47	·70	1·17	·29
"	Coryton	·21	1·23	·74	·75	"	Elterwater	·39	·65	2·03	·21
"	Okehampton ...	·20	1·35	1·08	·45	"	Shap	·21	·69	·61	·74
"	Court Barn	·66	1·19	1·10	·00	XI.	Llanfrecifa	·30	1·25	·65	·15
"	Langtree Wick	·43	1·24	·85	·29	"	Cardiff	·43	1·27	·85	·18
"	Barnstaple ...	·48	·49	1·08	·13	"	Carno	·50	·62	·64	·30
"	Glenthorn	·23	·90	·80	·48	"	Aberdovey	·45	·85	1·43	·52
VI.	Haughton Hall	·12	3·04	·82	·11	"	Rhiwbrifdir .....	...	3·10		...
"	Leaton Vic. ...	·19	1·32	·50	·11	"	Port Madoc	·27	2·76		·26
"	Sansaw	·18	1·59	·50	·13	"	Llandudno	·27	1·52	1·65	·20
"	Tamworth .....	...	1·85	...	...	XII.	Dumfries	·24	1·00	·68	·33
"	Barlaston .....	...	2·00	·56	...	"	Hawick	·67	·78	·48	·79
"	Cheadle	·14	1·95	·52	·27	XXIII	Warrenpoint	·15	1·45	·70	·45
VII.	Duffield .....	...	2·27	...	...	"	Seaford, Co. Down...	·10	·57	·96	·54
VIII.	Buglawton .....	...	1·82	...	...	"	Waringstown	·28	·78	·60	1·70

TAMWORTH.—As rainfalls exceeding an inch are rare here, I send you a few particulars of yesterday's (July 14th) rainfall, which amounted to 1·85 in. The first portion of the rain fell in heavy showers yesterday morning, with distant thunder, and lasted in that

way until 7 p.m., by which time $\cdot 57$ in. had fallen; but from that hour until 7 a.m. this morning there has been a heavy, persistent downpour without a moment's cessation, and it is still going on now in the same way (9 a.m.). It is the heaviest fall since July 20th, 1875.—WILLIAM ARNOLD.

BARLASTON, STOKE.—On Sunday morning last, July 15th, my rain-gauge registered exactly 2 in. for the previous twenty-four hours, the greatest fall I have ever noted, and the nearest to which occurred on the 17th August, 1871, when 1·95 in. was measured. On the 7th August, 1872, the quantity was 1·76 in., but the rainfall for twenty-four hours very seldom reaches an inch. From Friday afternoon the air had been almost entirely saturated with moisture, and the barometer had fallen from 29·780 on the previous Sunday and 29·310 on Friday morning to 28·626 (all uncorrected) on the 15th. On Monday morning (16th) the amount registered was $\cdot 56$ in. The wind was chiefly S. and S.W.; a moderately stiff breeze from Friday till Sunday morning, when it increased to half a gale, and at night blew hard.—W. SCOTT.

HAUGHTON, SHIFFNAL.—An unprecedented rainfall occurred here on Saturday, July 14th. On Sunday morning I registered 3·04 in., by far the greatest fall since I commenced observing in 1834. There was distant thunder, but nothing more; I was not at home then, but those who have witnessed rainfalls in the Tropics declare that what fell between 12 and 1 p.m. quite resembled that. On Sunday, too, it rained from morn till night, and I measured $\cdot 82$ in. next morning—3·86 in. in the forty-eight hours.—J. BROOKE.

FOXHILL, NEAR FRODSHAM, CHESHIRE.—An unprecedentedly heavy fall of rain began on Saturday, July 14th. Up to about 4 p.m. on that day there had been scarcely any rain. It then came on a very heavy thunder shower, which lasted about half-an-hour. I did not hear any thunder, but others reported hearing it about 10 miles off. After the shower there was no more rain until near midnight, when a deluge poured down for several hours. It ceased however about 6 o'clock a.m., and at 9 o'clock, the usual time of registering, there was found to be 1·95 in. in the gauge. It remained without rain until about 11 a.m. after which it rained incessantly until after dark, and the next morning I measured 2·80 in. I estimate that the whole of this rain, 4·75 in., fell in less than 40 hours. The wind was W. on Sunday morning when the rain began, and then gradually veered round to the S.E., where it remained the whole time of the rainfall. This locality is by no means a wet district, the average for the year being about 30 in., yet we have had up to the present date (24th) no less than 7·05 in. this month. I do not remember having recorded over 2 inches before in the 24 hours, except on one occasion, which is now about five years ago. The remarkable part is the continuous nature of the rain for so long a period together.—JAMES REYNOLDS.

OZONÉ TEST PAPERS.

To the Editor of the Meteorological Magazine.

SIR,—Will you or some of your readers kindly tell me what is to be done in the matter of Ozone Observations? My test-papers (Schönbein's) this year are wretched. I have written to Mr. Casella, and have been informed that he can get no better now, and consequently intends to drop the agency. I enclose you some specimens, that you may judge for yourself whether these things are worth using.

Yours, &c.,

J. D. P.

July 11th, 1877.

GREENWICH EXTREME TEMPERATURES.

The extreme Shade Temperatures of the month of July at the Royal Observatory, Greenwich, during the past 36 years.

Year.	Maximum.		Minimum.		Year.	Maximum.		Minimum.	
	deg.	date.	deg.	date.		deg.	date.	deg.	date.
1841	76·6	3	44·3	12	1859	93·0	18	46·5	25
1842	78·8	18	45·5	6	1860	75·0	17	41·6	5
1843	89·8	5	44·6	23	1861	76·3	1, 8	48·4	11
1844	87·4	25	47·1	16	1862	79·0	26	44·6	22
1845	83·3	7	44·6	29	1863	86·0	15	38·7	19
1846	93·3	5	44·4	10	1864	85·6	20	45·8	8, 15
1847	89·4	12	45·4	23	1865	85·0	15, 27	47·0	12
1848	84·5	14	42·7	1	1866	87·2	13	46·0	31
1849	84·1	8	39·5	1	1867	81·5	5	43·3	30
1850	87·0	16	43·5	10	1868	96·6	22	48·2	5
1851	84·4	2	41·4	11	1869	90·9	22	49·1	5
1852	90·3	5	49·2	23	1870	89·7	8	47·1	3
1853	81·7	7	48·3	1	1871	82·6	17	46·8	31
1854	88·7	25	44·0	29	1872	90·9	25	47·0	18
1855	79·3	10	43·7	5	1873	88·7	22	46·4	19
1856	87·5	31	44·0	10, 3	1874	92·0	9	46·2	18
1857	89·7	15	45·7	8	1875	77·5	29	42·5	13
1858	88·2	15	43·8	29	1876	94·0	17	44·7	12

Extremes in 1877, Max. : 88°·2 on 31st ; Min. : 42°·6 on 8th.

	Year.	Max.	Date.	Min.	Date.	Year.
Means of 36 years	...	86·0	15	45·0	15	...
Highest	1868	96·6	22	49·2	23	1852
Lowest	1860	75·0	17	38·7	19	1863
Range .....	...	21·6	...	10·5	...	...

Addiscombe.

EDWD. MAWLEY.

BOOKS RECEIVED.

[HAVING been unable to acknowledge books received for a few months, the following list is naturally longer than usual, but we cannot help calling attention to its unprecedented length, and to the importance of many of the works quoted. No stronger proof of the rapid progress of Meteorology could be given than this list affords.—ED.]

AUSTRALIA.

- ELLERY, R. L. J. Monthly Record of the Observations taken at the Melbourne Observatory, Jan.-Oct., 1876. 8vo.
 RUSSELL, H. C., B.A. Climate of New South Wales, Descriptive, Historical, and Tabular. 8vo. Sydney, 1877.
 TODD, C., C.M.G. Meteorological Observations made at the Adelaide Observatory, Jan.-Dec., 1876. Fcap. folio.

AUSTRIA.

- JELINEK C. UND OSNAGHI F. Jahrbücher der K. K. Central-Anstalt für Meteorologie und Erdmagnetismus. Jahrgang, 1874, Wien, 1876. 4to.
 Zeitschrift der Österreichischen Gesellschaft für Meteorologie, Jan. 1 to Aug. 1, 1877. 8vo.

BELGIUM.

- HOUEAU, J. C. Annales de l'Observatoire Royal de Bruxelles, Jany. and Feby., 1877. 4to.
 „ „ AND BUYS-BALLOT, C. H. D. Observations Météorologiques faites aux Stations Internationales de la Belgique et des Pays-Bas. Jan.-March, 1877. 4to.
 LANCASTER, A. Quelques remarques a propos de l'Hiver der 1876-1877. 8vo. Bruxelles, 1877.

CANADA.

- KINGSTON, G. T. Monthly Meteorological Register at the Magnetical Observatory, Toronto. Jan.-Dec., 1876. 4to.
 „ „ General Meteorological Register for the year 1876 at the Magnetical Observatory, Toronto. 8vo.

CEYLON.

- FYERS, A. B., Lieut.-Col., R.E. Rainfall in Ceylon during the year 1876, and Means during Seven Years. Single sheet folio.
 „ „ „ Results of Meteorological Observations taken in the Surveyor-General's Office, Colombo, during the year 1876. 8vo.
 „ „ „ Results of Meteorological Observations in Ceylon, Feb.-April, 1877. Single sheets folio.

DENMARK.

- Bulletin Météorologique du Nord, publié par les Instituts météorologiques de Norvège, de Danemark et de Suède. Jan.-June, 1877. Oblong 4to.
 Meteorologisk Aarbog for 1875. Udgivet af det Danske Meteorologiske Institut, Anden del. Fcap. folio. 1876.

FRANCE.

- BELGRAND, M., ET LEMOINE, M. G. Service Hydrométrique du bassin de la Seine. Observations sur les Cours d'Eau et la Pluie centralisées pendant l'Année 1875. Folio.

- BORIUS, A. *Le Climat de Brest ses rapports avec l'état Sanitaire. Première partie Température et Pluie.* Brest. 8vo. 1877.
- LEMOINE, M. G. *Service Hydrométrique du Bassin de la Seine, Résumé des Observations Centralisées pennant l'Année 1875.* Versailles. 8vo. 1876.
- MARIÉ-DAVY, M. *Annuaire de l'Observatoire de Montsouris pour l'an 1877.* Paris. 12mo.
- „ „ *Bulletin Mensuel de l'Observatoire de Montsouris, Jan.-March, 1877.* 4to.

GREAT BRITAIN.

- Army Medical Department, *Report for the year 1875.* 8vo. 1877.
- CHRISTIE, W. H. M., M. A. *The Observatory : a Monthly Review of Astronomy, April-July, 1877.* 8vo.
- CLARK, J. E., B. A. *The Natural History Journal, Feb.-April, 1877.* 8vo.
- COKE, R. G. *The Pollution of Rivers and Streams a source of injury to the Land Owner, Tenant Farmer, and the Public Health. (Trans. of the Chesterfield and Derby Institute of Engineers).* 8vo. 1874.
- GLAISHER, J., F. R. S. *On the Mean Temperature of Every Day from all the Thermometrical Observations taken at the Royal Observatory, Greenwich, from 1814 to 1873 (Quarterly Journal of the Met. Soc.).* 8vo.
- HAVILAND, A., M. R. C. S. *Physical Geography in Relation to Sanitary Science. (Proceedings of the National Association for the Promotion of Social Science).* 8vo.
- LASLETT, T. N. *A Description of the Metroscope, an Instrument for measuring inaccessible Heights and Distances, and for Levelling.* 4to.
- Leicester Literary and Philosophical Society. *Transactions, 1835-41.* 8vo. 1876.
- LUCAS, J. *The Chalk Water System. (Minutes of Proceedings of the Institution of Civil Engineers).* 8vo.
- MAIN, Rev. R., M. A. *Results of Meteorological Observations made at the Radcliffe Observatory, Oxford, in 1874.* Oxford. 8vo. 1876.
- Marlborough College Natural History Society. *Report for the half-year ending Christmas, 1876.* Marlborough. 8vo. 1877.
- MARRIOTT, W. *Contributions to Hygrometry, the Wet Bulb Thermometer. (Quarterly Journal of the Met. Soc.).* 8vo.
- MARRIOTT, W. T. *Riparian Rights. (Transactions of the Institution of Surveyors).* 8vo.
- Meteorological Committee. *Meteorological Observations at Stations of the Second Order for the year 1875. Part II.* 4to. 1877.
- „ „ *Quarterly Weather Reports, July-Sept., and Oct.-Dec., 1874.* 4to. 1877.
- „ „ *Monthly Charts of Meteorological Data for nine 10-degree Squares, folio. Remarks to accompany the same,* 4to. 1876.
- „ „ *Supplement to the Report of the Permanent Committee of the First International Congress at Vienna. Meeting at London, 1876.* 8vo. 1877.
- Mill Hill Magazine, Dec., 1876. 8vo.
- NICOL, Dr. J. *Llandudno as a Health Resort.* 4to. 1877.
- READE, T. MELLARD, C. E. *On Geological Time. Presidential Address to the Liverpool Geological Society.* 8vo. 1877.
- REDMAN, J. B., C. E. *On the River Thames (Minutes of Proceedings of the Institution of Civil Engineers).* 8vo.
- Report of the Astronomer Royal to the Board of Visitors of the Royal Observatory, Greenwich.* 1877. 4to.
- Report of the Kew Committee for the year ending October 31st, 1876.* 8vo.
- Rugby School Natural History Society. Report for the year 1876.* Rugby. 8vo. 1877.

- SLADE, H. P. A short practical treatise on Dew Ponds. 8vo. 1877.
- STEWART, Prof. BALFOUR, LL.D., F.R.S. On an Instrument for measuring the Direct Heat of the Sun (from Memoirs of the Literary and Philosophical Society of Manchester). 8vo. 1877.
- „ „ On the Variations of the Daily Range of Atmospheric Temperature as recorded at Kew Observatory (from the proceedings of the Royal Society). 8vo. 1877.
- „ „ On the Variations of the Daily Range of the Magnetic Declination as recorded at Kew Observatory (from the proceedings of the Royal Society). 8vo. 1877.
- Stonyhurst College Observatory Results of Meteorological and Magnetical Observations, 1876. 8vo. 1877.
- TAAFFE, R. P. B., M.D. Report to the Sanitary Committee for the fourth quarter of 1876. Brighton. 1877. 4to.
- TARBOTTON, M. O., F.G.S. Meteorological Observations in Nottingham during 1876. Fcap folio.
- TRIBE, J. W., M.D. Report of the Sanitary State of the Hackney district for 1875, and for the 20 years, 1856-75. 8vo. 1876.
- Watford Natural History Society Transactions, March, 1877. 8vo.
- Yorkshire Philosophical Society Annual Report for 1875. York. 1876. 8vo.

HAMBURG.

- NEUMAYER, Dr. Deutsche Seewarte. Monatliche Übersicht der Witterung, Jan-May, 1876, and Jan., 1877. 8vo.

ITALY.

- GUIDI, L. Curves of the Meteorological and Magnetic Observations at the Pesaro Observatory, July-Dec., 1876. Single sheets folio.
- LUVINI, J. Le Diéthéroscope Troisième communication faite à l'Académie des Sciences de Turin. 8vo.
- RAGONA, D. Progetto di una Società Meteorologica Italiana. Modena. 8vo. 1876.
- SECCHI, P. A. Bulletino Meteorologico dell'Osservatorio del Collegio Romana, Jan.-May, 1877. 4to.

JAPAN.

- JOYNER, H. B., C.E. The Progress and Ultimate Results of Meteorology especially considered in reference to Japan. Tokei. 8vo.

PRUSSIA.

- KARSTEN, Dr. G. Ergebnisse der Beobachtungsstationen an den deutschen Küsten. March-Sept., 1876. Oblong 4to. Berlin.

RUSSIA.

- WILD, H. Annalen des Physikalischen Central-Observatoriums, Jahrgang, 1875. Anhang. 4to. 1876. St. Petersburg.
- „ „ Monats und Jahresresumés der Beobachtungen der Meteorologischen Stationen in Russland. Aus den Annalen des Physikalischen Central-Observatoriums. Jahrgang, 1875. 4to. 1876. St. Petersburg. 4to.

SWEDEN.

- HILDERBRANDSSON, Dr. H. H. Bulletin Météorologique Mensuel de l'Observatoire de l'Université d'Upsal. Sept.-Oct., 1876. 4to.
- RUBENSON, R. Manads-och Arsmedia af Temperaturen på Statens Meteorologiska Stationer Under Åren, 1859-1872. 4to. 1876. Stockholm.
- „ „ Om Storleken af Temperaturens Dagliga Variation i Sverige. 4to. 1877. Stockholm.

UNITED STATES.

HINRICH, DR. G. Iowa Weather Review, June, 1876. 4to.

LOOMIS, ELIAS. Contributions to Meteorology, being Results derived from an Examination of the Observations of the United States Signal Service, and from other sources. Sixth and Seventh Papers (American Journal of Science and Arts). 8vo.

Report of the State Board of Health of Massachusetts. 1877. 8vo. Boston.

SUPPLEMENTARY TABLE OF RAINFALL IN JULY, 1877.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see Met. Mag., Vol. XI., p. 28., but the list is under revision and further details will be given in a month or two.]

Div.	Station.	Total Rain.	Div.	Station.	Total Rain.
		in.			in.
II.	Acol	2.01	XI.	Llanfrechfa	4.18
"	Hailsham	2.48	"	Castle Malgwyn	4.81
"	St. Lawrence, I. of W....	2.19	"	Heyope .....	...
"	Andover.....	3.85	"	Carno	4.33
"	Strathfield Turgiss	2.53	"	Rhug, Corwen	2.76
III.	Addington Manor.....	2.49	"	Port Madoc	6.82
"	Oxford	3.08	XII.	Melrose	4.74
"	Northampton	3.17	XIV.	Cessnock, Glasgow	2.98
"	Cambridge.....	2.71	XV.	Gruinart	4.18
IV.	Sheering	3.82	XVII.	Keith	3.57
"	Ipswich	3.35	XVIII.	Dalwhinnie	4.12
"	Diss	3.12	"	Auchnasheen	6.01
"	Swaffham	3.27	"	Springfield, Tain	2.75
V.	Compton Bassett	4.74	XX.	Skibbereen .....	...
"	Dartmoor	11.49	"	Glenville, Fermoy	2.49
"	Teignmouth	2.28	"	Tralee	3.29
"	Langtree, Torrington ..	5.72	"	Newcastle W., Limerick ..	1.42
"	Cosgarne, St. Austell ...	5.02	"	Kilrush	2.44
"	Taunton.....	3.05	XXI.	Kilkenny	2.11
VI.	Bristol	3.39	"	Kilsallaghan	3.14
"	Sansaw	3.39	"	Twyford, Athlone	3.62
"	Cheadle	4.34	XXII.	Ballinasloe.....	2.58
VII.	Coston, Melton Mowbray ..	2.94	"	Kylemore	7.40
"	Bucknall	2.32	"	Carrick on Shannon.....	2.01
VIII.	Walton, Liverpool	5.16	XXIII.	Rockcorry	3.55
"	Broughton-in-Furness ..	5.55	"	Warrenpoint	4.02
IX.	Stanley, Wakefield	2.46	"	Carnlough, Larne. ....	...
X.	Gainford	3.60	"	Bushmills	4.12
"	Shap	5.78	"	Buncrana	4.67

JULY, 1877.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.						TEMPERATURE.						No. of Nights below 32°
		Total Fall.	Difference from average 1860-5	Greatest Fall in 24 hours.		Days on which .01 or more fell.	Max.		Min.		In shade	On grass		
				Dpth	Date.		Deg.	Date.	Deg.	Date.				
		inches	inches.	in.										
I.	Camden Town	3.94	+ 2.15	.71	14	14	87.1	31	43.6	6	0	0		
II.	Maidstone (Hunton Court)...	1.85	+ .21	.73	14	10	...	...	...	...	...	...
III.	Selborne (The Wakes).....	5.19	+ 2.99	1.11	14	15	80.0	31	42.0	6, 8	0	0		
III.	Hitchen	3.23	+ 1.33	.55	14	17	75.0	31	42.0	6, 7	0	0		
IV.	Banbury	4.52	+ 2.46	1.25	14	19	79.0	29*	41.0	6	0	...		
IV.	Bury St. Edmunds (Culford).	3.11	+ 1.12	.65	14	18	82.0	31	40.0	7	0	0		
V.	Norwich (Sprowston)	3.25	...	.59	14	18	...	...	...	...	...	...
V.	Bridport	2.12	+ .01	.62	25	7	...	...	...	...	...	...
"	Barnstaple	4.80	+ 1.94	1.08	15	18	77.0	31	45.0	8	0	...		
"	Bodmin	4.93	+ 1.82	.82	14	24	75.0	31	44.0	6	0	0		
VI.	Cirencester	3.98	+ 1.54	1.45	14	19	...	...	...	...	...	...
"	Shifnal (Haughton Hall) ...	5.63	+ 3.46	3.04	14	16	76.0	30	43.0	6	0	0		
"	Tenbury (Orleton)	3.33	+ .95	.92	14	22	81.6	30	39.3	5	0	0		
VII.	Leicester (Belmont Villas) ..	2.64	...	.74	14	18	79.8	30	44.0	7	0	...		
"	Boston	2.82	+ .52	...	...	16	80.0	28	43.0	8	0	...		
"	Grimsby (Killingholme)	2.23	...	.40	14	17	76.0	29	44.0	8	0	...		
"	Mansfield	2.55	...	.85	14	15	81.9	29	41.0	8	0	0		
VIII.	Manchester .....	...	...	...	...	...	...	...	...	...	...	...
IX.	York	2.99	+ 1.05	.52	14	12	...	...	...	...	...	...
X.	Skipton (Arcliffe)	7.71	+ 4.48	1.90	14	28	72.0	30	36.0	6, 7	0	...		
X.	North Shields	2.43	+ .62	.80	17	14	...	...	...	...	...	...
XI.	Borrowdale (Seathwaite).....	15.45	+ 7.31	2.35	21	27	...	...	...	...	...	...
XI.	Cardiff (Crockherbtown).....	4.94	...	1.27	14	18	75.0	30*	40.0	12	0	0		
"	Haverfordwest	4.43	+ 1.13	1.20	22	12	70.0	9†	39.0	26	0	...		
"	Aberdovey	6.03	...	1.43	15	18	77.0	12	46.0	6	0	...		
XII.	Llandudno	5.28	+ 2.99	1.65	15	19	74.1	30	47.0	6	0	...		
XII.	Dumfries (Crichton Asylum)	4.79	+ 2.26	1.00	14	25	68.3	25	40.0	8	0	...		
XIV.	Hawick (Silverbut Hall)	4.70	...	.79	17	24	...	...	...	...	...	...
XIV.	Kilnarnock (Annanhill).....	4.09	...	.48	17	28	66.1	31	42.1	6	0	0		
XV.	Castle Toward	4.84	+ 1.70	1.03	17	28	67.0	17	37.0	6	0	...		
XVI.	Mull (Quinish)	5.31	...	1.11	21	26	...	...	...	...	...	...
"	St Andrews (Cambo Ho.) ...	2.75	...	...	...	...	...	...	...	...	...	...
"	Grandtully	2.94	...	.60	15	12	...	...	...	...	...	...
XVII.	Braemar	3.29	+ 1.01	.76	15	22	67.2	9	38.3	20	0	0		
XVIII.	Aberdeen	3.04	...	.43	19	22	72.7	30	42.5	8	0	0		
XVIII.	Gairloch	4.56	...	1.06	30	26	...	...	...	...	...	...
"	Portree	6.22	+ .15	.71	30	29	...	...	...	...	...	...
"	Inverness (Culloden)	2.81	+ .14	.65	16	21	68.7	22	39.9	5	0	0		
XIX.	Helmsdale	2.89	...	.65	16	20	...	...	...	...	...	...
XX.	Sandwick	2.85	+ .96	.48	19	24	65.7	22	45.0	23	0	0		
XX.	Caherciveen Darrynane Abbey	2.89	...	.70	25	21	...	...	...	...	...	...
"	Cork	1.43	...	.33	3	8	...	...	...	...	...	...
"	Waterford	2.35	— .97	.53	22	15	80.0	29	48.0	25	0	0		
"	Killaloe	2.59	— .60	.30	5	25	85.0	30	38.0	4	0	...		
XXI.	Portarlington	2.80	— .74	.80	16	24	76.0	30	43.0	5	0	0		
XXII.	Monkstown, Dublin	3.21	+ .78	.79	15	18	83.0	30	44.0	4, 17	0	0		
XXII.	Galway	3.20	...	.48	15	25	70.0	30	39.0	6	0	0		
XXIII.	Ballyshannon	5.17	...	1.00	15	30	...	...	...	...	...	...
XXIII.	Waringstown	4.92	...	1.70	16	26	77.0	14	40.0	4	0	0		
XXIII.	Edenfel (Omagh)	4.31	...	1.41	15	28	68.0	30	40.0	5, 6	0	0		

* And 31. † 10, 14, 27.

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

METEOROLOGICAL NOTES ON JULY.

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

ENGLAND.

SELBORNE.—Heavy R and H during a TS on 3rd; distant T on 7th; most oppressive on 31st. Mean max. temp. $66^{\circ}\cdot8$; mean min. $51^{\circ}\cdot4$. Prevailing wind, first half of the month N.W. and W.; remainder S.W. and W.

HITCHIN.—With the exception of 1875, the coldest July on our record.

BANBURY.—L on 5th, T on 7th, and TS on 6th and 16th. High wind and max. rainfall on 14th. Hay making not finished at the end of the month.

CULFORD.—T on 15th and 31st. Mean temp. of the month $60^{\circ}\cdot8$. Easterly winds only prevailed during two days.

BODMIN.—Mean temp. of month, $59^{\circ}\cdot8$. Rainfall above the average of 28 years.

HAUGHTON HALL, SHIFNAL.—An excessive rainfall, the greatest since 1855, when $5\cdot83$ was recorded; the fall this month ($5\cdot63$) is $3\cdot46$ above the average; the fall on the 14th beyond all precedent here, $3\cdot04$ fell in 24 hours, and $\cdot82$ in addition on the next day (St. Swithin); although distant T was heard in the N., nothing more took place here on the 14th, but a severe storm occurred at Newport, 9 miles N., from 12 to 1 p.m.; the rain was quite tropical. T was also heard in the afternoons of 4th and 5th. The nights were cold throughout, only six being above 55° . Root crops are patchy; wheat good on light and loamy soils, bad on strong soils.

ORLETON.—The same damp and sunless weather that has prevailed for so long a period, continued till near the end of this month, with rough winds, veering frequently from S.E. to S.W. and N.W. During the first 28 days there were only four on which the max. temp. in the shade reached 70° . A sudden change then took place, and the last three days were very fine and hot. The mean temp. of the month was nearly $2\frac{1}{2}^{\circ}$ below the average. R fell on almost every day, but frequently in very small quantities. A storm of L and T occurred on 5th, and distant T was heard on the 6th, 7th, 14th, and 31st.

LEICESTER.—A very favourable month for vegetation; rainfall slightly above the average, but equally distributed; no very warm weather till the last two or three days of the month. Wind generally W. to S.W.

GRIMSBY.—T at 1 p.m. and T, L and R at 4.20 p.m. on 5th; TS in morning and T at intervals in afternoon of 6th; T at mid-day on 14th, and at 1.45 p.m. on 17th. Very beautiful cir-cu at 11 p.m. on 27th. The month, as a whole, cold and cloudy, not ripening the corn, but the showers greatly improved the crops and filled the ears. The last three days splendid weather; much haze on 31st. Hay crops not equal to those of last year.

MANSFIELD.—T and R at 6 p.m. on 5th; the beginning and end of the month hot and bright sunny days; the remaining parts generally dull and showery.

ARNcliffe.—TS on 6th, 7th, and 14th. Rainfall in one hour, 2.30 to 3.30., $\cdot70$, and in the following three hours, 3.30 to 6.30, $\cdot72$, being $1\cdot42$ in four hours, in afternoon of the 14th, the total fall on that day being $1\cdot90$; $1\cdot72$ fell on the following day, the 15th, and $1\cdot18$ fell on 23rd; the fall during the month was $7\cdot71$, being more than double the average. The month was unusually dark and rainy.

SEATHWAITE.—Total fall $15\cdot45$, being $7\cdot31$ above the average; there were six days on which the fall exceeded $1\cdot00$. T on 6th, 7th, and 20th.

WALES.

HARVERFORDWEST.—A cold cloudy wet July, very little sun; temperature reached 70° only on four days. Hay operations much retarded; corn harvest likely to be very late. Scarletina prevailing.

ABERDOVEY.— $6\cdot03$, about twice the average fall of rain for this place, arising probably from the prevalence of westerly winds. In neighbouring parts, more to the E., where the fall is generally greater than at Aberdovey, such as Carno,

Llanidloes, Newtown, &c., there has been less than here. Heavy falls on 15th and 22nd, 1.43 and 1.06.

LLANDUDNO.—T and L more or less on 5th, 6th, 7th and 15th. Oats in ear on 7th. The month began and ended warm, but otherwise it was cold, 1° below the average.

SCOTLAND.

DUMFRIES.—The weather during the month has been of a very irregular character, generally damp, chilly and cloudy, the evenings cold; the mean temp. was 55°·0 as compared with 55°·4 last month.

HAWICK.—A very wet and cold month, with but little sunshine to enable the farmers to house their fine crop of hay. Potatoes keep clear so far of disease and Colorado beetles. Thunder showers on the 6th. First wasp of the season seen on 23rd. More than half the total rainfall of the month fell on 14th, 15th, 16th, and 17th. On 26th hay got into the barn.

ANNANHILL.—Rainfall above the average; bar. pressure below that of last month; temperature about the same; winds principally W. and S.W., usually light to fresh. Gales on 24th to 30th, and high wind on 10th and 15th. T heard and L seen on 6th and 17th; heavy R and H on the same dates. Pastures good and crops looking well, but the harvest will be late. Forest foliage very fine.

CASTLE TOWARD.—This has been a very wet month throughout; we have had little or no sunshine, and only three dry days during the month; it has been very backward weather for all kinds of out-door labour, more especially for hay-making; but little hay cut yet in this district; grass looks well and is in abundance now; crops of all kinds are an average, but later this season than in former years.

QUINISH.—The rainfall in the months of June and July has been unusually large.

BRAEMAR.—A damp and cloudy month, crops looking well, but very backward, sunshine much wanted.

ABERDEEN.—Bar. pressure and estimated wind pressure below the average; temp. and rainfall above it. Winds from N., S., and S.W. more frequent than usual. TS on 3rd, 12 to 1 p.m. A month of rather unsettled weather.

PORTREE.—A very wet, stormy and cold month; distant T on 5th; Heavy crops of all kinds, but very backward, fully a month later than usual. Cattle and sheep healthy, and thriving well on the grass.

CULLODEN.—Very heavy shower of H in the afternoon of the 4th. Solar halo in forenoon of 9th; T in afternoon of 14th with R; fog on 15th, 17th, and 19th, R slightly above the average.

SANDWICK.—July has been a very wet month, but more remarkable for the number of wet days (24) than for any heavy fall, the greatest fall having only been .48, which fell on the 19th.

IRELAND.

DARRYNANE.—Early part of the month rather fine, but cold for the season, last few days very foggy. Potato blight spreading very fast.

KILLALOE.—R fell on 25 days during the month, much perplexing the hay-makers. General character of the month dull and sultry, but it closed with three brilliant days. Mean temp. 61°, the same as June, and rather less than July, 1876. Potato disease appeared about the 10th of the month, and is increasing. Corn harvest likely to be late.

MONKSTOWN.—With the exception of the last three days, a cold damp July, very unlike summer.

EDENFELL, OMAGH.—There has been no return during the entire month of the short summer which ended with the TS of the 20th of June. On the contrary, July has been characterized by strong winds, constant R, and low temperature, the thermometer having only on one occasion marked a higher degree than 62°; there has been no sun to mature the splendid crops forced into luxuriance by the heat of June, nor drought to save the hay, and at present the prospects of the farmers are again gloomy.

S Y M O N S'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CXL.]

SEPTEMBER, 1877.

[PRICE FOURPENCE
or 5s. per ann. post free.

THE BRITISH ASSOCIATION AT PLYMOUTH.

WE cannot report that the recent meeting of the British Association was a success in any respect. It was equal to the average in the attendance of honoured and well known members from distant points, in all other respects it was below it. Notably as regards the interest taken in the proceedings by the residents in the three towns and the surrounding districts. Out of the last twenty annual meetings, we recollect only one, viz., Oxford, in 1859, at which the local contingent was weaker. We believe the following includes all the Meteorologists at the meeting, and the breakfasters were only those marked by an asterisk :—

Adams, Prof. J. C., F.R.S. Cambridge.	Herschel, Prof. A. S. Newcastle-on-Tyne
Barham, Dr. C. Truro.	Jackson, M. Ramsgate.
*Black, Surgeon-Major Edinburgh.	Lake, Dr. W. C. Teignmouth.
Chambers, C., F.R.S. Bombay.	*Latham, Baldwin, C.E. London.
Chapman, Dr. T. A. Hereford.	*Lonsdale, N. L. Clifton.
*Clapp, F. Exeter.	*Lowe, E. J., F.R.S. Nottingham.
*Crawford, W. C. Glasgow.	Merrifield, J., Ph. D. Plymouth.
Deacon, G. F., C.E. Liverpool.	*Muirhead, Dr. H. Cambuslang.
Dimond-Churchward, Rev. Bideford.	Pengelly, W., F.R.S. Torquay.
*Dines, G. Walton-on-Thames	Prior, R. C. A. Taunton.
*Dymond, E. E. Woburn.	Reade, T. M., C.E. Liverpool.
Everett, Prof. J. D. Belfast.	Smelt, Rev. M. A. Cheltenham.
Evans, J., F.R.S. Hemel Hempstead.	*Smith, D. Birmingham.
*Field, Rogers, C.E. London.	*Smyth, J., junr., C.E. Banbridge.
Fox, G. Kingsbridge.	Sopwith, T., F.R.S. London.
Galton, F., F.R.S. London.	*Symons, G. J. „
Glaisher, J., F.R.S. Blackheath.	Taylor, T. Aston Rowant.
*Harrison, J. P. Norwood.	Talmage, C. G. Leyton.
Header, W. Torquay.	Vivian, E. Torquay.
Hennessey, Prof. H., F.R.S. Dublin.	Woodward, C. J. Birmingham.

Professor EVERETT read the report of the Committee on

UNDERGROUND TEMPERATURE.

The observations conducted under the auspices of this committee were intended to determine the rate at which temperature increases as we go deeper into the earth. They were sometimes made by lowering self-registering thermometers into deep bores or artesian wells, sometimes by placing thermometers in holes bored in mining galleries, leaving the thermometer there for a considerable time,

and then taking them out and reading them. The contributions the committee had to make this year were from three different places. Observations on a very elaborate scale had been received from the important mining district of Schemnitz in Hungary. A request for observations was sent in 1873 to the Imperial School of Forests and Mines, and a committee was formed. Dr. Otto Schwartz, Professor of Physics and Mathematics, undertook the leading part in the work of the committee. His observations gave the following results:—No. 1 shaft, an increase of 1° Fahrenheit for every 89.5 feet; No. 2, 1° for 72 feet; No. 3, 1° for 64.2 feet; No. 4, 1° for 55.2 feet; No. 5, 1° for 93.2 feet, showing a mean increase of 1° for every 75.5 feet. The best mode of combining these results was to compare the sum of the depths with the sum of the increments of temperature. They thus had a total increase of $68^{\circ}.9$ in 5207 feet, at the rate of 1° F. in $7^{\circ}.5$ feet. Comparing the deepest with the shallowest temperatures (as a check on the assumed surface temperature) it was found that the mean increase was 1° in 72.5 feet. The mean of the two results was 1° in 74 feet. The rocks consisted for the most part of trachyte and greenstone. Thanks was due to M. Antoine Peck, Ministerial Councillor and Director of the Mines, and to Herr Ed. Pörchl, Director of the School, for energetic co-operation in this extensive and valuable series of observations. The next series of observations were made by Mr. Matthew Heckels, Manager of Boldon Colliery, near Newcastle, in holes bored upwards to a distance of 10 feet from some of the deepest seams. The mine was perfectly dry, and where the observations were made free from currents of air. The results of these observations was an increase of 31° F. for a depth of 1,614 feet, at the rate of 1° in 49 feet. The conditions under which they were made rendered them extremely valuable. Observations had been also received for the first time from India. They were taken by Mr. H. B. Medlicott, M.A., of the Geological Survey, in bores made in search of coal, at places called Khappa, Manegaon, and Moran, and have been published by him in the "Records of the Geological Survey of India," vol. x. Only the observations at Manegaon were entirely satisfactory. It was apparent from those that the influence of excessive summer heat reached to a considerable depth. The increase from 60 feet downwards was remarkably uniform, and the whole increase from this depth to the lowest reached, was $3^{\circ}.7$, at the rate of 1° Fahrenheit for 68 feet.

Dr. BARHAM, of Truro, read a note on—

SOME RELATIONS OF SEA AND LAND TEMPERATURE IN THE SOUTH WEST OF ENGLAND.

The purpose of the note was to furnish some materials for a correct estimate of the reciprocal influence of land and sea on the temperature of the air in the South West of England, and inferentially on that of the more eastern districts. The physical geography of the promontory of Cornwall and the Scilly Isles rendered them interesting for their meteorology, and also as a scientific instrument from Nature's workshop, hardly to be equalled elsewhere for displaying, and to some extent measuring, the operation of most of the factors of climate. The stations of observation were St. Mary's (Scilly), Penzance, Helston, St. Agnes, Truro, Plymouth, Guernsey, and Greenwich, the latter as a generally recognised central standard. The observations extended over four years. The mean highest temperature was the same at Scilly and Penzance, namely 71° ; at Guernsey, which came next, it rose to $72^{\circ}.7$; at Helston it approached 79° ; at Truro it was nearly 78° ; and at Plymouth 74° . The mean lowest temperatures were St. Mary and Penzance, again almost the same— 59° ; Guernsey, 61° ; Truro, $56^{\circ}.8$; at Greenwich, 55° . The absolute highest temperature at Scilly and Penzance was again much alike, namely, 74° and 75° ; Helston and Truro, 86° and 85° ; Guernsey, $78^{\circ}.5$; while at Greenwich it reached $91^{\circ}.8$; so that there was a difference of 16° between the extremes of Scilly and Greenwich, and of 12° between places almost adjacent, as Penzance and Helston. The absolute lowest summer temperature showed a similar relative equability. With regard to sea temperature, it was stated that the mean temperature of surface water at Scilly and around the Cornish coast at the height of summer was 60° . Its influence was well shown in

abstracting more than 8° from the average heat of hot days in the ten miles between Helston and the shores of Mount's Bay. There was scarcely any difference between Penzance and Scilly in consequence of the almost island character of the peninsula; but, immediately they got beyond the estuary, they got to a mainland climate, Helston being much hotter in summer and much colder in winter. That was the great reason why Penzance was so suitable as a health resort; its climate, though not identical with that of Scilly, having still a great analogy to it. The extreme cold recorded at Penzance during 50 years was 23° ; occasionally, but very rarely, it fell to 26° ; and at Scilly it was rarely below 29° . The mean temperature of the sea in the winter months was 50° ; and this, it was seen, moderated the extreme of cold in winter in the same way as it did the extreme of heat in summer. In the course of further observations, Dr. Barham showed how much farther inland the influence of the westerly winds extended than that of the east winds. He also pointed out that inasmuch as the growth of early vegetables was one of the staples of the district, the absence of frost was of the highest importance, and that for this purpose records of the minimum temperature on grass were essential. He regretted that such observations were not made in the district.

Mr. GLAISHER said the most important part of the paper was that referring to the action of the sea temperature on land climates. For a long time he had tried in vain to obtain sea temperatures for a consecutive number of years, and he was glad that Dr. Barham had secured observations for three years. He was inclined to think that the differences of temperature at various stations exhibited in the paper were greater than were entirely due to the influence of the sea. There was no doubt, however, that the sea climate all round the coast of England prevented high temperature by day and low temperature at night. He saw no reason why the heat radiation by night should not be the same at Scilly as at any other place, under the same atmospheric conditions.

Mr. SYMONS seconded Mr. Glaisher's appeal for more information on the subject of sea temperature. Financially this would be of the utmost importance. The catch of fish depended greatly upon the temperature of the sea; and if they could give fishermen some information on this head, they would know where to go for the fish, we should have better catches, and the food supply from that source would be greatly increased. This was a practical illustration of the utility of meteorology. He regretted that Dr. Barham's materials were not equal in value to the skill with which he had worked them up. Unless there had been a great improvement at one or two of the stations, he was inclined to think that some of the differences which had been set down to physical geography were really due not to the position of the station, but to the position of the instruments used. Until all the instruments were placed in good open spots, it would always be very difficult to compare the climate of one locality with that of another. With regard to Mr. Glaisher's remark on terrestrial radiation, it struck him that it would be much greater in districts where the air was dry than where it was moist, as in the West of England. The difference between Helston and Penzance was, he thought, due partly to the position of the instruments. The one essential in meteorology was to get the instruments accurately compared in the first instance, and then to have them placed in proper positions, as open as could be obtained.

Mr. DINES thanked Dr. Barham for his valuable paper, and asked in what way the temperature of the sea was taken, whether near the surface or below? He should expect much less radiation at the Scilly Isles than at Greenwich.

Dr. BARHAM, in his reply, said he thought there had been a great improvement at Helston in the instruments used, and in their modes of exposure; and he had no doubt they could place every confidence in the accuracy of the observer. The observations of sea temperature were made about a mile from land with every precaution against errors. The water tested was brought up from a depth of six or eight feet. Dr. Dymond, of the Falmouth Observatory, had done this work with scrupulous accuracy. The sea temperature at the Scilly Islands was very little different from that at Falmouth.

PLYMOUTH METEOROLOGY.

Dr. MERRIFIELD read a paper on "The Meteorology of Plymouth," the result of consecutive observations taken daily at eight a.m. during the twelve years, 1865 to 1876 inclusive. The barometer showed the average pressure for the year to be 29·945 inches. The months of greatest pressure were June 30·059 and July 29·996; of least pressure January and October, both being 29·868. Thus there was an average annual range of ·191 inch. The two former months corresponded to those of small rainfall; the two latter to those of great rainfall. A table annexed showed that the greatest ranges corresponded with the least pressure, and *vice versa*. Dr. Merrifield said he would leave it to his medical friends to discover whether great ranges of atmospheric pressure, independent of temperature, had any effect on persons suffering from diseases of the respiratory organs and of the heart. *Temperature*.—The coldest month was January, the average for that month being 42°·8, half a degree lower than December; but the nights of March were colder than those of February, and almost as cold as those of December and January. The hottest month was July, whose average was 63°·6, about 1° higher than August. There was a mean annual range of 20°·7, while the difference between the average maximum and minimum for the year was only 13°·5. Some years there was more than double the annual range. Extreme readings, as in all the south-west district, were exceedingly rare. The maximum temperature in the shade was 93° on June 27th, 1866; the minimum was 14° on December 27th, 1869. The mean temperature was 52°·0. From the reports of the British Association, he found that the average temperature from 1833 to 1837 was 52°·1, agreeing within one-tenth of a degree with what he had deduced. *Wet and dry bulbs*.—The greatest difference between the wet and dry bulbs was in June, 3°·8; and July, 3°·6; the former was also the driest month as well as having the least number of rainy days. The least difference was in December and January, ·9; and these were two of the three months of greatest rainfall and greatest number of rainy days. Only few days in the year were without cloud or mist. *Rainfall*.—The month of the greatest rainfall, 4·852 in., was in January, corresponding with that of the greatest number of rainy days, viz., 21; the month of least rainfall also corresponded with that of the least number of rainy days, viz., June, 1·375 in. in 9½ days. Leaving out thunder showers, the month of September was the month of heaviest rains. Some months, as February, October, and November, seemed to have a great number of rainy days, with drizzle nearly the whole time; and June and April had rain of least violence. There was nearly twice as much rainfall in the six months from September to February (inclusive) as during the remaining six months, while the number of rainy days was almost as three to two. The heaviest shower he had witnessed was on July 29th, 1871, when ¾ in. fell in less than half an hour. Although so near the sea, and in the path of the counter trades, Plymouth sometimes, though rarely, suffered from want of rain. Being sheltered, his rain gauge showed about 20 per cent. less than that shown by other gauges in the neighbourhood at about the same elevation above the ground. The predominant winds were westerly, there being 195 westerly to 144 easterly. Winds of the greatest violence occurred in November, December, and January, and always veered from about S.S.W. to N.W., when they gradually declined, the greatest force being from about W.S.W. Judging from newspaper reports, thunderstorms were fewer and less violent than further north and east. No doubt a larger portion of the atmospheric electricity generated by the evaporation and friction of the waters of the sea was silently discharged through the damp atmosphere, and thus eluded observation.

Mr. SYMONS observed that no doubt Dr. Merrifield had done all that it was possible for man to do with the instruments and position at his service. Being in Plymouth, it was only right that, as a worker in meteorology, he should say something about an organisation which existed in that town in connection with one of the local newspapers. The editor of this paper—the *Western Morning News*—took the trouble to send post cards to numerous observers throughout Devon, and and Cornwall, requesting returns; those were duly forwarded to the office of the paper, edited in the office, and printed in the paper. This kind of

thing was done in only two or three other counties in England ; and, as far as he knew, the *Western Morning News* was the only paper undertaking not only the printing, but the scientific editing of meteorological notes. It was only due, therefore, that they, as members of a scientific association, should acknowledge the valuable services rendered to the science of meteorology by that paper. (Applause).

THE HEIGHT OF CLOUDS.

Mr. A. MALLOCK read a paper "On the Measurement of the Height of Clouds," describing a method adopted by him in which photographs of the same cloud are taken from different points, and a calculation made from the difference of the angles.

The Chairman (Prof. G. C. Foster) was of opinion that if the method were used systematically at the public observatories, much useful information might be obtained.

The following paper, by Mr. G. DINES, was then read by Mr. G. J. SYMONS—

DIFFERENCE OF RAINFALL WITH ELEVATION.

In the year 1776 a rain gauge was placed upon the roof of Westminster Abbey by Dr. Heberden, which was found to collect much less rain than a similar gauge placed upon the ground. All subsequent observations have given the same results, and the fact that such difference exists will be admitted as beyond dispute.

Many discussions upon the cause of this difference have arisen from time to time, notably that in the *Meteorological Magazine* for 1871 ; and although the idea has been gradually gaining ground that the difference in the amount collected is caused by the wind, yet no general agreement upon the subject has yet been come to ; and this must be my apology for the introduction of the present paper.

A season of comparative leisure has given me the long-wished-for opportunity of investigating this subject ; and a tower easy of access, and attached to my residence, has enabled me to compare the amount of rain collected there with that upon the ground.

The gauge placed at the top of tower is 5 inches in diameter, 1 foot above the parapet, 50 feet above ground, and 101 feet above Ordnance datum. The lower gauge is 8 inches in diameter, 4 feet above the ground, and 54·54 feet above the same datum. Other gauges were used at the same time, and these were shifted occasionally into different positions for the purpose of experiment ; but the two above-named have been considered as standards to refer to, and still remain in the same position. The measuring glasses were of small diameter, so that the rainfall could be measured to the one-thousandth part of an inch with tolerable accuracy ; they were generally read off at the end of a shower, and not at fixed times only. Without going into details, the amount collected from August 1st, 1876, to August 1st, 1877, was—in the upper gauge, 24·60 inches ; in the lower gauge, 31·30 inches, the proportion for the twelve months being as 100 in the upper gauge to 127 in the lower one. In cases of high wind with fine rain, the amount collected in the lower gauge has been from two to three times as much as in the upper one. This was the case on several days in January last. On the other hand, with heavy rain and no wind, the amount collected in the upper gauge has been equal to, or in excess of, that of the lower one ; but this does not occur very frequently.

A large rain-water cistern attached to the house, and easily closed so as to prevent the egress of water, has enabled me to compare the amount of rain collected from a large slated roof with that which falls in the gauges, one inch of rain upon the roof (which runs very freely before the one-hundredth part of an inch has fallen) being equal to 16·77 inches in the cistern. As a rule, the amount of rain collected from the roof gives the fall at something between that of the two gauges ; but on several occasions in very windy weather the amount collected in the cistern made the fall upon the roof greater than given by any of the gauges. In

no single observation has the fall upon the roof been exceeded by that in the upper or 5 in. gauge.

The temperature of the rain has been supposed to have some influence upon the question. This was therefore taken in order to compare it with that of the dew point; but an unexpected difficulty occurred. The observations made upon what may be called pelting showers led to the conclusion that the temperature of the rain is *sensibly* increased by the stoppage of its motion; and how to get at the true temperature of the rain without interfering with its motion is still a difficulty.

Speaking generally, the temperature of the rain appears to be in excess of that of the dew point. When this is the case, the rain-drop, on its way to the earth, must diminish by evaporation, and in that way make the rain less in amount as it approaches the ground. The author, however, feels assured, from the best calculation he can make, that the difference from this cause would not amount to 1 per cent.; and the temperature of the rain may therefore be left out of consideration in dealing with this question.

These observations, continued for several months, and at every possible opportunity, appear to show that the difference of 27 per cent. in the amount of rain collected, is due to the wind at the higher level, causing an eddy about the rain gauges, and so turning aside the rain-drops, *and not to any deficiency in the amount of rainfall at the higher level.*

Such was the conclusion come to in my own mind; but looking to the long and almost angry controversies that had taken place upon this question, I felt that the additional evidence I could adduce was not sufficient to force the same conclusion upon the minds of others.

In this state of affairs, Mr. Symons's *British Rainfall* for 1876 came to hand; and after reading his remarks upon this subject (see page 37), a gauge of 24 inches in diameter was placed upon the top of the tower near to the 5-inch. The amount collected by that gauge since its erection, compared with the others, has been as follows:—

	inches.
5 in. gauge on tower	3·18 or as 100
24 in. gauge on tower	3·56 to 112
8 in. near ground	3·82 to 120

On several occasions the rain collected in the large gauge has been from 30 to 50 per cent. greater than that collected by the 5 in. gauge at the same level, and at the same time, equal to, or a little in excess of, that given by the 8-inch near the ground.

Before composing this paper, I should have much preferred a longer time for the continuance of observations with the 24-inch gauge; but the few already made are so decided in their character, as to induce me to take the earliest opportunity of calling the attention of meteorologists to the subject, in order that others may take action in the matter, and, if possible, decide the question, which, so long as it remains an open one (speaking for myself only), will be a standing disgrace to meteorologists.

Sir WM. THOMSON followed with a paper on the

VARIATIONS OF BAROMETRIC PRESSURE,

in which he urged that to avoid the publication of voluminous returns and vast accumulations of books of reference, the results of all meteorological observations should be given out by harmonic analysis. He knew this was a somewhat arbitrary law, but with such a vast accumulation of results printed in bulky form, which it was often difficult to get at, and which were very seldom referred to in consequence, it was becoming absolutely necessary that these results should, as they easily could, be given in the way he indicated.

A paper by Mr. C. MELDRUM was read

ON THE DIURNAL VARIATIONS OF THE BAROMETER AND WIND IN MAURITIUS.

Mr. Meldrum remarked that in 1875, 1876, and 1877, the number of cyclones had been much below the average, and that there had not been any one great

storm such as that which occurred in the periods 1860-63, and 1870-73. This, so far, confirms the hypothesis of a connection between the frequency of sunspots and the frequency of cyclones.

With regard to the rainfall the evidence in favour of a cycle corresponding with the sunspot cycle has much increased. Dr. Hunter, of Calcutta, has lately found for Madras a rainfall cycle identical with that which the author had previously found both for India and various other parts of the world. Mr. Meldrum has recently discussed the rainfalls of thirteen stations in the French colonies for various periods from 1832 to 1872, and obtained results nearly the same as those that had been found for 144 stations scattered over both hemispheres. Dr. Fritz, of Zurich, has shown that the severest hailstorms and the highest levels of the rivers occur in the years of maximum sunspot. In short there can, he thinks, be little doubt of an eleven-year rainfall cycle, and when its laws are known they will probably be of much practical use.

LUMINOUS METEORS.

Mr. J. GLAISHER read the report of the committee on "Luminous Meteors," which continued the record of a year of very active research, though the principal object the committee had in view—that of furnishing observers with a *résumé* of star showers and meteor systems, occasional and periodical, during recent years, such as would serve as a guide for the future—had to be postponed. The autumn and winter months were marked by numerous large fireballs in England and abroad; and two aerolites had fallen, one in America, and one near the town of Constantine, in Algeria. A magnificent meteor was seen in the United States in December last, from which one of these aerolites was projected. An equally splendid aerolite passed over Cape Colony on the 16th of March last, with loud explosions; but no aerolites were known to have fallen from it in its flight. Among the ten brilliant fire-balls might be enumerated those seen in England, of which one, at least—that which burst over the Channel on September 24th—was one of the most unusual brightness. The other conspicuous meteors noticed since the previous report took place on November 8th and March 17th, as well as on April 6th. This last meteor was exceedingly brilliant over Cork and Waterford, in Ireland. A remarkable success in the work of calculating the real paths and velocities had been made known in Germany, where Dr. Von Niessel had shewn that two large detonating meteors which burst with loud explosions over Bavaria and Bohemia April 9th, 1874, and April 10th, 1876, were not only connected together in date and in the place of their appearance, but also astronomically in the system to which they belonged, as they were both found in their origins, or the direction of their course, to have had a common radiant point. The committee had been engaged in the continued examination and comparison of star showers, and in this enquiry an immense labour had been performed for the past twelve months by Mr. W. F. Denning, of Bristol. Besides observing himself, and reducing to their radiant points nearly 1,000 meteors during that period, he had searched through in catalogues fully 12,000 tracks, and of these he had projected one or two thousand on maps, and had concluded from them nearly 150 radiant points. There had been no marked star showers for one or two years; but some examples of frequency on certain nights had occurred in America on the night of 18th-19th October last, and on the 23rd August and 13th September in England. The star shower of December 12th was seen to advantage at several stations, and was a most conspicuous display. The August showers of 1876 and of the present month had both been below the average of brightness for that shower, but several series of observations of them were made. The past year had added fully thirty or forty radiant points to those recorded before. In continuation, the report gave descriptions of several brilliant meteors observed in 1876 and their rates of velocity, which varied from $19\frac{1}{2}$ to 40 miles per second. On the subject of meteoric irons, statistics were given of the fallen meteors found in the Mexican district, which amounted in total weight to more than fifteen tons. The report concluded with an account of a meteoric fall on April 26th last year in Shropshire. After a heavy explosion like that of artillery, which was audible for many miles, a meteorite was found in a field near the town of

Wellington. When discovered it was still warm, and weighed $7\frac{3}{4}$ lbs. It had been exhibited at a bazaar at Wolverhampton, and since then the Duke of Cleveland had presented it to the British Museum. The fall of only eight aerolites had been recorded in England, of which the last occurred in 1844. Mr. Glaisher referred in terms of eulogy to the labours of Professor Herschel in connection with this branch of the section's work.

AN INDIAN METEOR.

One of the Secretaries read a paper by Major G. N. MONEY, giving "An account of a Meteor which passed over Bhawnpore, in India, in October, 1873." While staying at the capital of the independent state of Bhawnpore, on the Sutlej, he was aroused from sleep early one morning by a tremendous sound resembling the passage of several express trains, while the room was brightly illuminated, and this sound was followed by violent explosions which shook the building. He at first supposed an earthquake had occurred. After breakfast he heard that a shower of stones had fallen eighteen miles off to the north-east, and later in the day some pieces were brought in. The largest was an irregular mass, 3 feet long by 1 foot thick, still hot, and blackened outside as by the action of fire, of a dark gray colour inside, and very heavy. The natives said there were many more—one as large as a bullock cart. A second shower fell about thirty miles beyond the first. There could be no deception, as there were no other stones within a hundred miles of Bawnpore, the soil being purely alluvial or sandy. The meteor, it appeared, was seen by a European who was superintending the erection of a palace for the Nawab. He described it as a huge ball of fire, as big as twenty moons, which passed with a roaring sound directly over his head in a north-easterly direction. It lit up the whole sky, the light being perfectly dazzling, and left behind it a flaming track of red, green, and yellow. Before passing out of sight two explosions in quick succession took place, at each of which a shower of sparks seemed to fall, but no alteration was apparent in the size or shape of the meteor itself. No attempt was made by the Government to collect information about this remarkable meteor. To give some idea of its magnitude it was stated that it was seen and heard at points quite 400 miles from Bhawnpore.

Professor HERSCHEL said it was remarkable how many large explosions of meteors had been observed in recent years. In that reported from the United States last December, the meteors followed each other like a flock of geese, but only one of them fell to the earth.

ATMOSPHERIC OZONE.

Mr. G. M. DIXON wrote, with respect to the work of the committee appointed to examine into the reliability of certain methods recently proposed for the quantitative estimation of atmospheric ozone, that the necessary arrangements for the experiments had not yet been completed, and the PRESIDENT announced that whilst Mr. Dixon's proposed method for the measurement of ozone had not yet been tried, it was intended to satisfactorily test it before any great length of time.

THE FRENCH ASSOCIATION AT HAVRE.

With a view to mutual advantage the meeting of the French Association was held this year at Havre, and the time fixed to follow immediately upon the Plymouth meeting. Our report upon the French meeting will be given next month.

OZONE TEST PAPERS.

To the Editor of the Meteorological Magazine.

SIR,—A correspondent in your number for August, who signs himself “J. D. P.,” relieves himself by making a great lamentation over the evils of Schönbein’s “Ozone Papers,” as if he had made a great discovery, and as if he was ignorant of the fact that the whole subject has been dealt with exhaustively years ago. The large majority of your readers must know that the fallacies inherent in the old system of observing Ozone, and the improved modes which can alone be considered reliable have been fully described. Any method to be reliable must rest, as I have many times pointed out, on the acceptance of the following principle :—

To estimate Ozone apart from all other bodies in the air, it is necessary to pass a *known* quantity of air over a test paper, alone influenced by Ozone at a *known* and *unvarying* velocity.

Let meteorologists do that in any way they like. I shall be very glad to learn that any improvements have been devised of the means for attaining this object, which have been described in my work, entitled, “Ozone and Antozone: When, Where, Why, How is Ozone observed in the Atmosphere.”—I remain, Sir, yours faithfully,

CORNELIUS B. FOX, M.D., F.M.S.

Chelmsford, August 25th, 1877.

To the Editor of the Meteorological Magazine.

SIR,—Referring to the letter of your correspondent, “J. D. P.,” in this month’s *Meteorological Magazine*, we beg to forward you a sample box of our ozone test papers, which have now been in use in all parts of the world for some years past, and have always given every satisfaction.

We remain, your obedient servants,

NEGRETTI & ZAMBRA.

Holborn Viaduct, E.C., August 27th, 1877.

[We have sent “J. D. P.” some of these papers, and shall be happy to send other specimens where desired.—Ed.]

AUGUST METEORS.

To the Editor of the Meteorological Magazine.

SIR,—I am surprised to see letters in the papers noticing the scarcity of Perseides this year. Surely it must be owing to the condition of the sky. I and many others out here thought them more numerous than usual. Taking advantage of a cloudless evening, with an intensely clear sky, I was one of a party of 14 who on the evening of the 10th ascended 7000 feet above the sea to see the sun set, and to remain on the mountain all night to see him rise. From 10 p.m. till daylight the shower of Perseides was incessant. Very many were of large size, but the greater part were small, and some of them most minute. The largest number was seen between the hours of 11 p.m.

and 2 a.m. There were also a great many shooting stars in all parts of the sky : indeed, from the 7th to the 12th inclusive, they were abundant every night.

On the 25th a magnificent meteor made its appearance at 7.55 p.m. At a point about 2 degrees N. of Jupiter, and travelled slowly and almost horizontally eastward. Its colour was yellow, and the nucleus pear-shaped, and about four times the size of Venus when at greatest brilliancy. It left a trail of considerable length, and threw out during its course smaller meteors on either side of the nucleus. These travelled a short distance, also leaving short trails. The meteor disappeared behind the point of a mountain 7 miles off and 8000 feet high, due E.S.E. from this. It seemed at the moment of disappearance to be breaking up, and I think must finally have disappeared near Mars, which rose over the same mountain a short time afterwards, Saturn having already risen when I lost sight of the meteor.

It was witnessed by a great many English who are here, and caused much consternation amongst the villagers. Sunday, the 19th, was intensely hot and an uncomfortably dry day here. I give you the readings of the dry and wet bulbs.

	Dry.		Wet.		Difference.		Weather.
3 a.m.	57.0	.....	52.6	.....	4.4	.....	b
9 „ ...	70.0	.....	62.5	.....	7.5	.....	b
1 p.m.	89.0	.....	65.0	.....	24.0	.....	b
3 „	89.0	.....	66.0	.. ...	23.0	.....	b
5 „	81.0	.....	63.0	.....	18.0	.....	b
6 „	79.0	.....	64.0	.....	15.0	.....	c.
9 „	67.0	.....	64.0	... ..	3.0	.....	t.s.

Truly yours,

MICHAEL FOSTER WARD, F.R.A.S., F.M.S.

Rossinière, 25th August.

WHIRLWIND NEAR GUILDFORD, SURREY.

The following paragraph appeared in the *Times* of Saturday, August 11th :—

A correspondent writes under date, Guildford, August 10th :—“To-day a whirlwind of violent character passed over the villages of Cranleigh and Alford, Surrey. The morning had been rainy, with slight thunder and lightning. In the afternoon a heavy storm set in. This was followed by a whirlwind. On the farm of Mr. George Bruford oak trees of 10 ft. in circumference were snapped asunder, while others were torn up by the roots. Wheat sheaves were whirled in the air and carried in some instances distances of two miles. Cocks of hay were raised in the air and scattered in all directions. In the village of Alford roofs were torn from various houses. Two labourers working in a harvest field at Alford were lifted bodily from their legs and landed in an adjoining meadow. Faggot stacks were whirled in the air and scattered over the country.”

As this account is somewhat exaggerated, it may be interesting to state what actually occurred, as far as we were able to ascertain by visiting the spot on the following Monday (August 13th.)

On Wednesday, August 8th, the morning was hot and close, with a westerly wind; about 3 o'clock the wind backed to south, and blew strongly, and it commenced to rain heavily; about five minutes past 3 the whirlwind occurred; it seems to have commenced in the neighbourhood of Alfold, and travelled in a N.N.E. direction; the effects of it are traceable almost as far as Cranleigh, a distance of about three miles; in that village, however, no rain fell, nor was there any very strong wind felt during the afternoon.

The country over which the whirlwind passed was mostly arable, with large trees in the hedges, but the track was not at all clearly defined, there being in many cases nearly a quarter of a mile without any signs of its passage; yet it appears that the track, although not perfectly straight, never varied much from a direct line.

The first trace we could find was in a belt of trees which crossed the track nearly at right angles, N.E. of Alfold Park Farm; the damage extended about 20 or 30 yards, which would apparently mark the width of the track; the side branches were not taken off, but those meeting the wind were broken back into the trees, and some of them six or eight inches in diameter were carried right through the trees to a distance of several yards. The whirlwind then passed over some low undergrowth and another belt of trees about a couple of hundred yards off, without leaving any trace, but it then swooped down again on two trees in the next field, the distance between these was about 50 yards, yet both were considerably damaged. On the further side of the field a small oak about a foot in diameter was snapped off about four feet from the ground (this probably required more force than any of the other damage); it then passed over a field of standing corn, and crossed the road a little to the north-west of Alfold Crossways, taking some of the ridge tiles off one of the cottages adjoining the road, and disarranged a wood-stack, &c. From this point it seems to have lifted over the rising ground on the other side of the road, and appeared again at Brockhurst Lees, where it slightly damaged several trees, upset a haystack, and took some of the tiling off a stable roof; a man working in the stable at the time said he heard a rushing, roaring noise, and, looking out, saw the trees and hay blowing about, and thought he had better stay where he was. Between here and Holdhurst Farm the trees were considerably damaged, one having the upper part, where the stem was eight or ten inches in diameter, broken right off, and the corn stacked in the fields ready for carrying was whisked about in a most disorderly manner. The track at this part was, however, very undecided, and seems to have curved about considerably, leaving the direct course and passing round west of the hill by Holdhurst Farm. In the middle of a field adjoining the road, between Holdhurst Farm and Knowle Farm, a small oak, about a foot in diameter, was torn up by the roots; this was the last damage of any importance, the whirlwind crossing the road by Knowle Farm, where it lies slightly in a valley, and damaging a few trees in

some thickly wooded grounds on the other side. After this it seems to have entirely disappeared, no trace of it reaching Cranleigh.

As regards the two men mentioned in the *Times* we could only hear of one who was working in a field and was almost taken off his feet but we were unable to find him to hear his account.

GREENWICH EXTREME TEMPERATURES.

The extreme Shade Temperatures of the month of August at the Royal Observatory, Greenwich, during the past 36 years.

Year.	Maximum.		Minimum.		Year.	Maximum.		Minimum.	
	deg.	date.	deg.	date.		deg.	date.	deg.	date.
1841	79·6	27	45·5	12	1859	91·3	25	46·5	31
1842	90·5	10	47·5	30	1860	70·8	4, 16	45·5	7
1843	82·8	19	47·2	10	1861	89·3	12	46·2	31
1844	75·4	20	42·5	27	1862	79·9	1	44·7	24
1845	77·8	31	43·2	1	1863	84·9	9	46·0	21
1846	92·0	1	47·5	13	1864	88·6	5	38·1	27
1847	87·7	1	42·3	3	1865	78·0	27	43·2	3
1848	74·7	3	43·1	9	1866	78·5	26	45·0	19
1849	82·5	9	42·4	5	1867	89·0	14	40·9	3
1850	81·0	5	40·0	22	1868	90·5	5	47·8	26
1851	82·0	12	42·2	31	1869	89·0	28	42·1	31
1852	81·5	1	49·9	4	1870	81·0	1, 6	41·0	31
1853	77·5	19	45·8	18	1871	89·2	13	46·1	28
1854	85·2	28	43·0	18	1872	81·7	17	45·0	28
1855	79·0	28	47·3	14, 30	1873	87·3	8	47·9	29
1856	89·8	2	45·0	23	1874	81·2	19	44·0	24
1857	88·0	3	48·8	28	1875	85·4	16	43·6	2
1858	86·9	12	43·3	29	1876	93·8	14	41·1	26

Extremes in 1877, Max. : 83°·3 on 20th ; Min. : 40°·5 on 24th.

	Year.	Max.	Date.	Min.	Date.	Year.
Means of 36 years	...	84·0	13	44·5	19	...
Highest	1876	93·8	14	49·9	4	1852
Lowest	1860	70·8	4, 16	38·1	27	1864
Range .....	...	23·0	...	11·8	...	...

Addiscombe, 7th Sept., 1877.

EDWD. MAWLEY.

AUGUST, 1877.

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 1860-5	Greatest Fall in 24 hours.		Max.		Min.					
				Dpth	Date.			Deg.	Date.	Deg.	Date.		
												In shade	On grass
		inches	inches.	in.			Deg.	Date.	Deg.	Date.			
I.	Camden Town	2.23	— .41	.55	25	17	82.9	20	42.4	24	0	...	
II.	Maidstone (Hunton Court)....	2.58	+ .38	.92	25	11	...	...	...	...	0	1
III.	Selborne (The Wakes).....	3.86	+ .68	.76	7	15	74.6	20	34.0	24	0	...	
IV.	Hitchen	3.02	+ .67	.49	26	19	75.0	20	41.0	31	0	...	
V.	Banbury	4.30	+ 2.17	.75	27	22	77.0	20	37.0	24	0	...	
VI.	Bury St. Edmunds (Culford).	2.76	+ .32	.32	16	19	79.0	20	37.0	23	0	...	
VII.	Norwich (Sprowston).....	...	...	...	...	...	...	...	...	...	...	...
VIII.	Bridport	3.20	+ .61	.93	7	10	...	...	...	...	...	...
IX.	Barnstaple	5.09	+ .90	1.10	7	18	...	...	...	...	...	...
X.	Bodmin	6.38	+ 2.52	.94	26	22	73.0	14	45.0	24	0	0	
XI.	Cirencester	6.31	+ 3.47	1.20	14	20	...	...	...	...	...	...
XII.	Shifnal (Haughton Hall) ...	5.00	+ 2.13	.78	7	23	78.0	7	41.0	24	0	...	
XIII.	Tenbury (Orleton)	4.89	+ 2.01	.67	14	24	79.0	20	38.8	24	0	0	
XIV.	Leicester (Belmont Villas) ..	2.57	...	...	...	...	...	...	...	...	...	...
XV.	Boston	2.92	+ .63	.61	27	18	81.0	20	41.0	24	0	...	
XVI.	Grimsby (Killingholme)	4.12	...	1.55	25	18	74.0	7	43.0	24	0	...	
XVII.	Mansfield	4.73	...	1.00	25	23	78.9	6	42.0	24	0	...	
XVIII.	Manchester .....	...	...	...	...	...	...	...	...	...	...	...
XIX.	York	4.46	+ 1.75	.85	25	16	75.0	7	42.0	24	0	...	
XX.	Skipton (Arnccliffe)	7.11	+ 1.17	.85	22	28	75.0	17	34.0	23	0	...	
XXI.	North Shields	6.32	+ 3.47	1.58	18	27	68.0	1, 8	42.0	24	0	...	
XXII.	Borrowdale (Seathwaite).....	11.79	— 2.29	2.00	18	20	...	...	...	...	...	...
XXIII.	Cardiff (Crockherbtown).....	5.70	...	1.14	27	21	80.0	20	41.1	2	0	...	
XXIV.	Haverfordwest	6.07	+ 1.19	1.11	21	16	77.2	5	39.0	23	0	...	
XXV.	Aberdovey	6.98	...	1.65	20	19	81.0	5, 15	47.0	23	0	...	
XXVI.	Llandudno	5.77	+ 1.95	1.03	21	22	74.4	6	47.0	23	0	...	
XXVII.	Dumfries (Crichton Asylum)	6.95	+ 3.30	1.19	19	22	73.0	17	37.4	24	0	...	
XXVIII.	Hawick (Silverbut Hall).....	7.56	...	1.54	18	29	...	...	...	...	...	...
XXIX.	Kilmarnock (Annanhill).....	3.76	...	...	...	...	...	...	...	...	...	...
XXX.	Castle Toward	6.79	+ .49	1.32	21	20	74.0	16	37.0	23	0	...	
XXXI.	Mull (Quinish)	4.15	...	.63	8	20	...	...	...	...	...	...
XXXII.	St. Andrews (Cambo Ho.) ...	6.85	...	...	...	...	...	...	...	...	...	...
XXXIII.	Grandtully	5.03	...	1.30	20	16	...	...	...	...	...	...
XXXIV.	Braemar	6.29	+ 2.45	2.20	20	22	67.8	7	30.2	25	1	4	
XXXV.	Aberdeen	6.55	...	1.59	20	25	66.2	16	39.7	25	0	0	
XXXVI.	Gairloch	4.80	...	.95	30	22	...	...	...	...	...	...
XXXVII.	Portree	4.91	— 2.54	.83	29	25	...	...	...	...	...	...
XXXVIII.	Inverness (Culloden)	5.06	+ 1.81	1.14	21	20	71.1	7	39.7	25	0	1	
XXXIX.	Helmsdale	5.16	...	.88	20	25	...	...	...	...	...	...
XL.	Sandwick	2.50	— 1.21	.46	7	21	64.0	13	40.4	25	0	...	
XLI.	Caherciveen Darrynane Abbey	...	...	...	...	...	...	...	...	...	...	...
XLII.	Cork	6.08	...	1.25	17	16	...	...	...	...	...	...
XLIII.	Waterford	6.66	+ 2.71	1.52	18	18	78.0	1	39.0	24	0	...	
XLIV.	Killaloe	5.77	+ .84	1.58	16	21	85.0	4	35.0	23	0	...	
XLV.	Portlanning	3.48	— 1.02	.44	9	27	...	...	...	...	...	...
XLVI.	Monkstown, Dublin	4.78	+ 1.57	1.54	15	22	76.0	20	41.5	23	0	...	
XLVII.	Galway	5.22	...	.63	21	23	75.0	13	41.0	23	0	...
XLVIII.	Ballyshannon	4.46	...	.72	18	24	...	...	...	...	...	...
XLIX.	Waringstown .....	...	...	...	...	...	...	...	...	...	...	...
L.	Edenfel (Omagh)	5.74	...	1.28	15	25	69.0	13*	37.0	22	0	...	

* And 16.

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

METEOROLOGICAL NOTES ON AUGUST.

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

ENGLAND.

SELBORNE.—T and L at 7 p.m. on 7th; L at 7 p.m. on 21st; TS at 10 a.m. and 7 p.m. on 25th. Min. 34° at 4 ft. on 24th. The coldest August I have ever recorded, the only August in which frost on grass has occurred excepting on 31st in 1869 and 1870. Bad harvest weather, some wheat growing in sheaf; potatoes much diseased; hops promising both in quality and quantity.

HITCHIN.—The coldest and wettest August for many years.

BANBURY.—Very little corn carried; wheat much injured by sprouting; potatoes much diseased. Flood in the Cherwell valley on 23th.

CULFORD.—High wind on 9th; T on 15th, 21st, and 31st, and a very severe TS on 16th; a wet and rather cold month, max. temp. being 79° , and the min. 37° , the mean $60^{\circ}\cdot 8$. The rainfall slightly above the average; prevailing winds S. and W. The most severe TS which has for many years been experienced in this district occurred on the afternoon of the 16th. A large tree in the neighbourhood of Bury was struck, set on fire, and burnt to ashes; several buildings were also struck and slightly injured, but happily no serious damage has been sustained.

BODMIN.—Mean temp. of the month $63^{\circ}\cdot 1$; R 3 in. above the average of the last 28 years.

SHIFNAL.—Another cold, rainy, ungenial month. Remarkably low temp. throughout, exceeding 70° on four days only, and 55° on seven nights only. Distant T all the 15th, and severe with heavy R at 6.30 p.m.; again heavy storm on the 25th at 6.45 p.m. The grain crops suffering sadly, and troublesome harvest. No wasps as yet, and scarcely a butterfly (not even white) in the garden; no mushrooms; swifts all gone by the 12th.

ORLETON.—Another cloudy month, with frequent heavy falls of R, and a damp atmosphere. The rainfall nearly double the average; very unfavourable for ripening the corn from the absence of sunlight. Mean temp. nearly 3° below the average. Frequent TSS on 15th and 16th; T heard on 14th, 15th, 16th and 25th. Violent winds on 21st and 23th.

LEICESTER.—Very unsettled weather, especially during the latter part of the month, but very much less rain has fallen here than in some parts of the country.

GRIMSBY, KILLINGHOLME.—T at 11.45 a.m., and at 3.40 p.m. on 8th.; T 4.20 p.m. on 15th, and L at night; TS on evening of 16th; TS at 10.30 a.m. on 21st. The wettest August I have ever registered; potato disease rife at the close; corn ripe on the 20th, but, owing to the rain, corn cutting was not general till the 23rd. Root crops will be heavy, but fruit scarce.

MANSFIELD.—25th, $\cdot 76$ of R fell from 8 to 9 p.m. on 24th. A damp, close month, with heavy rains at intervals; all produce late; strawberries not over at the end of the month; temp. nearly as high as that of July; July temp. at 9 a.m. $61^{\circ}\cdot 7$, August at same time $60^{\circ}\cdot 1$; temp. at 9 p.m., July $56^{\circ}\cdot 4$, August $56^{\circ}\cdot 8$; mean temp., July $59^{\circ}\cdot 7$, August $59^{\circ}\cdot 5$.

ARNcliffe.—Unusually wet, dark, and sunless. No 48 hours in the month without R.

NORTH SHIELDS.—8th, TS; 21st, TS; 24th, lunar halo. (Total fall in July should have been 2.45 not 2.43).

SEATHWAITE.—8th, T; 12th, T; 16th, T and L.

WALES.

HAVERFORDWEST.—The weather was very fine, and warmer than the preceding month up to the 15th, after which it became very unsettled; heavy storms of R, accompanied by T and L from 19th to 22nd, and again from the 25th to the end of the month, rendering harvest work very difficult. I find from the 1st of September, 1876, to the end of August, 1877, $69^{\circ}\cdot 21$ in. of R has fallen. The present summer throughout has been cold and unseasonable.

ABERDOVEY.—20th, heavy R with T, total fall 1·65 in. ; 25th, heavy R, with high wind. A very wet month, most unfavourable both for hay and corn harvest.

LLANDUDNO.—20th, began to cut oats ; 21st, TS at 5 a.m., R to 10.30 a.m., then fine but windy ; 24th, barley cut. Like July—variable, wet, and on the whole cold month. Rainfall more than double the average, and the mean temp. $1\frac{1}{2}^{\circ}$ below it. Corn and crops all late, and much damaged by the wind and disease appearing among potatoes.

SCOTLAND.

DUMFRIES.—August has been unprecedentedly wet, rainfall (6·95) nearly double the average ; mean temp. $55^{\circ}\cdot9$, and bar. pressure low ; TSS were registered three times ; prevailing winds, easterly.

SILVERBUT HALL, HAWICK.—7th, TS ; 15th, hay got in. The rainfall here has been more than double that of any August during the last 11 years. The oldest inhabitant never saw such a wet hay season. The potatoes are going rapidly to ruin from disease ; the corn crops are quite green yet, and much of it laid flat by the wind and R. Much of the hay is still out and sadly spoiled ; the pods of garden peas do not fill, gooseberries are almost useless through bursting. The sun has scarcely been seen during the season.

CASTLE TOWARD.—With the exception of a few days the month of August has been one of the most dismal of the year. We have had severe rainfalls for the short time they lasted. As a rule in former seasons the harvest was pretty general by this time, but this season the crops look as green as they did two months ago. It is difficult to say when cutting will become general. The crops will be three or four weeks late this year. Much of the standing corn has been laid by the wind and rain, and is not likely to rise again. Potatoes are also giving way and will not be a profitable crop.

QUINISH, ISLE OF MULL.—The extraordinary fall of R, 18th to 21st, reported elsewhere in Scotland, was not felt here to the same extent, the four days only showing a fall of 1·07 in. during that period. The month has been singularly broken, with R from all points of the compass, rapid changes of weather and temp.

BRAEMAR.—A most unseasonable and unusually wet month ; at the close hard frost and hills covered with fresh snow. Potato crop rendered almost useless, being so late.

ABERDEEN.—Bar. pressure and mean daily temp. below the average ; night temp. and R above it. Winds from N., N.E., E., and S.E. above the average. A month of exceptionally dull, wet, and cold weather. Crops greatly damaged by the R of the 20th and 21st.

PORTREE.—A very cold month ; scarcely any sunshine during the month, which has kept the crops much behind in ripening ; very little of the hay crop yet secured. Heavy H showers at 10.30 a.m. on 23rd. [A strong frost on the 1st of September ; ice half an inch thick at 9 a.m. on the 2nd. Potatoes blackened.]

SANDWICK.—27th, three peaks of T with L between 4 and 8 p.m. While there have been great floods in most parts of Britain, we have reason to be thankful there has been nothing of the kind here. Indeed, islands are little liable to such floods, even when the rainfall has been excessive, as the R soon reaches the sea ; but the rainfall here this month has been much less than the average of the last five or six years, and more than half an inch below the average of the previous 36 years. At Balfour Castle the fall was only 1·50 in., while here it was 2·50 in. There has, however, been much cold N. wind, and the crops are two or three weeks later than usual.

IRELAND.

WATERFORD.—Wind very variable, principally N, rarely W., rather high wind on 31st ; average temp. of month, $60^{\circ}\cdot5$.

KILLALOE.—The heavy rainfall of this month has seriously retarded farm work, and the saving of the hay and corn crops claims the utmost diligence of the farmer. TS on 15th, followed on 16th by a much more severe and protracted one, with heavy R ; 1·35 in. fell between 9.30 p.m. and midnight. This heavy fall sent down floods from the mountain ravines, carrying away bridges, hay, and

some live stock, and doing much damage to adjoining lowland. Very little corn cut about here, but nearly all ripe and waiting for fine weather. Potato disease increasing, and the haulm now quite destroyed. Eclipse of 23rd could only be seen here from 9.45 to 10.30 p.m.

MONKSTOWN.—The wettest August for many years. The fall on the 15th was extremely partial, under .10 in. having been registered at Bray, and about .60 in. in Dublin, while here it was 1.54 in., it fell with T and L; temp. low for the time of the year.

BALLYSHANNON.—Another very wet month, grain crops much injured, and still unhoused. It is much feared that the potato crop in this country will be a failure; the haulms are completely cut away, and more than half the potatoes are rotten.

OMAGH.—Persistent E, high wind, and low temperatures have again been the characteristics of the last of our summer months, which has passed without summer having reached us. As a result the hay harvest is as yet uncompleted, flax unpulled, corn green, and the general prospects of the farmer are very dark indeed.

SUPPLEMENTARY TABLE OF RAINFALL IN AUG., 1877.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see Met. Mag., Vol. XI., p. 28., but the list is under revision.]

Div.	Station.	Total Rain.	Div.	Station.	Total Rain.
		in.			in.
II.	Acol	1.88	XI.	Llanfrechfa	6.19
„	Hailsham	2.69	„	Castle Malgwyn	6.12
„	St. Lawrence, I. of W....	2.47	„	Heyope .....	...
„	Andover.....	3.07	„	Carno	6.69
„	Strathfield Turgiss	2.06	„	Rhug, Corwen	5.41
III.	Addington Manor.....	4.14	„	Port Madoc	4.96
„	Oxford	3.09	XII.	Melrose	6.76
„	Northampton	3.71	XIV.	Cessnock, Glasgow	7.33
„	Cambridge.....	3.82	XV.	Gruinart	4.44
IV.	Sheering	3.82	XVII.	Keith	5.94
„	Ipswich	2.70	XVIII.	Dalwhinnie .....	...
„	Diss	2.80	„	Achnasheen .....	...
„	Swaffham	4.05	„	Springfield, Tain	4.67
V.	Compton Bassett	3.62	XX.	Skibbereen .....	...
„	Dartmoor	12.27	„	Glenville, Fermoy	7.51
„	Teignmouth	4.09	„	Tralee	4.49
„	Langtree, Torrington ..	6.30	„	Newcastle W., Limerick ..	5.08
„	Cosgarne, St. Austell ...	7.75	„	Kilrush	8.91*
„	Taunton.....	3.30	XXI.	Kilkenny	5.30
VI.	Bristol	5.39	„	Kilsallaghan	5.21
„	Sansaw	5.09	„	Twyford, Athlone	5.41
„	Cheadle	5.50	XXII.	Ballinasloe.....	4.82
VII.	Coston, Melton Mowbray ..	3.05	„	Kylemore	7.64
„	Bucknall	2.94	„	Carrick on Shannon.....	2.97
VIII.	Walton, Liverpool	4.76	XXIII.	Rockcorry	2.76
„	Broughton-in-Furness ..	7.97	„	Warrenpoint	8.73
IX.	Stanley, Wakefield	3.96	„	Carnlough, Larne.....	...
X.	Gainford	4.99	„	Bushmills	3.65
„	Shap	6.18	„	Buncrana	6.23

* Tremendous rain on 16th, 4.46 in.; the observer reports it as occurring between 1.45 and 4.0 p.m., and adds that there has been nothing like it for fifty years.

SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CXLI.]

OCTOBER, 1877.

PRICE FOURPENCE
[or 5s. per ann. post free.]

LE VERRIER.

THE name of Urbain Joseph Le Verrier will descend to remote posterity, associated with geometrical skill, the resolute attack of astronomical problems, so vast, that even his friend Adams describes the work as "appalling," and with the conquest and completion of almost every thing upon which he had set his heart. Future generations will know Le Verrier as, jointly with Adams, the discoverer of Neptune. But meteorologists claim also the right to lay a wreath upon his tomb.

Le Verrier was beyond everything else an astronomer, but if he had not been that, his labours for meteorology would have been more appreciated. True, he wrote few original papers upon the subject, his care was chiefly given to organization, but he may fairly be said to have founded the present system of telegraphic meteorology, for we believe that his "Note sur un système régulier d'Observations Météorologiques, établi en France par les soins de l'Administration des lignes télégraphiques et de l'Observatoire Impérial de Paris" is the earliest work on weather telegraphy, just as the "Bulletin International" is the oldest daily weather report.

Again, Le Verrier's "Atlas des Orages," "Atlas Météorologique," and "Atlas des mouvements généraux de l'Atmosphère" may fairly be put in the front rank of meteorological publications.

Le Verrier's latest work in Meteorology was not of a high order, he was perfectly conscious that it was so, but he desired to effect two objects, he wished to lessen the serious losses which his countrymen suffer from late frosts in spring and from hail-storms, and he desired to scatter broadcast throughout the country an acquaintance with the first principles of meteorology. Concerning this work we venture to reprint, from the June number of this magazine, the closing lines of an account of this branch of Le Verrier's work.

"We believe that the erection of these public barometers, and the publication of the bulletins from the Paris Observatory, will lead a few people to think, and if only one person is induced by each public barometer to study Meteorology, how grand an assemblage of thinkers will France possess! Real thinkers, workers and students of Meteorology."

logy, are as rare in France as in England, and if Le Verrier's 1,000 barometers kindle a thirst for meteorological knowledge in a thousand breasts, our science will make such progress as it has never made before, and Le Verrier's latest will be amongst his most useful labours."

THE FRENCH ASSOCIATION AT HAVRE.

THE meeting of the French Association for the Advancement of Science was held this year at Havre, and commenced on Thursday, August 23rd. The opening meeting took place at half-past two, in the Theatre which was well filled. On the platform were the Mayor, the President, and Council of the Association, and a number of distinguished *savants*. The president, M. Broca, after referring to the increasing prosperity of the Association, delivered an elaborate address on "The Fossil Races of Western Europe." The Mayor having bid the members welcome to the town of Havre, the general secretary, M. P. P. Déhéraïn read the report for the past year, in which allusion was made to the loss the Association had sustained by the death of the late M. C. Sainte Clair-Deville. The financial statement having been presented by the treasurer, M. G. Masson, the meeting terminated. The President and a number of the members then went to the old Palais de Justice to take part in the opening of the Geological and Paleontological Exhibition which had been organized by the Geological Society of Normandy. This was one of the best and most carefully arranged local exhibitions of the kind that we have ever seen, and reflects great credit upon its promoters.

In the evening a reception was held at the Hôtel de Ville, which was very largely attended. During the proceedings the Mayor proposed the health of the President and Members of the Congress, to which M. Broca replied, and said that he had been greatly impressed with the magnificent reception given to the Association by the municipality and inhabitants of Havre. In referring to the admirable Geological Exhibition which had been opened that afternoon, he expressed the hope that such a collection would not be dispersed, but that a permanent exhibition might be established.

The fifteen sections into which the Association was divided met at 9 o'clock on Friday morning in the various rooms of the Hôtel de Ville for the reading and discussion of papers, and meetings were held daily at that hour, except on Tuesday, which was given up to excursions; some of the sections had afternoon sittings. The Anthropological, Chemical, Mathematical and Medical Sections were the best attended, but in several of the others the attendance was very meagre.

A general *séance* was held on Friday afternoon, when the following communications were read:—"The Progress of Navigation," by M. Vial; "Geology of Havre; the Mouth of the Seine," by M. Lennier, President of the Geological Society of Normandy; "On the Works of the Port of Havre," by M. Quinette de Rochemont. In the evening

a lecture was delivered in the Theatre by M. le Comte de Saporta "On the Ancient Climates considered in their relations with the march and variations of European Vegetation."

On Wednesday afternoon another general *séance* was held, when Lieut. G. Biard explained the programme of the proposed voyage round the world which has been organized for the year 1878 by the Société des Voyages d'Études. In the evening Prof. Levasseur lectured in the Theatre on the "Soil and Wealth of the United States."

The concluding meeting of the Association was held on Thursday afternoon, when Montpellier was selected as the place of meeting for 1879, and several recommendations to the Government were passed.

M. Frémy has been elected President for next year's meeting, which will be held at Paris.

Excursions were made to Fécamp and Etretat on Sunday, to Tancarville and Lillebonne on Tuesday, and to Rouen by steamer on Friday returning on Saturday, September 1st.

The town during the meeting was very gaily decorated, and a fête of some kind took place every evening, including concerts, illuminations, fireworks, grand Venetian fête, procession of Chinese lanterns, &c.

THE METEOROLOGICAL SECTION.

The bureau consisted of—Prof. D. Ragona, Director of the Observatory, Modena, *Honorary President*; M. Alluard, Director of the Observatory on the Puy de Dome, *President*; Gen. De Nansouty, Director of the Observatory, Pic du Midi, *Vice-President*; and M. Angot, Secretary of the French Meteorological Society, *Secretary*.

Amongst those present at the meeting of this Section, in addition to the above, were—Lieut. Brault, MM. Dumas, De Fonvielle, Glaisher, Janssen, Lemoine, Marchand, Marié-Davy, Marriott, Capt. Mouchez, MM. Rédier (senr. and junr.), Tarry, Tissandier, and Vinot.

The papers read were:—

Prof. Ragona—"On the annual march of the Barometer."

" " "On the diurnal change of absolute and relative Humidity."

" " "On the effective variations of Temperature."

M. Alluard—"New Hygrometer." (Exhibited.)

M. Rédier—"Self-registering Thermometer." (Exhibited.)

M. Marchand—"On the Atmospheric Absorption of the forces contained in Sunlight, and on the calculation of this Absorption."

Mr. Glaisher—"On Nocturnal Increase of Temperature with Height."

Mr. Marriott—"On the Dry and Wet Bulb Thermometers."

M. De Fonvielle—"On Observations of Atmospheric Pressure made in Balloons."

M. Alluard exhibited some very interesting diagrams showing the variations in atmospheric pressure during storms at the summit of the Puy de Dome, nearly 5,000 feet above sea level, and at Clermont Ferrand, 1,500 feet. These clearly show that the changes of pressure

in the upper regions of the atmosphere are by no means similar to those at the surface of the earth, for when the pressure at the lower station was decreasing that at the upper was shown to be rising, and *vice versâ*; or, when the former was steady, the latter was very greatly disturbed or rapidly rising or falling.

There was brought before the Section a Report on the re-organization of French Meteorology, which had been drawn up by a joint committee of the French Association and the Meteorological Society. The committee recommended that a National Meteorological Institute should be established in Paris, which should have charge of the whole of French Meteorology. Two sittings were given up to the discussion of this report, but it was not adopted. A resolution was, however, passed calling the attention of the Government to the inferiority of French Meteorology, and asking that an official enquiry might be instituted into its working.

On the motion of Dr. Janssen, it was resolved to request the Transatlantic Steamship Companies to have meteorological observations made on board their vessels. It was also resolved to ask M. Giffard to organize a Meteorological Observatory in his captive balloon during the Exhibition at Paris.

Another resolution was passed deprecating the delay in the construction of a telegraphic line from Bagnères to the Pic du Midi, over 9,000 feet above sea level, for the purpose of sending regular observations when the observatory upon the latter is cut off by snow from all communication with the lower world.*

It was stated that in consequence of the International Exhibition and the meeting of the French Association being next year at Paris, a free International Meteorological Congress will be held in that city under the auspices of the French Meteorological Society.

THE WINTER OF 1876-7 IN ALGIERS.

To the Editor of the Meteorological Magazine.

SIR,—We had a most remarkable summer (!) last winter in Algiers ! Great heat and drought. End of November gave us 87° in shade ; December maxima *averaged* about 70°. I doubt if there were six days all the winter when max. did not reach 60°. The “old year and new year met” at a temperature of 67° (300 ft. above sea). On April 3rd, at 2 p.m., I saw a veritable shade 92° in a small wood, on blowy top of a hill 700 ft. above sea, far from any road or building ! M. Bulard, at his station near the town, but little above the sea, registered 100° on that day ! In the province of Oran there has been famine, and the whole of Algiers was visited by locusts in May, not very seriously however. The rainfall is about half or two-thirds what it should be, and not only that, but the greater part of the October rain ran off,

* The line (17 miles long) is now finished—October 8th.

and what did fall in December and March, and at other times also, generally was in heavy downpours which ran off. The only really soaking rain was on February 25th.

Yours very sincerely,

H. A. BOYS.

Wing Rectory, Oakham, Oct. 1st, 1877.

1876							1877.					
Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May.	June.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
1	05
2	34	...	06	04	...	...	...	...
3
4
5	04	...	...	...	...
6	82	...	69	...	...	...
7	40	...	...	...
8	03	02	...	...
9	21	...	...	...
10	05	...	...	11	24	...	...
11	60	...	...	60	...	...	...
12	02	19	...	...	...	...	...
13	38	...	...	02	...	...
14	09	...	...	...	02	...	...	16	...	...
15	24	1 62	...	26	06	...	...	01	...	...
16	1 90	25	98	...	...	...	...	...	...
17	1 68	42	02	12	...	...	...	...	...
18	10	...	17	...	...	...	...	...	...
19	70	...	...	...	...	...	10	...	...
20	01	...	...	48	06	...	...
21	1 40	...	...	...	...	03	02	...	...
22	15	70	...	...	...	...	05	...
23	12	07	...	...	18	45	...	...	...
24	10	30	...	...	...	...	03	...
25	80	...	...	01	...
26	18	...	15	...
27	33	...	...	...	...	...
28
29
30
31
			33	7 52	1 33	4 48	1 98	1 06	3 18	63	34*	05

Total fall, 20.90 in.*

Gauge kept on Terrace, 20 feet from ground, at house of Colonel Playfair, English Consul at Algiers, 650 feet above the sea.

N. B.—All the amounts here put down are reckoned to the day on which they were measured, *i. e.*, the day after they fell.

* Our correspondent is wrong either in the daily entries or the total ; '24 in. is the true total of the figures sent. As we do not feel sure where to address an enquiry to him, we print it as it is : perhaps he will see this and favour us with the correction.—Ed.

SUN SPOTS AND FAMINES.

NOTE FROM DR. BUIJS BALLOT.

The question of the relation between the sun-spot period and rainfall, which had rather slumbered, has been brought forward again in connection with the Indian Famine, the most important fact being that the list of believers in the connection now includes Mr. Buchan. As, however, Mr. Buchan, in his letter to the *Times*, did not give any reasons for accepting the theory, except the evidence of the Madras register, we scarcely know whether to regard his advocacy as due merely to friendship and generous impulse, or as the result of an examination of all the evidence on both sides, sufficiently thorough to be worthy of his reputation.

Respecting the various letters which have subsequently appeared we need perhaps only mention that Mr. Symons urged that the enquiry being a purely statistical one, astronomers and meteorologists should separately provide the data, and some entirely unprejudiced statisticist should report upon the subject. The desire for an investigation appears to be unanimous.

We may also mention here that we have been requested by Dr. Buijs Ballot to state that the Harlem Society of Sciences intend to reward with a gold medal the best answer to the following question :—

What meteorological phenomena have we sufficient reason to consider related to the solar spot cycle?

Answers are to be sent before January, 1878, to Professor von Baumhauer, Secretary to the said Society, at Harlem. The essays are to bear a motto, and the motto is also to be upon a sealed envelope containing the author's name.

OZONE.

We have not the least desire to take part in the discussion on the above subject, commenced in our pages, but we think it desirable to point out the very important fact revealed by the two letters in our last number, and the unsatisfactory conclusion to which they lead.

Dr. Fox, if not actually the best read man on Ozone in this country, is at any rate one of the very highest authorities; after close reading and many experiments, he says—

“To estimate ozone apart from all other bodies in the air, it is necessary to pass a *known* quantity of air over a test paper, alone influenced by ozone, at a *known* and *unvarying* velocity.”

This is evidently a very carefully worded phrase, it enunciates four requirements :—

1. The paper must be so prepared as to be affected by nothing but ozone.
2. The quantity of air passing over it must be known.
3. The velocity of the air passing over it must be known.
4. The velocity must be uniform.

Therefore the paper must be placed in some kind of chamber, and a definite amount of external air must be drawn through the chamber past the paper.

Thus much for Dr. Fox's requirements ; if they are valid it is certain that all observations made by fastening a strip of paper in a thermometer stand, or even in an ozone cage, are useless.

This is an unpleasant state of matters, because we believe that nineteen-twentieths of the observations now being published are made in the manner we have mentioned. We may go further and state that we believe the stations where Dr. Fox's conditions are carried out do not number half-a-dozen in the whole of the British Isles.

There are about thirty stations belonging to the Scottish Meteorological Society, about fifteen belonging to Mr. Glaisher, and a large number under the Army Medical Department, at work at the present time on the plan which Dr. Fox condemns. Surely it is necessary that it should be definitely settled whether observations made in the rough way at present prevalent are of any use or not. If Dr. Fox's conditions are reasonable and ought to be complied with, let us try to get half-a-dozen well-selected stations properly equipped.

If observations on the existing plan are useless, it is as wrong to let observers continue making useless observations, as it is to spend time and money over publishing figures which can only mislead. But, on the other hand, before stopping any observations of this class let it be quite certain that they are really useless. We have a strong objection to all but very good observations ; we believe that it would be a good thing if some scores of thermometers were broken, and if some of the journals now kept were thrown behind the fire ; but we have also an almost superstitious respect for continuity, and would never stop any observations calculated to be of real service.

As to the Ozone subject, we need answers to the following questions :—

(1). Is it possible to deduce useful results from observations upon an ozone paper hung up in a thermometer stand ?

(2). Should the answer to No. 1 be a negative, why not stop all the observers unprovided with aspirators, &c. ?

HIGH BAROMETER AND THE COMING WINTER.

To the Editor of the Meteorological Magazine.

SIR,—I think the remarkably high range of the barometer last Saturday requires special notice, as in all my previous observations I never knew it so high.

February, 1863	...	...	...	it was	30·50 in.
October, 1875	...	...	...	"	30·50
January, 1876	...	...	...	"	30·60
Saturday, October 6th, 1877	...	...	...	"	30·64

These are the highest I have known. The mercury began to fall on Saturday evening, and is now 30·12, and inclining to rise.

Yours truly,

JAS. NUTTER.

Beech House, Cambridge, Oct. 8th, 1877,

P.S.—The enclosed I have extracted from the “Miller” paper, and is in your way :—

“To the Editor of the MILLER.

“SIR,—I wish through the medium of your valuable paper to give my brethren in the trade a statement of what the weather will be for the next six months. I have watched very carefully the state of the atmosphere from September the 15th to the 25th. The sun crossed the Equator on Sunday, the 23rd, and entered the tropic of Capricorn in the southern hemisphere. The farmers will have a fine, dry autumn for sowing their wheat, and getting in the remainder of the crops. There is a hard, dry, frosty winter in store for us, but this will not be very acceptable for water millers, as it means a short supply of water. The wind will blow from the north chiefly, and it must be patent to every thinking mind that a regular north wind contains no vapour.—Yours truly,

“Sept. 25th.”

THOMAS BEBBINGTON.”

Mr. Bebbington is evidently an implicit believer in the theory that the general characteristics of each half year resemble those of the equinoctial week preceding it. This is a very old idea, but though it has many supporters, and upon the mere law of probabilities is bound to be *sometimes* right, we are not aware of any person who having written down at the end of each equinoctial week his opinion of the weather of the coming half-year, and compared it with the subsequent weather, has remained convinced of the accuracy of the method. This is the true test of all predictive rules, write in a book what you expect, and compare it with what you get. The late Mr. DuBoulay, of Sandgate, was a firm believer in this rule, and for three years published annually a pamphlet stating what the summer would be over the South-Eastern quarter of England :—

1862 was to be remarkable for excessive rain, little sun, and cold. The rainfall was exactly the average, temperature a little below it.

1863 was to be fine, especially July, August, and September. June was rather wet, July and half August very fine, rest of August and September very wet.

1864. The summer was to be remarkably dry. June was cold, and with frequent but slight rain ; July to September very dry.

The above, though not sufficient to prove anything, may serve as specimens of what it would be well to do for a series of years.

To Mr. Bebbington's prediction we add another copied from *Nature* of October 4th :—

“ON THE COMING WINTER.

“Having recently computed the remaining observations of our earth-thermometers here, and prepared a new projection of all the observations from their beginning in 1837 to their calamitous close last year—results generally confirmatory of those arrived at in 1870 have been obtained, but with more pointed and immediate bearing on the weather now before us.

"The chief features undoubtedly deducible for the past thirty-nine years, after eliminating the more seasonal effects of ordinary summer and winter, are:—

"1. Between 1837 and 1876 three great heat-waves, from without, struck this part of the earth; viz., the first in 1846·5, the second in 1858·0, and the third in 1868·7. And unless some very complete alteration in the weather is to take place, the next such visitation may be looked for in 1879·5, within limits of half a year each way.

"2. The next feature in magnitude and certainty is, that the periods of minimum temperature, or cold, are not either in, or anywhere near, the middle time between the crests of those three chronologically identified heat-waves, but are comparatively close up to them *on either side*, at a distance of about a year and a half, so that the next such cold wave is due at the end of the present year.

"This is, perhaps, not an agreeable prospect, especially if political agitators are at this time moving amongst the colliers, striving to persuade them to decrease the out-put of coal at every pit's-mouth. Being, therefore, quite willing, for the general good, to suppose myself mistaken, I beg to send you a first impression of plate 17 of the forthcoming volume of observations of this Royal Observatory, and shall be happy if you can bring out from the measures recorded there, any more comfortable view for the public at large.

"PIAZZI SMYTH, Astronomer-Royal for Scotland.

"Royal Observatory, Edinburgh, September 27th."

SUPPLEMENTARY TABLE OF RAINFALL IN SEPT., 1877.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see Met. Mag., Vol. XI., p. 28., but the list is under revision.]

Div.	Station.	Total Rain.	Div.	Station.	Total Rain.
		in.			in.
II.	Acol	1·82	XI.	Llanfrehfa	4·36
„	Hailsham .....	...	„	Castle Malgwyn	2·69
„	St. Lawrence, I. of W....	1·57	„	Heyope	3·32
„	Andover.....	1·81	„	Carno	2·70
„	Strathfield Turgiss	1·29	„	Rhug, Corwen	3·50
III.	Addington Manor.....	2·17	„	Port Madoc	4·28
„	Oxford	2·55	XII.	Melrose	2·41
„	Northampton	2·20	XIV.	Cessnock, Glasgow	1·47
„	Cambridge.....	1·95	XV.	Gruinart	1·96
IV.	Sheering	1·49	XVII.	Keith	2·85
„	Ipswich	·88	XVIII.	Dalwhinnie .....	...
„	Diss	1·93	„	Auchnasheen	3·00
„	Swaffham	2·40	„	Springfield, Tain	1·04
V.	Compton Bassett	2·63	XX.	Skibbereen .....	...
„	Dartmoor	5·75	„	Glenville, Fermoy	4·46
„	Teignmouth	2·36	„	Tralee	2·67
„	Langtree, Torrington	2·93	„	Newcastle W., Limerick	2·37
„	Cosgarne, St. Austell	8·17	„	Kilrush	1·41
„	Taunton.....	2·15	XXI.	Kilkenny	2·58
VI.	Bristol	2·90	„	Kilsallaghan	1·90
„	Sansaw	2·78	„	Twyford, Athlone	3·91
„	Cheadle	2·29	XXII.	Ballinasloe	3·53
VII.	Coston, Melton Mowbray	2·17	„	Kylemore	3·10
„	Bucknall	2·30	„	Carrick on Shannon.....	2·97
VIII.	Walton, Liverpool	2·92	XXIII.	Rockcorry	2·00
„	Broughton-in-Furness	3·07	„	Warrenpoint	1·83
IX.	Stanley, Wakefield	2·48	„	Carnlough, Larne.....	...
X.	Gainford	2·18	„	Bushmills	1·69
„	Shap	4·49	„	Buncrana	3·12

REVIEWS.

Le Climat de Brest. Première partie, Température et Pluie ; par
Prof. A. BORIUS. Brest, 1877, 8vo.

OUR readers will remember the name of Dr. Borius as that of the author of an excellent book upon Senegal. In the work before us he commences a similar treatise upon the climate of Brest, where he is now residing. We greatly admire the frank way in which Dr. Borius points out the imperfect conditions of exposure of some of the thermometers upon which he has had to rely, and can only express our surprise that the resultant mean temperature ($52^{\circ}7$) should be so near the truth as it appears to be. We regret that the author has adopted a seasonal year (December to November) instead of the civil one (January to December), and trust that it will be the last time that we shall see large masses of data grouped in that way. The relations between meteorology and civil life are too numerous and important for it to be desirable that the periods embraced should be incomparable. The mean monthly temperature is lowest in December ($43^{\circ}3$), highest in July ($64^{\circ}2$). In discussing the temperatures of the four seasons Dr. Borius puts forward the claims of Brest to a high winter temperature. We are inclined to think that, even allowing for the bad placing of the Brest thermometers, and for uncertainty as to the application of corrections for index error, the fact remains that Brest has a very mild winter and not hot summer temperature. We translate a few paragraphs upon this subject:—

“The mean winter temperature ($44^{\circ}2$) is remarkably high, and it may reach $47^{\circ}7$, as in 1869, or even $48^{\circ}2$, as in the winter just passing. The coldest winter at Brest ($41^{\circ}2$) is warmer than an average one in Paris ($38^{\circ}3$), or even in London.”

“This high winter temperature is one of the most characteristic phenomena of our climate, and greatly surprises strangers, especially those residing in the centre or east of France. The contrast between Brest, Paris, and our frontier towns is very striking, not only as regards the general mildness of the winter but also for the rarity of frosts and their slight intensity when they do occur.”

“The only French towns in which the winter is as mild as, or milder than, Brest are Bayonne, Perpignan, Marseilles, Grasse, Nice and the towns in the department of Alpes-Maritimes. In all other parts of France the cold is much more severe. Bayonne and Perpignan are, therefore, the only towns north of the Pyrenean chain which enjoy as mild a winter as Brest; one must go into Spain, to the southern slopes of the Pyrenees, in order to find winters comparable with those of Brest. The departments of the Bouches-du-Rhône, of the Var, and the Alpes-Maritimes are the only ones which can in this respect be compared with Finistere. These comparisons would still remain even if a subtractive correction of 1° were applied to the Brest observations, which is more than can be necessary.”

"But if the uniformity of the Brittany climate gives mild winters, it gives also summers cooler than those of other towns in the same latitude.

"The mean summer temperature of Brest ($62^{\circ}8$) may, rather than the winter, be proved to be too high by future observations made under favourable conditions, but it will not probably be more than $0^{\circ}2$ or $0^{\circ}4$. The towns situated within a few miles of the shore of the English Channel are the only ones at which the summers are as cool as at Brest."

"All these comparisons refer to temperature alone. Such a mild winter temperature in the latitude of Brest cannot co-exist with a clear sky. Cloud is almost constant, rain abundant and frequent, so that the advantages of a mild temperature are counterbalanced by dark weather, a misty horizon, and a very disagreeable hygrometric condition. One would never think of recommending to an invalid a town where the fine days are so rare, that usually he would be obliged to remain shut up in his room."

That is something like an honest paragraph. What a pity it is that such straightforward statements are so rare.

Three sets of rainfall observations have been made at Brest, but not one of the gauges seems to have been well placed, and consequently the averages differ greatly. The true quantity seems to be about 40 inches, of which the larger portion falls between September and February.

We hope that ere long the quality of the Brest observations will be greatly improved, and we think that the town would be fortunate if it placed their reorganization in the hands of Dr. Borius.

Report of the Rugby School Natural History Society for 1876.

Rugby: Billington, 1877, 8vo, 88 pp., 11 plates.

Twenty-fourth Half-yearly Report of the Marlborough College Natural History Society. Christmas, 1876. Marlborough: Perkins & Son, 1877, 8vo, 206 pp., 3 plates.

The Natural History Journal, Nos. 1 to 3 and 6. York: W. Sessions, 1877, 8vo, 56 pp.

THANKS rather to the energy of the masters than of the boys these are two capital reports, but the Rugby boys seem to have done more than usual, and we have no wish to be hard upon anybody. Of course, it is only our duty to look at the meteorological portion, but, having satisfied ourselves respecting that part of the Rugby report, we own to having had a good laugh over the anonymous paper on "Cats."

The Marlborough report contains very few papers, and only two by the boys themselves; but, at the same time, they seem to have worked hard both at Ornithology and Botany. The concluding portion of the Flora of Marlborough is given as an appendix, and is very valuable.

The last work on our list is a monthly periodical conducted by the Societies in Friend's Schools. It does not aim quite so high as the two other books with which we have grouped it, but it appears to accomplish so much useful work in Natural History, that we should strongly advise the Editors to put themselves in communication with the Phenological Committee of the Meteorological Society. Both parties, and Science itself, would gain by co-operation.

The Astronomical Register. Jan. to Sept. 1877. 8vo. London : J. D. Potter.

The Observatory. April to Sept., 1877. 8vo. London : Taylor and Francis.

WHEN a periodical has reached its fourteenth year, and its early volumes are so scarce as to be priceless, it needs little help from its contemporaries. This is the case with the *Astronomical Register*, and we need only say that recent numbers sustain its old character.

The *Observatory* is a new periodical edited by Mr. W. H. M. Christie ; it occupies nearly the same ground as its elder contemporary, contains many excellent articles, mostly signed, and is altogether a valuable publication.

We trust that amid the numerous English reading people devoted to Astronomy there are amply sufficient to support both these journals.

Ponts et Chaussées. Service Hydrométrique du bassin de la Seine. Résumé des observations centralisées pendant l'Année 1875. Par M. G. LEMOINE, Ingénieur des ponts et chaussées, sous la direction de M. E. BELGRAND, Inspecteur Général. 8vo. Versailles, 1876.

WHAT a pity it is that people are both too proud and too self-willed to learn ! Here is the annual report on the rainfall and discharge of the river Seine, worked out most carefully, treated in a strictly scientific manner, and consequently yielding, as truly scientific work generally does yield, information of great practical importance. Messrs. Lemoine and Belgrand not only keep up to the high level they first assumed in their administration of the great river, they go beyond it ; their work is both accurate and complete. Why can we not have similar reports upon the Thames ? We fear the true answer is, Because the general public knowing nothing of science are rather afraid of it ; they prefer " practical " men (as if a scientific man were necessarily unpractical), and though it is now fashionable to speak of scientific men with respect, and to talk much about the desirability of science-teaching, the people have yet to be born who would entrust matters of importance to purely scientific hands. Truly England can learn as much from France, as France from England. Why are we too narrow-minded to do it ?

SEPTEMBER, 1877.

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 1860-5	Greatest Fall in 24 hours.			Max.		Min.		In shade	On grass
				Dpth	Date.		Deg.	Date.	Deg.	Date.		
		inches	inches.	in.								
I.	Camden Town .....	.83	— 1.43	.28	3	10	73.3	11	36.1	25	0	1
II.	Maidstone (Hunton Court)...	.73	— 1.39	.25	2	8	...	...	...	...	...	...
III.	Selborne (The Wakes).....	1.44	— 1.00	.50	2	9	68.0	10*	29.0	25	2	6
IV.	Hitchen	1.79	— .07	1.04	3	13	61.0	2†	33.0	24**	0	...
V.	Banbury	2.22	— .15	.85	3	13	65.0	12	33.0	25	0	...
VI.	Bury St. Edmunds (Culford)...	1.40	— .21	.51	3	17	72.0	11	32.0	24	1	6
VII.	Norwich (Sprowston).....	3.05	...	1.28	3	17	...	...	...	...	...	...
VIII.	Bridport	2.40	+ .08	.86	11	9	...	...	...	...	...	...
IX.	Barnstaple	3.13	— .58	1.71	2	9	69.0	11‡	36.0	22	0	...
X.	Bodmin	3.75	+ .08	1.13	10	13	67.0	6	39.0	22	0	0
XI.	Cirencester	2.10	— .76	.54	11	7	...	...	...	...	...	...
XII.	Shifnal (Haughton Hall) ...	2.66	+ .71	1.11	2	12	...	...	...	...	...	...
XIII.	Tenbury (Orleton)	2.22	— .46	.77	2	8	66.5	15	34.0	5	0	2
XIV.	Leicester (Belmont Villas) ...	1.52	...	.51	3	10	67.8	12	35.8	25	0	...
XV.	Boston	2.18	+ .56	.70	2	14	70.0	11	35.0	25|||	0	...
XVI.	Grimsby (Killingholme).....	4.82	...	1.79	2	16	67.0	11	38.0	27||||	0	...
XVII.	Mansfield	3.53	...	1.48	2	14	69.5	11	33.5	25	0	1
XVIII.	Manchester .....	...	...	...	...	...	...	...	...	...	...	...
XIX.	York	3.20	+ .87	1.22	14	11	64.0	11§	35.0	28	0	...
XX.	Skipton (Arnccliffe)	4.24	— .72	1.29	13	18	64.0	18	32.0	24	1	...
XXI.	North Shields	1.76	+ .06	.46	20	13	...	...	...	...	...	...
XXII.	Borrowdale (Seathwaite).....	8.98	— 4.23	4.78	12	11	...	...	...	...	...	...
XXIII.	Cardiff (Crockherbtown).....	3.25	...	1.39	2	7	69.3	10	36.8	5	0	...
XXIV.	Haverfordwest	3.92	+ .21	.90	10	9	65.2	10	35.0	21||||	0	4
XXV.	Aberdovey	2.59	...	.77	14	12	71.0	1||	37.0	22	0	...
XXVI.	Llandudno	4.30	+ 1.96	1.78	14	15	68.9	10	42.5	8	0	...
XXVII.	Dumfries (Crichton Asylum)...	2.37	— .57	.77	11	6	63.5	11	33.5	21	0	...
XXVIII.	Hawick (Silverbut Hall).....	1.67	...	.50	12	9	...	...	...	...	...	...
XXIX.	Kilmarnock (Annanhill).....	1.81	...	.58	5	8	64.0	12	34.1	21	0	3
XXX.	Castle Toward	2.36	— 2.26	.71	14	7	61.0	17	32.0	21§§	2	0
XXXI.	Mull (Quinish)	2.57	...	.74	11	12	...	...	...	...	...	...
XXXII.	St Andrews (Cambo Ho.) ...	2.20	...	...	...	...	...	...	...	...	...	...
XXXIII.	Grandtully	2.13	...	.89	5	6	...	...	...	...	...	...
XXXIV.	Braemar	2.10	— .54	.65	5	9	61.2	8	30.0	2	3	12
XXXV.	Aberdeen	1.80	...	.52	5	16	64.2	14	37.5	3	0	3
XXXVI.	Gairloch	2.50	...	.54	13	16	...	...	...	...	...	...
XXXVII.	Portree	3.80	— 6.96	.86	13	17	...	...	...	...	...	...
XXXVIII.	Inverness (Culloden)	1.41	— 1.28	.80	6	8	66.9	11	35.3	3	0	8
XXXIX.	Helmsdale	1.21	...	.26	12	14	...	...	...	...	...	...
XL.	Sandwick	1.63	— 2.03	.26	13	20	59.9	13	39.8	30	0	0
XLI.	Caherciveen Darrynane Abbey	3.02	...	.66	14	11	...	...	...	...	...	...
XLII.	Cork	3.23	...	.83	10	8	...	...	...	...	...	...
XLIII.	Waterford ...	3.63	+ .50	1.76	10	8	69.0	4	33.0	22	0	...
XLIV.	Killaloe	2.62	— 1.54	.72	14	10	75.0	5	32.0	22	1	...
XLV.	Portarlington	1.52	— 1.76	.64	14	21	64.0	14	35.0	21	0	...
XLVI.	Monkstown, Dublin	2.01	+ .02	.79	10	8	71.0	5	34.0	4	0	...
XLVII.	Galway	2.42	...	.61	12	13	68.0	11¶	36.0	22	0	...
XLVIII.	Ballyshannon ...	2.43	...	.65	10	12	...	...	...	...	...	...
XLIX.	Waringstown	2.16	...	.59	11	14	66.0	17	33.0	3	0	...
L.	Edenfel (Omagh)	2.27	...	.83	10	14	64.0	11	31.0	3	1	...

* And 11. † 10, 11, 15. ‡ 13. § 12. || 26, 28. ¶ 16, 17. ** 27. §§ 28. §§ 22.
 +Shows that the fall was above the average; —that it was below it.

METEOROLOGICAL NOTES ON SEPTEMBER.

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

ENGLAND.

SELBORNE.—A chilly and ungenial month, with frequent fogs, especially towards the end. Prevailing wind first half S. and W., second half N. and N.E. R and H on 12th.

HITCHIN.—The coldest September in our record.

CULFORD.—The coldest September during many years; mean temp. $52^{\circ} \cdot 1$. On the morning of six days the grass was crisp with frost; N.E. winds on six days, and during 11 of the remaining 24 the wind was from the N.W.; T on 3rd and 11th.

BODMIN.—Mean temp. $57^{\circ} \cdot 7$, being $1^{\circ} \cdot 6$ below the average.

SHIFNAL.—The previous R continued for the first 4 days, with a fall of $\cdot 50$ on the 3rd, when a change for the better ensued till the 11th, then R again during 5 days, thence to the end dry, with three slight exceptions, enabling the farmers to get in the rest of their damaged crops, some out till the end. Winds westerly generally with clouded sky till the 20th, when from E. with bright weather; morning foggy from 27th; no equinoctial gales. Clouded yellow butterflies (*Colias Edusa* and *Hyale*) appeared here as elsewhere, after many years' interval; few others. Not a damson in the parish, and very few plums and wall fruit; blackberries the only substitute abundant, also hazel nuts; hardly any acorns.

ORLETON.—A heavy fall of R occurred on the 2nd and 3rd, which flooded the brooks and river, and retarded the harvest, which was very late. The wind then changed to the N. and E., and gradually dried up the land; R fell only on 5 days afterwards during the month, but the temp. was low, and the sky generally cloudy till after the 20th, when the sky became clear with sunny days and cold nights. The wind was violent on the 3rd and 15th. No T heard nor L seen. Mean temp. of the month was about $3^{\circ} \cdot 5$ below the average, and much lower than that of any September during the last 16 years.

LEICESTER.—Nearly all the R fell in the first half of the month, one-third of the total amount having fallen on the 3rd; the last fortnight very fine. Very foggy mornings during the last week. Much N.E. wind, and temp. generally below the average.

BOSTON.—The temp. of the month 5° below the average of the last 13 years in this neighbourhood. The wind blew from a north-easterly direction on 18 days; the average for this month being four days. Harvest much impeded by the very heavy R at the beginning of the month. The crops generally are below the average, but not so deficient as in other districts of the country. The potatoe crop is a failure, two-thirds of the tubers being affected by disease. Hay and grass keeping has been plentiful; fruit generally has yielded a very poor crop. The deficiency in the corn crops is accounted for by the cold, wet, backward spring, and the lowness of the temp., and stormy weather in July, when the wheat was in flower. The fruit was ruined by the frosts in spring, when the trees were in blossom; and the potatoes by the wet weather of the late summer and early autumn.

GRIMSBY.—Air very moist throughout the month. The wheat proves to be in a worse condition than was at first imagined; some barley carried in fair condition at the end of the month. August and September have each had a fall of more than $4 \cdot 00$ of R, a thing that has never occurred in two consecutive months since I have kept a register; neither have I ever before recorded three falls of more than $1 \cdot 00$ in. within a month, as was the case this year, viz., August 25th, $1 \cdot 55$; September 2nd, $1 \cdot 79$, and September 14th, $1 \cdot 22$. The rainfall of the year is now $24 \cdot 60$. For the same period in 1872 it was $25 \cdot 51$, but last autumn was far wetter than that of 1871. TS on 11th, at 5 p.m.; and T at the same time of day on the 12th.

MANFIELD.—The early part of the month was marked by heavy R on the 2nd and

3rd, amounting together to 2'14, and all falling between 6 p.m. on 2nd, and 6 p.m. on 3rd, giving 1'48 to the 2nd, and '66 to the 3rd; the remaining part of the month has been fine autumnal weather, with occasional showers; after the 14th they were very slight, it being fine autumnal weather with haze. Mean temp. of month 51°·9

NORTH SHIELDS.—T S with H on 20th.

WALES.

Haverfordwest.—With the exception of the very wet weather, from the 10th to 14th, this has been a magnificent month; certainly the finest in the year. Although the crops are light in quality, especially the oats, yet all has been saved well. Latter half of the month barometer high.

Aberdovey.—A warm, genial month; very favourable for the harvesting in these parts, especially on the hill sides. Winds generally calm; about 2 inches less R than fell in September of last year. No frost here.

Llandudno.—The first half of the month wet and variable in every respect, but it was much less so in the second half. There was a heavy gale on the night of the 13th, followed the night after by an unusually heavy fall of R (1'78), from this time to the end the fall only amounted to '22. Sea fog from 10 to noon on 24th, and another from 2 to 4.30 p.m. on 29th. Mean temp. of the month about 3° below the average; and the fall of R much above it.

SCOTLAND.

Dumfries.—September has been a dry month; R fell only on six days, but on three of them following each other it was nearly 2'00, and there was not any fell between the 13th and the end of the month. Both rainfall and temp. was below the average; winds have been light, the prevailing direction being northerly; bar. high. T and L only recorded once.

Hawick.—On the night of the 1st there was much L, which was followed by two frosty nights; very high winds on 12th and 13th. The month has been the driest of this year, much hay has been got in, and harvest operations have gone on without much interruption; potatoes are much diseased; and the turnip crop is far from satisfactory. The flower gardens are now looking summerlike.

Aberdeen.—Bar. above the average; mean temp. 51°·1, or 1°·7 below the average (20 years); and rainfall, 1'80, is 1'31 below it. Wind pressure less than the average; but wind from N.W., N. and S. more frequent than usual. A month of rather dry, but dull weather.

Portree.—On the whole a favourable month for farmers, the corn crops have ripened wonderfully well during the month, harvest work is now carried on briskly, but there will be no full ripe corn in the island this year. The potatoes are free from blight, but the unprecedented frost on the 1st of the month has retarded the growth. Straw and hay, if got in well, will be plentiful all over the island.

Sandwick.—September has been much drier than the average, and also colder owing to the prevalence of northerly winds which blew on twenty days. Harvest is unprecedentedly late, and very few oats are yet ripe enough for cutting. Aurora on the 15th.

IRELAND.

Darrynane.—Heavy TS on 14th.

Waterford.—Mean temp. 54°·4; wind N. on 21 days; high wind on 8th; heavy R (1'76 in.) on 10th; extremely heavy R, with high wind, 5.30 to 6.15.

Killaloe.—From 14th to end of the month perfect weather, and all that could be desired for concluding harvest operations. Mean temp. 54°·0.

Monkstown.—First and last 10 days of month very fine and dry, rather cool N.W. winds being prevalent; 11th to 14th very damp and warm, with daily falls of R.

Ballyshannon.—Although more than 2 in. of R has fallen, the month on

the whole has been favourable for gathering in the grain crops, but the potato crops throughout the district are more than half diseased.

WARINGSTOWN.—Latter part fine and favourable for the harvest, which has been delayed till now.

EDENFEL, OMAGH.—The first fortnight of September was a continuation of the raw, rainy, unseasonable weather which has made the year remarkable; the hay was not all saved, and but little had been attempted at the grain harvest; but since the 14th, and as if to leave a better impression behind of the dying year, we have been blessed with weather as like summer as it could be at this season, so that what would have been a disastrous, will now be but an unfavourable, year for the farmers.

GREENWICH EXTREME TEMPERATURES.

The extreme Shade Temperatures of the month of September at the Royal Observatory, Greenwich, during the past 36 years.

Year.	Maximum.		Minimum.		Year.	Maximum.		Minimum.	
	deg.	date.	deg.	date.		deg.	date.	deg.	date.
1841	79·6	12	36·6	5	1859	76·0	24	41·5	12, 20
1842	75·8	2	41·1	21	1860	69·7	7, 8	35·7	12
1843	79·9	17	34·0	28	1861	81·1	1	37·7	27
1844	78·0	1	34·8	29	1862	73·8	15	39·2	23
1845	73·5	9	33·4	23	1863	71·8	19	35·0	30
1846	86·4	6	39·2	29	1864	75·5	8	40·9	12
1847	72·5	11	33·1	27	1865	86·0	8	40·2	23
1848	80·5	22	33·2	13	1866	71·0	28	41·3	25
1849	79·0	6	42·7	18	1867	79·9	1	35·5	25
1850	70·5	2	39·0	7	1868	92·1	7	43·6	11
1851	76·6	1	37·6	10	1869	80·0	5	41·2	1
1852	77·5	4	37·9	17	1870	72·6	1	37·4	25
1853	73·0	17	37·5	27	1871	82·0	1	39·0	23
1854	81·2	4	37·9	29	1872	81·4	3	34·5	23
1855	78·2	23	34·1	27	1873	72·5	27	38·2	22
1856	72·5	10	40·0	20, 21	1874	78·1	25	43·4	19
1857	80·7	17	41·5	21	1875	81·0	18	44·6	1
1858	83·8	12	41·5	25	1876	72·5	21	41·6	13, 18

Extremes in 1877, Max. : 73°·4 on 11th; Min. : 33°·3 on 25th.

	Year.	Max.	Date.	Min.	Date.	Year.
Means of 36 years	...	77·7	11	38·5	20	...
Highest	1868	92·1	7	44·6	1	1875
Lowest	1860	69·7	7, 8	33·1	27	1847
Range .....	...	22·4	...	11·5	...	...

Addiscombe, 8th Oct., 1877.

EDWD. MAWLEY.

S Y M O N S'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CXLII.]

NOVEMBER, 1877.

PRICE FOURPENCE
[or 5s. per ann. post free.]

ANEMOMETERS AND THE GALE OF OCTOBER 14TH-15TH.

THE extensive damage produced in the Midland Counties by this gale, induced us to apply to such of our correspondents as we were aware possessed anemometers, for copies of their records, and we have the pleasure of giving a few facts in a table on page 147. It is, however, necessary to preface it with some general remarks. In the first place we do not know of two anemometers of which the records can fairly be compared. By this we wish it to be distinctly understood that, while we admit that a maker may send to Kew a dozen anemometers all of which shall agree within two per cent., we believe that there are no two now at work of which records of 100 miles having passed, would really prove that from 98 to 100 miles had actually been the horizontal motion at each station. There are many reasons for this.

Every anemometer requires oiling; no two anemometers require oiling at equal intervals of time; the frequency depends on climate, dust, smoke, salt in the atmosphere, &c.; moreover the relative attentiveness of the observer is a disturbing element. The friction coefficient depends on the stickiness or otherwise of the lubricating material, and from the day that an anemometer is cleaned and oiled it begins to coagulate, and the friction increases until it is again cleaned. For the reasons previously given, anemometers cannot all be oiled at the same date, and if not, some are in one state, others in the opposite.

There are several sets of observations which prove, and Mr. Glaisher's balloon voyages confirm, the fact that the velocity of the wind is greatly retarded by friction against the earth's surface. Therefore, every foot that the anemometer is placed above the ground puts it in a stratum of which the horizontal movement is greater than at less altitudes. We are not aware that the *amount* of this increase of velocity with altitude has been determined, but of its existence, and of its being a large value there can be no doubt. This compels us to admit that strict comparison can only be made between anemometers placed at equal altitudes above the ground.

There is a very great difference between the wind passing an anemometer mounted on a pole and one placed upon the roof of a house.

The former probably shows (subject to correction for friction) the

velocity of the current at the altitude at which it is fixed ; the latter shows a higher value than the truth, inasmuch as it shows the current due to its altitude, plus that of part of the air which has struck the building on which it is placed. This deflected air will vary with the shape and size of the building, and with the azimuth of the wind. It would be at its minimum when the anemometer was at the top of a conical building, and at its maximum with a rectangular building of considerable extent, when the wind struck perpendicularly upon one of its sides. No attempt has been made to determine the amount and character of the errors thus produced.

The foregoing sources of incomparability are removable. The next is only partially so, viz., the differences due to local surroundings. In examining the progress or intensity of storms we require to know the velocity, &c., say at London and Oxford ; we do not want to know the difference between the velocity in St. James's Park and on Primrose Hill. Hitherto the practice has too often been to fix the site first, and then put up the anemometer on the observatory *because* the observatory is the natural place for it. The reverse method is the proper one : hunt carefully for as perfectly suitable a site as possible for the anemometer, and then plan your observatory.

Few people are aware how very little shelter an anemometer will bear. We have never put any faith in the readings of the Camden Square anemometer, because we thought it sheltered ; yet we find that from S.S.E. through W. to N.N.W. there is nothing more than 2° higher than the cups, and from N.N.W. through E. to S.S.E. nothing more than 10°, and very little so much as that. Yet at Greenwich a total motion of 1179 miles is recorded against 511 at Camden.

From the foregoing and other considerations, upon which we have not time to dwell, such as size of instruments, mode of registering, &c., we conclude that *no two anemometers at present at work are strictly comparable.*

Now a few words respecting the table, and very few are necessary. The Roman numerals indicating patterns of anemometer are—I., small size Robinson's cups (radius about 1 ft.) ; II., large size (radius about 2 ft.) ; III., pressure plates.

We never recollect seeing so many anemometer records together before, but the only real novelty in the table is the last column but one. Finding it hopeless to learn anything by comparing the recorded horizontal velocities, we tried to ascertain if the records of each station were consistent with themselves. For instance, there are five stations within a dozen miles of London, and they record horizontal motions ranging from 1179 miles (Greenwich) through 983, 864, 691 down to 511 at Camden Square. Who can say where the truth is, amid such discordant statements ? We therefore compared the records of the two separate days at each station with the aggregate for 48 hours, and this gave the (generally) very consistent figures in the last column but one, showing (1), that roughly speaking 60 per cent. of the horizontal motion occurred in the first of the two days ; (2), that the

excess of the first day was greatest at the western stations, and vanished at Greenwich.

STATIONS.	AUTHORITIES.	ANEMOMETER.			Total Horizontal motion in 24 hours, ending 9 a.m.		Per cent. of 48 hours in first 24 hours.
		Pattern.	How mounted.	Height.	15th.	16th.	
					feet.	miles.	
Roy. Bot. Gardens, Lond.	W. Sowerby, F.L.S., F.M.S.	I.	{ Column	26	387	304	56 ¹
Camden Square, „	G. J. Symons, Sec. M.S. ...	I.	{ Mound.	27			
Addiscombe	E. Mawley, F.M.S. ...	II.	Pole.	35	280	231	55 ²
Roy. Obs., Greenwich ...	Sir G. B. Airy, K.C.B., F.R.S.	I.	Roof.	50	481	383	56 ³
Deptford, Kent	W. Jeffree	I.	Roof.	60	580	599	49 ⁴
Worthing, Sussex	W. J. Harris, F.M.S.	I.	Roof.	65	525	458	53 ⁵
Strathfield Turgis, Hants.	W. J. Harris, F.M.S.	I.	{ Shed.	15	635	..	...⁶
Radcliffe Obs., Oxford ...	C. H. Griffith, F.M.S.	I.	{ Pier.	15			
Aspley Guise, Beds.	R. Main, M.A., F.R.S.	I.	Post.	20	...	...	...⁷
Wisbeach	E. E. Dymond, F.M.S.	I.	Roof.	110	559	418	57 ⁸
Marlborough, Wilts.	E. E. Dymond, F.M.S.	I.	Post.	13	384	254	60 ⁹
Babbacombe, Devon. ...	W. J. D. Ward	I.	...	...	412	305	57 ¹⁰
Sidmouth, „	T. A. Preston, M.A., F.M.S.	I.	Pole.	19	824	266	76 ¹¹
Mid. Inst., Birmingham.	E. E. Glyde, F.M.S.	I.	Pole.	25	662	361	65 ¹²
Buxton, Derbyshire	W. T. Radford, M.D.	III.	Staff.	11	...	...	...¹³
Barrow, Lancashire	A. Cresswell	I.	Roof.	70	552	411	57 ¹⁴
Ulley, Rotherham	E. J. Sykes, F.M.S.	I.	Roof.	30	340	235	59 ¹⁵
„ „	F. Slade, C.E.	I.	Pole.	36	785 (?)	891 (?)	...
Hawes, Yorks.	L. Berry	I.	„	5	306	207	60 ¹⁶
Kilmarnock, Ayr	J. D. Parker, LL.D., F.M.S.	II.	„	5	280	196	59 ¹⁷
„ „	W. H. Dunlop, F.M.S.	I.	Post.	10	540	...	...
„ „	„ „	I.	Stand.	12	427	...	...

REMARKS.

- ¹ A good blow, but have often had more.
- ² Heavy gale, but not exceptionally so. No damage in this neighbourhood.
- ³ Max. velocity 37 m. in the hour, ending 2.45 a.m. on 15th. Wind S.S.E. at 4 p.m. on 14th, W.S.W. at 9 a.m. on 15th.
- ⁴ Max. velocity 44 m. per hour between 2 and 3 a.m. 15th. Max. pressure 22 lbs. at 4.20 a.m.
- ⁵ Very violent from 11 p.m. 14th to 9 a.m. 15th.
- ⁶ On Pierhead, $\frac{1}{2}$ -mile from shore; at 9 a.m. on 15th velocity 34 miles per hour. Very strong 2 to 4 a.m. on 15th.
- ⁷ Anemometer pole broken by very heavy gale at 3.15 a.m. on 15th. Anemometer had run 327 miles in 18 $\frac{1}{4}$ hours. Min. bar. at 3 a.m. Much damage.
- ⁸ Bar. min. at 2 a.m. Max. velocity 36 m. per hour at midnight.
- ⁹ Have had four stronger gales this year. Gale began late in evening of 14th.
- ¹⁰ Max. pressure, 20 lbs. at 1 a.m. on 15th.
- ¹¹ Very strong gale, and much damage done.
- ¹² Exceptionally violent 11.30 p.m. on 14th to midnight; said to be the strongest gale for 30 years.
- ¹³ 17 lbs. on square foot (= 61 m. per hour) at 9 a.m. on 15th, which is rarely equalled here; much damage.
- ¹⁴ Max. pressure 26 lbs. at 1.30 a.m. on 15th; max. velocity 40 m. per hour, 2 to 4 a.m. Direction always between S. and W. Barometer pumping very much from midnight to 2 a.m., when sea level min. of 29.25 in. occurred.
- ¹⁵ Wind not at all exceptional.
- ¹⁶ Anemometer read at irregular intervals, generally strong wind here—this was not excessive.
- ¹⁷ Not continuously violent, but heavy gusts—observations taken at 10 a.m., not 9 a.m.

In the following notes we have embodied all the references to the weather of the 14th and 15th of October which have reached us, and they show that in the Midland Counties the gale was of very exceptional violence. Our correspondents have sent few details of damage, but from the newspaper reports, of demolished houses, factories, chapels, &c., it must have amounted to many thousand pounds.

ENFIELD CHASE.—15th. **SIR,**—A gale of extraordinary violence swept over this district this morning. The storm commenced about 11.30 p.m. yesterday, and gradually increased in violence till 2 a.m. this morning, from which time till 4 a.m. the force of the wind was terrific. Vivid flashes of lightning were seen in S.E., between 3 and 4 a.m.; after 4 a.m. the violence of the storm slightly abated, and the wind began to veer from S. to S.W. At 7 a.m., after a sharp shower, the storm ceased, though the wind has continued strong and squally all day. The gale was the most violent that has been experienced here for years, and though in this exposed position, little damage was done, the damage in the more low lying districts, and particularly at Winchmore Hill, where great numbers of trees were blown down, was considerable. One of the most remarkable features of the storm was the excessive temperature which preceded it. At 6 p.m. yesterday the thermometer stood at 61°, at 9 p.m. at 63°·2, and during the night it rose to 64°·8; as the storm passed off, the temperature fell very rapidly, being only 50° at 8 a.m., and at 9 p.m. to-night only 43°·8, or nearly 20° lower than at the same time yesterday. The barometer fell rapidly yesterday evening, but the minimum was only 29·32 in.—Yours truly, *Thos. Paulin.*

WORTHING.—14th. Fine morning, with fresh breezes from W.S.W. and S.W. Wind “backed” all day, and in afternoon and evening was S.E. and S.S.E. Barometer fell sharply; sky presented a wild appearance—clouds being, in common parlance, “mare’s tails,” indicative of wind and stormy weather.

15th. During early morning 2 to 4 a.m., wind blew very strong from S.S.W. and W.S.W.; after 4 a.m., barometer began to rise, wind “veering” more W. At 6.30 a.m. and 7.30 a.m. sharp squalls of wind and rain, again, shortly after 8 a.m., a very heavy rain storm came on from S.W. and W.; during its passage, the wind “veered” to W.N.W., sky cleared, and it was fine altogether afterwards.—*Wm. J. Harris.*

- ST. LAWRENCE, ISLE OF WIGHT.—14th. Gale in the early morning.
15th. A wonderful whirlwind passed along the sea from W. to E. at 2.30 p.m., and drew the water up into a column of considerable height. It was seen by many persons. I have heard of no damage done by it.—*C. Malden.*
- SELBORNE, HAMPSHIRE.—14th. Violent wind, W. to S.
15th. Much wind, S.W.—*T. Bell.*
- HITCHEN.—15th. Terrific gale, said to be the most violent in living memory.—*W. Lucas.*
- ADDINGTON, BUCKS.—14th. Fine ; wind increasing all the afternoon and evening.
15th. Wind very high in early morning ; a great many branches broken off trees, but have heard of no other damage.—*J. Mathison.*
- MAG. COLL., OXFORD.—14th. Damp ; very high wind in night, several trees blown down, and other damage done.—*F. Chapman.*
- BANBURY.—14th. Much damage to trees and buildings in the neighbourhood by the gusty wind of this night ; very high wind.—*T. Beesley.*
- NORTHAMPTON.—14th. In night of 14th–15th heavy S.W. gale, and great destruction of property.—*H. Terry.*
- CAMBRIDGE.—14th. A warm, fine, summer day ; windy in evening.
15th. Severe S.S.W. gale, without rain, from 0 to 4 a.m.—*G. Warren.*
- CULFORD, SUFFOLK.—15th. High wind.—*P. Grieve.*
- DISS, NORFOLK.—14th. Fine day, and magnificent sunset ; violent S.W. gale at night.
15th.—Tremendous gale, intense at 3 a.m. ; a few trees were blown down and stacks unthatched ; but the mischief was not so great as I expected.—*T. E. Amyot.*
- SPROWSTON, NORFOLK.—14th. Gale from S.W. at midnight.
15th. Strong gale, unroofing stacks, but not followed by rain ; gale lasted all day, strongest at 3 a.m.—*T. Cozens Hardy.*
- COMPTON BASSETT.—14th. Very fine ; hurricane at night which did considerable damage to buildings, and uprooted many large trees.—*J. Allen.*
- BEAMINSTER, DORSET.—14th. Calm, lovely day ; sudden change about 4 p.m. ; S.W. gale sprung up about 8 p.m., and blew a hurricane at midnight, doing great damage to the church tower.—*A. Codd.*
- KIRKHAM, BABBACOMBE, TORQUAY.—14th. Fine and warm (max. temp. 65°·3), with a fresh southerly breeze till the evening, when the bar., which had been falling all day, fell fast, and the wind rose to a severe gale from S.S.W., which increased to almost a hurricane between 11 p.m.

and 0.15 a.m. of the 15th, it then gradually lulled to force 2 by 7 a.m., and shifted to W.S.W. I append a few observations :—

Day.	Hour P.M.	Bar. at 32° at sea level. in.	Shade temp.		Wind.	Force.	Weather.
			Dry. Deg.	Wet. Deg.			
14th	9.14	29.389	61.1	57.4	S.S.W.	9 ...	cq.
„	11.0	29.290	57.8	52.3	„	11 ..	bq.
„	12.0	(min.) 252	55.2	51.4	„	12 ...	oqp.
	A.M.						
15th	0.15	29.300	55.0	—	„	11 ...	oq.
„	9.14	29.836	46.9	43.5	W.	2 ...	cv.

Rainfall, 0.03 in. in past 24 hours. Shade min.
in past night, 45°.9.

Enormous quantities of dust and gravel were blown about, rattling against the windows; about a load of gravel was blown away from this garden. Trees have been wrecked, houses unroofed, and vegetation scorched up in every direction; plate glass windows blown in at Torquay, and a yacht ashore.—*E. E. Glyde.*

DRUID ASHBURTON, DEVON.—14th. Very heavy S.W. storm at night.
15th. Showers early; at 11 a.m. thunder and hail.—*F. S. Amery.*

TAVISTOCK, DEVON.—14th. Fine morning, afterwards windy; a perfect hurricane in the night.—*W. Merrifield.*

CLAWTON, HOLSWORTHY, DEVON.—14th. One of the most severe S.W. gales I recollect; great injury done to trees, many blown over, ricks scattered, and general damage.—*W. W. Melhuish*

LANGTREE, TORRINGTON, DEVON.—14th. Very heavy gale at night, uprooting trees, &c.—*J. E. Bazeley.*

ARLINGTON COURT, BARNSTAPLE.—15th. SIR,—It may interest you to know that this place was visited last night by a real hurricane. It began to blow hard about 11 p.m., 14th. I looked at my barometer at 11.20 p.m.; it stood at 28.65 in. (we are 600 ft. above sea level). I looked again at 11.40 p.m., it had risen to 28.70 in., but at 0.20 a.m. 15th, it had fallen to 28.45 in., and at 9 a.m. it was at 29.29 in. About 0.45 a.m. it was blowing a real hurricane. Very great damage has been done to the roofs of the houses; my observatory had its roof lifted clean off, and deposited some 80 yards off, and from 200 to 300 trees (some of great girth) have been blown down. I measured one 18 ft. in girth. The wind at the early part was S.S.W., but it gradually got round to N. As I write the ground is white with hail.—Yours very truly, *Bruce Chichester.*

ASHLEY DOWN, BRISTOL.—14th. Terrific gale at night.—*W. F. Denning.*

- SHIFNAL, SHROPSHIRE.—14th. A fearful hurricane from S. to W. and N.W., beginning at 9 p.m. and lasting till 4 a.m.; the severest since the memorable one of January 7th, 1839.—*J. Brooke.*
- SANSAW, SHROPSHIRE.—14th. Fearful storm of wind, especially at night.—*F. G. Tippinge.*
- ORLETON, WORCESTER.—14th. Much low drifting cloud, with lofty dusky cirrus above; very fine and warm after 10 a.m., with soft broken clouds, and a strong S. wind; moonlight at 8 p.m., with soft white drifting clouds, and rough wind.
15th. Great hurricane from 0 to 3.30 a.m., with spots of rain; morning fine, with rough wind. The hurricane was most destructive to the timber trees and buildings; all the roads were blocked up by fallen timber trees, or strewed with boughs and branches. No wind of equal violence has occurred since the hurricane in the night between the 6th and 7th of January, 1839, which was preceded by a similar advance in temperature.—*T. H. Davis.*
- TEAN VICARAGE, NEAR CHEADLE, STOKE-ON-TRENT.—15th. A tremendous gale in night, from S. veering to W. Especially severe from about 1 to 4 a.m. this morning (15th). Some of the gusts terrific, so that even this solidly-built house swayed perceptibly under the pressure. A tree in the field just below this house had its top snapped off. No rain fell during the storm, but a few slight showers, chiefly small hail, since 9 a.m. this morning. Temperature yesterday afternoon (14th) quite summer-like (max. 67°). Sky almost cloudless, and clear atmosphere. Even at 9 p.m. the thermometer stood at 58°, but wind, which had been very brisk even in the afternoon, had then increased to a gale, and subsequently, by about midnight, to a violent storm.—*G. T. Ryves.*
- BICKENHILL, BIRMINGHAM.—14th. Unusually mild; a terrible gale began at 9 p.m., but moderated towards morning; several trees snapped in two, and branches strewed in all directions.—*W. R. Capel.*
- LEICESTER.—15th. A very violent gale in the early morning, which did considerable damage; many trees uprooted.—*H. Billson.*
- COSTON, MELTON MOWBRAY.—14th. Very severe gale at night, unparalleled in the memory of the inhabitants.—*A. M. Rendell.*
- BOSTON.—14th. A very heavy gale, which continued with more or less force all the next day.—*W. H. Wheeler.*

GRIMSBY, LINCOLN.—14th. Wind rising at night.

15th. Heavy gale from near midnight till 3 p.m.—
J. Byron.

MANSFIELD, NOTTS.—14th. Terrific gale at night.

15th. Terrific gale in early morning Stormy night.—
R. Tyrer.

STANLEY, WAKEFIELD.—15th. Furious gale in the morning.—*R. Burrell.*

BUCKDEN, SKIPTON.—14th. Fine ; strong wind at night.

15th. Rain, a gale, hail, and thunder at night.—*W. R. Metcalfe.*

N. SHIELDS.—14th. Fine.

15th. Showery, fine rain.—*R. Spence.*

SEATHWAITE, CUMBERLAND.—15th. Snow on hill-tops.—*T. Birkett.*

GAINFORD, DURHAM.—14th. Fine afternoon.

15th. W.S.W. gale, with rain and sleet.—*A. Atkinson.*

WOODLANDS, ELTERWATER, WESTMORELAND.—14th. Dull all day, and windy ; rain at night.

15th. Frequent showers of hail and rain.—*E. Tucker, jun.*

SHAP, WESTMORELAND.—14th. A great storm of wind.

15th. Wet, and very windy.—*W. Hoggarth.*

LLANFRECHFA, MONMOUTH.—14th. Thunder and lightning.—*F. J. Mitchell.*

HAVERFORDWEST.—14th. Great storm, very little rain, sky clear ; at midnight bar. falling fast ; tremendous gusts at 12 (midnight), between which time and 3 a.m. the force of the wind was very great ; much damage done to roofs, slates lying in heaps. Near Rosebeach Precelly Slate Quarries, a new roof just slated, and firmly nailed down, was forcibly lifted entire and carried 50 yards, and it came down without injury flat on to the ground. The sky was clear, bright, and starlight nearly the whole of the night, except at intervals, when enormous hailstones fell in heavy showers.—*E. P. Phillips.*

SOLVA, PEMBROKE.—14th. Heavy gale, increasing towards night.—
E. Robinson.

CASTLE MALGWYN, CARDIGAN.—14th. Very rough wind, and showery.

15th. Windy, and small showers.—*H. Howard.*

ABERDOVEY.—14th and 15th. Great storm of wind, commencing about 10 p.m. on 14th.—*D. Charles.*

LLANDUDNO.—14th. Very windy and warm ; began to rain about 8 p.m. ; stormy night.

15th. Very windy day ; two heavy hail showers in the afternoon, showery evening, stormy night.—*J. Nicol.*

HAWICK.—14th. Rough blustering winds, hurricane blowing from the west.

15th. Rough wind, hail showers ; hills white with snow, or rather hail.—*D. Elder.*

KILMARNOCK.—15th. Great storm from W.N.W., reaching force 11 on Beaufort scale; a considerable quantity of grain still standing out in the fields.—*W. H. Dunlop.*

CESSNOCK PARK, GLASGOW.—14th. Fine morning, hailstorm at noon, rain at night.

15th. Stormy morning.—*R. Hart.*

ABERDEEN.—14th. Lightning 9 a.m.—*A. Beverley.*

KEITH STATION.—14th. Sleet. 15th. Snow.—*J. Masson.*

AUCHNASHEEN STATION.—14th. Heavy rain and snow, = 2·03.—*The Agent.*

PORTREE.—14th. The rain poured down in torrents, raising the rivers and streams to an extent never before seen; corn and potatoe fields covered with water, and gravel, several feet deep, rendering several fields unfit for cultivation in all time to come; bridges and roads were swept to the sea, causing damage to the extent of several thousand pounds to the road commissioners, and stopping all our communication throughout the island, except on horseback. At Uig, the whole burial ground, except six graves, was carried completely away; coffins were put ashore by the sea 10 and 20 miles distant. The mansion house garden and all the plantations were also swept away, with the estate manager, who was the only one in the house at the time; not a vestige remains. No such floods here since inhabited by human beings.—*J. Grant.*

CULLODEN, INVERNESS.—14th and 15th. Constant heavy rain from E.N.E.; barometer in morning, 28·563 at 32°; frequent heavy showers of snow.—*D. Forbes.*

BUDGATE (NAIRN).—14th. Rain. 15th. Stormy, much wind.—*J. Joss.*

SANDWICK.—15th. Storm, velocity 69 miles per hour from 7 to 8 p.m.; mean from 5 to 9 p.m. 65 miles. One of the strongest gales for years.—*C. Clouston.*

DARRYNANE ABBEY.—14th and 15th. Very heavy gale from W.—*D. O'Connell.*

TRALEE.—A cyclone passed on 13th, 14th and 15th; rainfall on 14th, 2·25 in.—*H. Stokes.*

WATERFORD.—14th. Wind very high.—*E. Garnett.*

NEWCASTLE, W.—14th. Storm from W., with rain and hail.

15th. Storm from N.W., with rain and hail.—*J. T. Hayes.*

MILLTOWN MALBAY, CLARE.—14th. A furious hurricane, which did some damage.—*M. Molohan.*

KILRUSH.—14th. Wet, wild, heavy W. gale, veering to N.W. in the evening; very bad, rainfall 1·23 in.

15th. Wind still N.W. and stormy.—*M. Bourke.*

KILLALOE.—14th. Storm.—*J. Digan.*

NAAS, KILDARE.—14th. Dry, windy day; showers from S.W. in evening. 15th. Windy and cold.—*P. Homan.*

- BELVEDERE, MULLINGAR.—14th. Rough, stormy morning; wet afternoon.
15th. Rough, stormy morning; stormy afternoon.—*G. Curd.*
- KILOONNEL, GALWAY.—15th. Storm from N.W., with hail and occasional thunder.—*H. E. Muriel.*
- BALLINASLOE.—14th. Heavy rain in morning, and very squally, with much rain all day.
15th. Very squally; lightning at 1.10 p.m.—*W. H. Kempster.*
- NEW BARNSLEY, BELFAST.—14th. Stormy rain at night.
15th. Stormy, with showers.—*J. Firth.*
- POMEROY, DUNGANNON.—15th. Heavy showers, hail and thunder.—*S. A. Brennan.*
- BALLYSHANNON.—13th and 14th. Heavy gales from W.S.W.
15th and 16th. Heavy hail storm, leaving the mountains quite white.—*H. Allingham.*
- KILLYGARVAN, RAMELTON.—14th. Wind S. in morn, N.W. afterwards; heavy rain (1.37 in.), and great gale for seven hours, at night.
15th. Heavy squalls; hail.—*C. H. Cochrane.*
- BUNCRANA.—14th. Rainfall 1.84 in. (No notice taken of the wind, though it is specially noted as strong on other days in the month).—*T. Colquhoun.*

THE RAINFALL OF OCTOBER 14th-15th.

The gale of this date was, in the Eastern counties of England, remarkable for the fact that it was not accompanied by a drop of rain. In the North-West of Scotland, on the other hand, the rainfall was very large. At Portree the fall on the 14th was nearly 5 inches (4.98); it was more than $1\frac{3}{4}$ inches at the following stations:—

Braemar, Aberdeen ...	1.95 in.	Portree, Skye	4.98 in.
Strome Ferry, Ross ...	2.19 in.	Tralee, Kerry.....	2.25 in.
Auchnasheen, „ ...	2.03 in.	Buncrana, Donegal ...	1.84 in.
*Gairloch, „ ...	1.94 in. +		

* Gauge allowed to run over.

REVIEW.

Observations Météorologiques Suédoises publiées par l'Académie Royale des Sciences de Suède, exécutées et rédigées sous la direction de l'Institut central de Météorologie. Vol. XV., 2 ième série Vol. I. 1873. P. A. Norstedt & Söner, Stockholm, 1876. 4to. viii.—143 pages.

THIS is the Swedish contribution to international meteorology, and a very creditable one it is—the materials are good, and the paper, printing, and binding superior to either the Russian or the English. It is printed in Swedish and French, but it wants a map, and tells us very little about the instruments employed or their mode of exposure.

Dr. Rubenson has not followed strictly the plan put forward by the

permanent Committee of the Vienna Congress, and there is so much in his remarks upon his departures from that plan, that we translate that part of the introduction :—

“The plan proposed by the permanent Committee for the monthly and annual results did not reach me until after the arrangement of that part of the volume had been settled, and the greater part of the manuscript prepared. The arrangement adopted by me had been previously submitted to the examination of MM. Wild, Mohn, and Hoffmeyer, who approved its general tenour; thenceforth I considered myself justified in expecting that the final arrangements which we were then awaiting from the permanent Committee, would be chiefly conformable to my own. I considered myself all the more justified in this supposition, because I had drawn up my tables in close conformity with that originally designed by M. Wild. But even had it been possible at the last moment, without too great inconvenience, to have substituted for the form adopted by me that proposed by the permanent Committee, I should have hesitated to do so until many of the European Meteorological Institutes had shown by its adoption that they desired a perfect identity in the forms employed. The uniformity which the permanent Committee have endeavoured to obtain in the publications of various countries, seems to me primarily designed to secure that all the elements of the greatest importance in the present condition of the science, shall always be given. I think it also quite proper that the result of the labours of the Committee should be expressed in the forms drawn up for the use of those interested. But on the other hand, it appears to me that mere differences in the form of publication of various countries are not likely to produce appreciable inconvenience. Whoever devotes himself to the examination of a Meteorological question, and requires to consult the publications of various countries, will soon find that his difficulties arise from differences of temperature scale, barometer scale, and wind force, rather than from differences of formula or form of publication. One rapidly becomes accustomed to any table that one uses, but if, for example, one can only obtain from one country the monthly means of temperature, from another only the five-day means, and from another only the 8 a.m. temperatures, then no matter how abundant the data, there is serious difficulty in using it.

“Some meteorologists seem to be of opinion that the form proposed by the permanent Committee should be used only for a few stations in each country, and that a different form may be adopted for the other stations. But this appears to me rather to complicate matters than to simplify them. Each central institute will naturally desire to publish all its observations uniformly, and according to the above rule it must either employ the Committee's form for all its stations, or print a number of the returns twice over—which will rarely be in accordance with the financial resources of the establishment. In a country so extensive as ours, and one in which the number of observing stations will probably never much exceed those thought

necessary for the international service, the question of dividing the stations into national and international, and publishing the latter separately, can hardly ever arise. The fact of introducing into a work a greater number of records than those usually employed for international work, can scarcely ever give rise to real inconvenience. The separation of the stations can only become important when an international publication is started, which is to contain in one volume the returns from a certain number of stations in each country. Until this is done the introduction of the proposed classification seems to me of little utility.

"In one respect I have departed from all the forms of giving monthly and annual results known to me, namely as regards the direction of the wind. As will be seen, this is given separately for each of the three observation-hours. I have done this because many of our stations are on the coast. An examination of the winds upon our coasts, to which I have devoted considerable time, enables me to state that it is possible to determine from them the daily influence of the land and sea breezes. Therefore I do not believe that it would be desirable to mingle in a single average, the result of the three observations daily; for it would render it impossible to determine from the publication, the daily variation in the wind's direction, or obtain from it the most accurate determination of the prevailing wind."

OZONE.

To the Editor of the Meteorological Magazine.

SIR,—As you say in the last issue of the *Meteorological Magazine* that you would like a few opinions about ozone observations, I beg to say that I think the rough way of observing, by hanging an ozone paper from the roof of a thermometer stand, and using no cage or aspirator, may produce very fair results. I observed ozone in this way, in an open stand, at Forest Hill, near London, for six years, and found the papers colour more or less with winds blowing in from the open country, but never colour with N.W. to N. winds, which blew from London, or when the air was calm or foggy.

I have observed the papers in a Stevenson's screen for more than a year in this maritime locality, and have obtained much higher averages than for Forest Hill (as would be expected), though occasionally, in calm weather or with a hazy air from N.E., the papers do not colour. In sea fog, or when the clouds come down to the earth, I generally find ozone developed. At both stations the ozone was most fully developed with S.W. gales, rain, and a low barometer, and least developed with polar winds, or calm dry weather, and a high barometer. I consider that whether acted upon by ozone alone, or by other chemical constituents of the air, they are a fair test of the purity and health-giving property of the air, since the colour is always deepest in strong, pure winds from the Atlantic Ocean, and no colour is ever shown in the impure air of a London fog.

For ordinary observations on the comparative purity or ozone-pro-

ducing capacity of the air, I do not see why an aspirator, drawing a known quantity of air at a given velocity over the paper, need be used, for if more ozone is registered in a strong wind than in a light wind (supposing the amount in the air to be the same), its purifying effect would also be increased, on account of the more frequently renewed supplies.

In drizzle or fog, the papers register better in a closed Stevenson's screen than in an open thermometer stand, as the colour does not get washed out by the wet in the former as it often does in the latter.

The papers I used throughout were Schönbein's, supplied by Casella, but latterly they have been difficult to read, the colour being mottled or in patches, so that I take the greatest depth of tint as the correct account.—I am, yours sincerely,

EDWIN E. GLYDE, F.M.S.

Kirkham, Babbacombe, Torquay, Nov. 2nd, 1877.

GREENWICH EXTREME TEMPERATURES.

The extreme Shade Temperatures of the month of October at the Royal Observatory, Greenwich, during the past 36 years.

Year.	Maximum.		Minimum.		Year.	Maximum.		Minimum.	
	deg.	date.	deg.	date.		deg.	date.	deg.	date.
1841	64·6	1	32·2	21	1859	81·0	4	26·5	24
1842	60·9	8	29·5	25	1860	68·5	28	32·4	12
1843	70·4	1	28·5	18	1861	75·6	8	39·6	29
1844	67·4	3	30·8	22	1862	71·7	3	28·5	30
1845	67·6	3	31·4	25	1863	66·5	4	34·0	24
1846	67·7	4	35·0	28	1864	67·2	19	37·5	6
1847	74·4	12	33·0	25	1865	71·7	2	33·5	20
1848	73·6	6	33·1	31	1866	68·1	3	31·0	27
1849	69·7	19	31·5	10	1867	64·8	14	30·8	5
1850	64·5	7	31·5	27	1868	66·6	12	29·3	20
1851	70·1	10	34·7	17	1869	73·9	9	27·9	28
1852	64·0	2	31·0	17	1870	68·6	3	32·4	11
1853	67·0	26	31·7	3	1871	68·4	18	31·2	13
1854	72·8	2, 5	31·3	27	1872	66·6	2	29·1	14
1855	66·8	1	35·0	28	1873	75·1	3	26·7	29
1856	66·2	22	31·4	29	1874	69·6	1	36·0	23
1857	69·0	1	37·8	31	1875	68·8	5	33·5	13, 17
1858	69·5	3	33·0	30	1876	72·2	6	34·5	31

Extremes in 1877, Max. : 68°·8 on 14th ; Min. : 28°·2 on 18th.

	Year.	Max.	Date.	Min.	Date.	Year.
Means of 36 years	...	69·2	8	32·1	21	...
Highest	1859	81·0	4	39·6	29	1861
Lowest	1842	60·9	8	26·5	24	1859
Range .....	...	20·1	...	13·1	...	...

Addiscombe, 9th Nov., 1877.

EDWD. MAWLEY.

OCTOBER, 1877.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.				Days on which 1/4 or more fell.	TEMPERATURE.				No. of Nights below 32°
		Total Fall.	Difference from average 1860-5	Greatest Fall in 24 hours.			Max.		Min.		
				Dpth	Date.		Deg.	Date.	Deg.	Date.	
I.	Camden Town	1.97	— .62	.44	27	16	67.5	14	30.9	19	3
II.	Maidstone (Hunton Court)...	2.13	— .86	.47	25	11	...	...	...	...	3
III.	Selborne (The Wakes).....	3.21	— 1.00	.81	29	15	64.0	12	21.0	18	9
IV.	Hitchin	1.38	— 1.17	.35	23	16	60.0	14	27.0	17	6
V.	Banbury	1.64	— .79	.36	24	19	67.0	14	25.0	18	7
VI.	Bury St. Edmunds (Culford)...	1.34	— 1.37	.35	29	11	67.0	14	24.0	17	6
VII.	Norwich (Sprowston).....	1.71	...	.55	29	14	...	...	...	...	9
VIII.	Bridport	2.19	— 1.84	.34	24	15	...	...	...	...	6
IX.	Barnstaple	3.94	— 1.18	.71	24	17	73.0	15	32.0	17	1
X.	Bodmin	3.69	— 1.63	.75	23	19	66.0	1	34.0	17	0
XI.	Cirencester	2.33	— 1.16	.37	29	16	...	...	...	...	1
XII.	Shifnal (Houghton Hall) ...	2.30	+ .06	.30	22	20	65.0	14	28.0	18	3
XIII.	Tenbury (Orleton)	2.32	— .91	.33	23	20	68.0	14	24.3	18	5
XIV.	Leicester (Belmont Villas) ...	1.37	...	.45	27	13	68.5	14	31.8	18	1
XV.	Boston	2.24	+ .12	.48	29	16	68.0	14	30.0	18	1
XVI.	Grimsby (Killingholme)	1.72	...	.38	29	16	65.0	14	29.0	18	1
XVII.	Mansfield	1.84	...	.35	29	21	67.0	14	28.1	18	2
XVIII.	Manchester .....	...	...	...	...	...	...	...	...	...	3
XIX.	York	3.02	+ .50	.68	23	17	61.0	13	28.0	18	...
XX.	Skipton (Arncliffe)	9.15	+ 2.49	1.39	12	21	62.0	2	22.0	28	...
XXI.	North Shields	2.61	— .67	.70	23	19	61.4	13	29.0	18	1
XXII.	Borrowdale (Seathwaite)	22.92	+ 6.60	3.58	12	23	...	...	...	...	1
XXIII.	Cardiff (Crockherbtown).....	4.89	...	.49	29	16	64.5	15	29.0	18	2
XXIV.	Haverfordwest	6.22	+ 1.03	1.45	20	15	64.0	14	27.8	17	2
XXV.	Aberdovey	4.69	...	.60	28	21	...	3	36.0	18	0
XXVI.	Llandudno	3.36	— .60	.59	22	16	69.0	14	37.3	18	0
XXVII.	Dumfries (Crichton Asylum)...	6.27	+ 1.10	.88	24	20	63.8	2	24.6	18	5
XXVIII.	Hawick (Silverbut Hall)	4.68	...	.61	24	21	...	...	...	...	9
XXIX.	Kilmarnock (Annahill)	5.04	...	.48	26	23	61.3	4	30.0	18	1
XXX.	Castle Toward .....	...	...	...	...	...	...	...	...	...	4
XXXI.	Mull (Quinish)	7.52	...	1.07	28	26	...	...	...	...	...
XXXII.	St. Andrews (Cambo Ho.) ...	3.55	...	...	...	...	...	...	...	...	...
XXXIII.	Grandtully	5.38	...	.65	14	17	...	...	...	...	...
XXXIV.	Braemar	5.66	+ 2.91	1.95	14	18	60.0	2	25.7	26	8
XXXV.	Aberdeen	2.14	...	.36	12	19	63.1	6	30.2	19	4
XXXVI.	Gairloch (see foot note).....	7.41	...	1.94	14	26	...	...	...	...	13
XXXVII.	Portree	15.37	+ 4.59	4.98	14	28	...	...	...	...	...
XXXVIII.	Inverness (Culloden)	3.79	+ 1.13	1.39	15	18	60.5	3	30.0	25	4
XXXIX.	Helmsdale	4.61	...	1.26	15	20	...	...	...	...	10
XL.	Sandwick	4.57	— .35	.60	15	22	60.0	5	31.7	19	1
XLI.	Caherciveen Darrynane Abbey	5.86	...	1.13	28	20	...	...	...	...	9
XLII.	Cork	7.18	...	1.25	28	13	...	...	...	...	...
XLIII.	Waterford	4.59	+ .19	1.34	20	19	69.0	1	28.0	18	...
XLIV.	Killaloe	6.07	+ 1.05	.78	12*	19	73.0	1	29.0	17	1
XLV.	Portarlinton	2.76	— 2.37	.55	29	20	63.0	1	30.0	16	1
XLVI.	Monkstown, Dublin	2.11	— 1.81	.54	15	14	64.0	14	29.5	19	2
XLVII.	Galway	5.68	...	.94	18	19	65.0	25	32.0	16*	2
XLVIII.	Ballyshannon	4.06	...	.68	14	20	...	...	...	...	...
XLIX.	Waringstown	3.00	...	.45	24	21	65.0	14	29.0	17	2
L.	Edenfel (Omagh)	4.07	...	.46	20	23	61.0	3	29.0	17	2

* And 23. + 17.

Gairloch.—Gauge full, if not overflowing, on morning of 15th.

METEOROLOGICAL NOTES ON OCTOBER.

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

For Notes on Oct. 14th and 15th, see pages 148 to 154.

ENGLAND.

SELBORNE.—Remarkably variable night minima from 14th to 22nd, viz., 52°, 48°, 40°, 32°, 21°, 24°, 38°, 46°, 51°·6. Wind very variable, and at times violent.

BANBURY.—Thick fog came on suddenly at 7.30 a.m. on 18th, but soon cleared.

CULFORD.—Variable weather, with prevalent westerly wind.

SPROWSTON.—A fine dry month, sharp frost on 18th, gale on night of 30th.

BODMIN.—Mean temp. 54°·8.

SHIFNAL.—The month opened fine and dry, with thick fog the first five mornings. No R (except a little on 7th) until 10th, afterwards it continued daily (with four exceptions) till 31st. High winds on 27th and 30th from S. Swedes and other roots greatly dwindled by the R and cold nights. Figs, all but three or four, dropped off unripe. Dahlias, &c., cut down by frost on night of 17th. Vast quantities of hips and holly-berries, few haws and acorns.

ORLETON.—Fine bright weather with morning fogs till 10th, afterwards R almost every day. Mean temp. about 2° below the average. Lunar halo 9·30 p.m. on 26th; great wind on 30th.

LEICESTER.—First three weeks very fine and dry; only 0·03 in. of R fell between Sept. 18th and Oct. 11th. Heavy R on 27th, and continuous R on 29th. Mean temp. 48°·5 Wind generally S.W., except for a few days at the beginning of the month.

BOSTON.—Until the R fell towards the end of the month, complaints were general that the land was too dry for working and for sowing the wheat.

KILLINGHOLME.—Very variable month; at first some very pleasant days, but after the 15th it was very unsettled; it has, however, been a good seed time for wheat; brilliant lunar halo on 23rd; R and high wind till 4 p.m. on 29th; high wind all night on 30th.

MANSFIELD.—Mean temp. 47°·0, which is slightly below the average; from 1st to 10th very beautiful autumnal weather, with occasionally foggy nights, afterwards variable.

NORTH SHIELDS.—Fog on several days, chiefly early in the month; L on 11th.

SEATHWAITE.—S on the hill-tops on the 12th, 15th, and 17th; rain every day (except the 15th) from the 9th to the 31st; T on 27th.

WALES.

HAVERFORDWEST.—The magnificent weather of September was prolonged until October 6th, after which an exceedingly wet and stormy period set in.

ABERDOVEY.—Mean temp., 49°·8; stormy and wet towards close of the month; T and L at 6 p.m. on 27th; on 14th and 28th weather quite like May.

LLANDUDNO.—Very fine until 10th, afterwards unsettled, with several heavy gales. On the whole the weather was warm, and the R less than usual. Several showers of H on 16th; H also on 27th.

SCOTLAND.

DUMFRIES.—Dry, with frosty mornings until the 9th, afterwards R almost daily; mean temp. (46°·1) below the average; heavy S.W. gales on 11th and 26th.

HAWICK.—Very fine till 10th, when frost set in, afterwards very wet. Some corn still unripe, and potatoes much diseased.

KILMARNOCK.—Boisterous month, winds chiefly W. and S.W.; T and L on 11th, 12th, and 28th; H on 11th, 12th, 15th, 17th, 27th, and 28th; S on 16th; dense fog on 19th.

QUINISH.—Very wet and stormy; T and H on 22nd.

GRANDTULLY.—S on 10th, 11th, 12th, 15th, and 16th.

BRAEMAR.—Dull and wet; the crops for a few days covered with S, grain consequently of little value; harvest exceptionally late.

ABERDEEN.—Bar. and mean temp. just the average, rainfall below it; S.W. winds more prevalent than usual; L on 11th and 15th.

PORTREE.—Cold, wet, and stormy; only three fair days; S on 16th and 17th;

harvest still out, and in bad condition.

CULLODEN.—Fog on 2nd, 3rd, 20th, 24th, and 25th; L on 11th; S on 12th, 16th, and 17th.

IRELAND.

DARRYNANE.—Very mild month; T and L on 27th; sea very rough the last three weeks.

WATERFORD.—Prevailing wind, southerly; fog on 25th.

KILLALOE.—The first nine days fine, and very favourable for all out-door work. Month closed with frequent and heavy E.

MONKSTOWN.—Unusually fine October, dry, and mild.

BALLYSHANNON.—First part very mild, remainder of month quite the reverse; 10th and 11th heavy gales from N.W.; 15th and 16th, heavy hailstorm, leaving the mountains quite white; 26th and 27th, heavy gales from N.W., with T & L.

WARINGSTOWN.—First ten days fine and dry, latter part very broken; oats still out in many places.

EDENFEL, OMAGH.—The fine weather which commenced on September 18th unfortunately terminated on October 9th, a fortnight too soon for the in-gathering of the crops, already late, and immature from the cold wet summer, so that now (Nov. 1st) nearly a fourth of the grain in this county remains in the fields, and what is in is threshing out so badly, that with potatoes, turnips, and flax equally unproductive, a winter of much distress is inevitable, especially among the small farmers and dealers.

SUPPLEMENTARY TABLE OF RAINFALL IN OCT., 1877.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see Met. Mag., Vol. XI., p. 28., but the list is under revision.]

Div.	Station.	Total Rain.	Div.	Station.	Total Rain.
		in.			in.
II.	Acol	1.70	XI.	Llanfrehfa	5.76
„	Hailsham	4.77	„	Solva	3.13
„	St. Lawrence, I. of W.	2.78	„	Castle Malgwyn	5.42
„	Andover	2.03	„	Carno	5.26
„	Strathfield Turgiss	1.67	„	Rhug, Corwen	4.94
III.	Addington Manor	1.55	„	Port Madoc ..	6.68
„	Oxford	1.68	XII.	Melrose	3.70
„	Northampton	1.04	XIV.	Cessnock, Glasgow	5.90
„	Cambridge	1.25	XV.	Gruinart	6.24
IV.	Sheering	1.48	XVII.	Keith	2.32
„	Ipswich	1.43	XVIII.	Dalwhinnie	12.43
„	Diss	1.23	„	Auchnasheen	11.96
„	Swaffham	1.85	„	Springfield, Tain	3.96
V.	Compton Bassett	2.03	XX.	Skibbereen .....	...
„	Dartmoor	8.58	„	Glenville, Fermoy	5.94
„	Teignmouth	2.15	„	Tralee	7.48
„	Langtree, Torrington ..	3.46	„	Newcastle W., Limerick ..	5.10
„	Cosgarne, St. Austell ..	3.15	„	Kilrush	5.97
„	Taunton	1.95	XXI.	Kilkenny	3.70
VI.	Bristol	3.13	„	Kilsallaghan	3.07
„	Sansaw	2.70	„	Twyford, Athlone	5.71
„	Cheadle	3.06	XXII.	Ballinasloe	4.08
VII.	Coston, Melton Mowbray ..	2.06	„	Kylemore	11.68
„	Bucknall	1.66	„	Carrick on Shannon	4.56
VIII.	Walton, Liverpool	3.67	XXIII.	Rockcorry	4.34
„	Broughton-in-Furness ..	12.39	„	Warrenpoint	4.13
IX.	Stanley, Wakefield	2.98	„	Carnlough, Larne .....	...
X.	Gainford	2.78	„	Bushmills	4.42
„	Shap	8.77	„	Buncrana	6.76

S Y M O N S'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CXLIII.]

DECEMBER, 1877.

PRICE FOURPENCE
[or 5s. per ann. post free.]

WHY ARE NOT HYGROMETERS SO GENERALLY USED
AS THERMOMETERS?

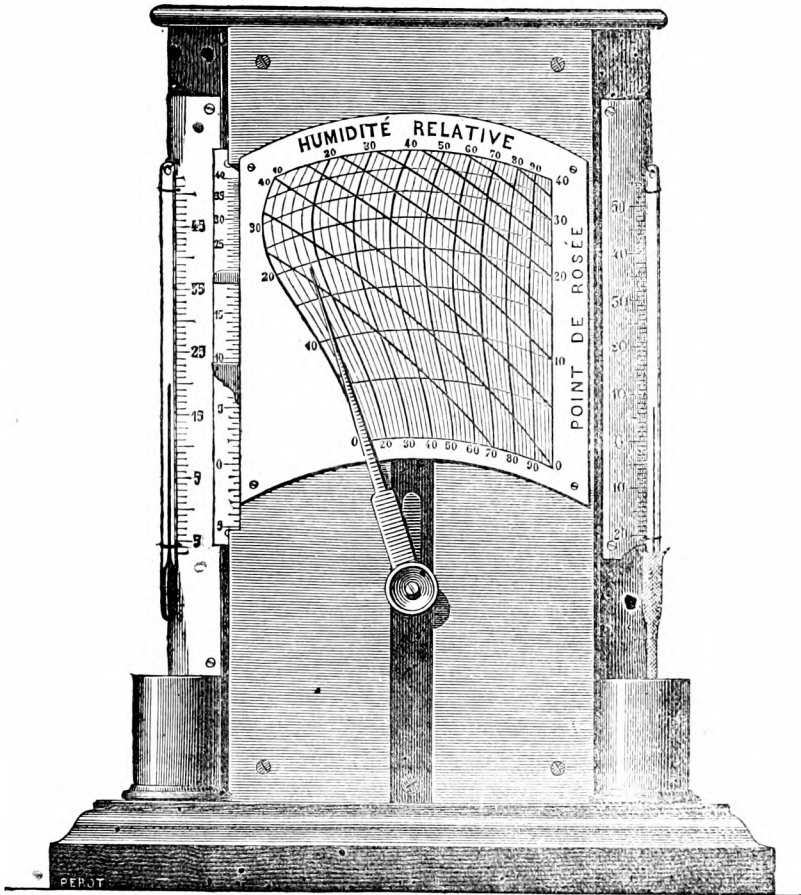
For their own personal comfort the upper and middle classes generally have thermometers in their rooms and houses, and they regulate (at any rate, partially) the heating of their apartments by the indications of the thermometer. The same is true, to a still greater extent, with reference to conservatories, greenhouses and hothouses, one of which without a thermometer is a rarity.

But our sensations and those of plants do not depend upon temperature alone; there is another element of equal importance, namely, the humidity of the air. People in health merely feel a little depression when the air is very damp, and slightly irritable when it is very dry; but to invalids even a change of two or three per cent. in the humidity is perceptible, and the very life of plants depends upon their having a suitable atmospheric humidity—that is to say, it is not sufficient to stand a plant in water, if at the same time you surround its leaves with a dessicated air. Why, then, is it quite an exception to find a hygrometer either in a private house, or a greenhouse, and a still greater rarity to find one in working order?

We believe that this arises from two causes, partly from the difficulty of obtaining a true indication of the humidity, and partly from laziness. Hitherto one has not only been obliged to attend to the muslin of the wet bulb, and to the supply of water, but the instrument only gave the difference between the dry and wet bulb temperatures, and, therefore, to obtain any indication of the humidity of the air, tables had to be consulted and calculations made. It is perhaps not much to be wondered at that, under these circumstances, hygrometers have remained to a great extent unpopular and have rarely been used properly except by meteorologists, who, by the bye, are generally very neglectful in their treatment of this instrument.

It appears to us that the form of hygrometer designed by Mr. Lowe, of Boston, U.S., removes most of the objections, inasmuch as it renders tables of all descriptions unnecessary. We are not aware that it is on sale in this country, but it is well known in France, and Messrs.

Redier have kindly lent us an engraving. It will be seen to consist primarily of the two usual thermometers, one dry and one wet. By the side of the dry bulb an extra scale will be noticed, with two dark



indices travelling upon it. In the middle there is a knob with a long pointer attached to it, which can be raised or lowered, and also turned round.

The mode of use is as follows :—(1) read the dry bulb thermometer and *raise* the knob in order to set the upper index on the extra scale at the dry bulb temperature ; (2) read the wet bulb and *turn* the knob until the lower index is at the wet bulb temperature. The end of the long hand will then point to the (a) humidity, (b) dew point, and (c) elastic force of vapour, according as one reads the vertical, oblique, or horizontal lines.

We are not sure that the accuracy is sufficient for strictly scientific work, and, for general use, we think it would be better not to give so many details, as they are rarely required and tend to confuse those who are not accustomed to reading curves. The humidity is un-

doubtedly the best expression of the moisture in the air, for domestic or horticultural purposes, and an instrument which will give it accurately without any calculations appears to us extremely good, and likely to lead to a greatly increased use of the hygrometer for hospitals, &c.

As regards the mechanical arrangements, they are, we believe, entirely due to Mr. Lowe, but as regards indicating the humidity on a set of curves, we believe priority rests with Mr. H. C. Russell, of Sydney Observatory.*

Since writing the above, a case has been mentioned to us which will serve extremely well as an illustration of prevailing ignorance in high quarters, and of the importance of the cause we are pleading:—

A physician in attendance on a patient, directed that a kettle with a long spout, so as to send the steam into the room, should be put on the fire, and kept constantly steaming all night. So much vapour was created that the sheets, &c., became damp, and injury resulted.

Under the new system the physician would merely say, "Do not let the temperature go below 60° nor the humidity below 90," and with the apparatus above described, an intelligent nurse would be able to keep the patient in the most favourable conditions possible.

METEOROLOGICAL REGISTERS.

To the Editor of the Meteorological Magazine.

SIR,—As I am of opinion that Meteorological Registers would be rendered more valuable by the adoption of the following suggestions, I offer them, hoping you will kindly find room for them in your Magazine:—

First. An additional column to be set apart for the amount of barometrical fluctuation daily, and at the end of the month the total movement of the mercurial column noted, together with the mean daily motion. This would be very useful information, teaching us more concerning the true character of the month than the mean height or the simple extremes. Why one month was stormy and unsettled, possessing the same mean pressure as another of opposite character, would be made plain at a glance.

Secondly. With regard to the temperature of the air, I would suggest that a column be set apart wherein is stated each day the difference from the same observation of the previous day, and at the end of the month the mean daily difference noted.

Stability or instability of temperature being a very important matter in the consideration of climate, having as much to do with the health of the community as mean temperature or daily range.—I am, Sir, yours respectfully,

HENRY COLBORNE, M.R.C.S., F.M.S.

St. John's Hill, New Wandsworth, Nov. 30th, 1877.

* *Table to facilitate finding the Humidity of the Air*, reviewed in *Met. Mag.* Vol. V., p. 74.

OBSERVATIONS TAKEN AT ADDISCOMBE, SURREY,
DURING THE GALE OF SUNDAY, 11TH NOV., 1877.

DATE and TIME.	Barometer.		Wind.		Temperature. (Stevenson screen.)		REMARKS.
	Corrected and reduced to Sea-level.	Rate of rise or fall per hour.	Direction	Velocity in previous h.r.	Dry Bulb.	Wet Bulb.	
Nov. 8th—					°	°	
9 p.m...	29·877	...	SSW	9	48·5	46·6	Cloudless.
Nov. 10th—							
9 a.m...	29·435	—·037	SSW	13	51·8	48·3	Rainfall since 9 p.m. of 8th, ·445.
3 p.m...	29·376	—·010	SSW	21	52·5	48·2	
9 „ „	29·437	+·010	SSW	14	48·1	46·5	Rainfall during previous 12 hours, ·118.
Nov. 11th—							
9 a.m...	29·356	...	S by W	19	50·2	47·9	Rainfall during previous 12 hours, ·014.
3 p.m...	29·085	—·045	S by W	28	52·1	49·9	Light R falling. Scud from S.S.W.
8 „ „	28·894	—·038	S	32	...	...	Driving R with but slight periods of intermission since 3 p.m.
8.30 „ „	28·863	—·062	S	...	...	...	Driving R.
9 „ „	28·848	—·030	S	32	51·0	49·4	„ „
9.30 „ „	28·823	—·050	S	...	...	...	„ „
10 „ „	28·805	—·036	S	31	...	...	„ „
10.30 „ „	28·780	—·050	S	...	...	...	„ „
11 „ „	28·752	—·056	S by E	34	...	...	„ „
11.30 „ „	28·734	—·040	S by E	...	...	...	„ „
Midnight „	*28·723	—·022	S	†38	...	...	„ „
Nov. 12th—							
0.15 a.m...	28·726	+·012	S	...	...	...	„ „
0.30 „ „	28·765	+·156	WSW	...	...	...	Very heavy R between 0.25 and 0.40 a.m.
0.45 „ „	28·780	+·060	WSW	...	...	...	Heavy R.
1 „ „	28·779	—·004	WSW	22	...	...	„ „
1.30 „ „	28·783	+·008	WSW	...	...	...	„ „
2 „ „	28·788	+·010	WSW	10	...	...	„ „ Min. 40°·6.
2.30 „ „	28·794	+·016	WSW	...	...	...	Light R only.
3 „ „	28·789	—·010	SSW	7	...	...
3.30 „ „	28·790	+·002	SSE	...	...	...
4 „ „	28·788	—·004	S	9	...	...
5 „ „	...	...	W	13	...	...	Heavy H shower for about 15 min.
6 „ „	...	...	SSW	12	...	...	Light shower.
7 „ „	...	...	SSW	12	...	...
8 „ „	...	...	SSW	11	...	...	Light shower.
9 „ „	28·967	...	SSW	13	43·7	41·1	Bright sunshine.
10 „ „	29·000	+·033	S	11	...	...
3 p.m...	29·047	+·009	SSW	10	48·7	44·3	Light R.
9 „ „	29·088	+·007	SE	7	43·3	41·6	Rainfall since 9 a.m., ·067.
Nov. 14th—							
9 a.m...	30·086	+·028	SW by S	3	40·8	40·3	Rainfall since 9 p.m. of 12th, ·045.

* Lowest observed, and also the lowest of the year as yet. At 9 p.m. on the 16th the reading was 30·460 in., thus indicating an increase of pressure of 1·737 inches in 4 days 21 hours.

† Maximum velocity in any one hour, also the maximum of the year as yet. Cistern of barometer 210 feet above sea level, and cups of anemometer (Beckley's self-registering) about 15 feet above roof of house, and 50 feet above ground.

During this gale occurred the lowest barometer, the heaviest rainfall, and the highest wind of the present year.

At 0.25 a.m. of 12th the wind suddenly veered from S. to W.S.W., and at once dropped from a velocity of 35 miles to one of 11 miles an hour; at the same time the rain began to fall very heavily, and continued to do so for about 15 minutes. During the previous half-hour or so the barometer had risen about .04 inch from its absolute minimum.

The mean velocity of the wind for the 12 hours ending 0.30 a.m. of 12th was 31.5 miles, for previous 6 hours 19.7 miles, and for following 6 hours only 10.3 miles per hour.

During the 12 hours ending 9 p.m. of 11th .581 in. of rain fell, and during the next 12 hours .925 in., bringing up the total fall for the 24 hours ending 9 a.m. of 12th to 1.506 inches. This is the heaviest fall in any similar 24 hours of which I have any record (1873—77).

EDWD. MAWLEY.

Addiscombe, 29th Nov., 1877.

[We have been favoured with several other very full reports of this storm, which, with the consent of the senders, we should be glad to hand over to any person who may have leisure to study them.—Ed.]

THE RAINFALL OF NOVEMBER, 1877.

To the Editor of the Meteorological Magazine.

SIR,—The heavy and continuous rainfall for the past month of November has been exceptional here as elsewhere, for which reason I forward you the daily fall for comparison. The greatest fall took place on the 24th, when from about 3 p.m. till 9 p.m. 1.65 in. fell, and during 12 hours of continuous rain, 9 a.m. to 9 p.m., 1.30 in. was measured by the gauge. The fall for the month (8.4 in.) is 5.30 in. above the average for the previous eight years, and 3.12 in. above the average for the previous ten years. The total fall for the eleven months hitherto is 33.34 in., whereas our average annual fall is about 28 in.

Three low depressions of the barometer occurred during the month, viz., on 12th, at 0.30 a.m., 28.710 in.; on 24th, at 6 p.m., 28.992 in.; and on the 30th, at 9 a.m., 28.819 in.

The anemometer recorded 13224.5 miles as the total horizontal movement of air for the month; giving a mean velocity of 440.8 miles daily. The two greatest amounts registered were for the 24 hours ending November 12th and 23rd, at 10 a.m., and being 907.5 and 962.5 miles respectively; the greatest rate per hour was about 3.30 p.m. of 11th, being equal to a velocity of 60 miles per hour, or a force of from 9 to 10.—I am, Sir, yours most obediently,

WM. J. HARRIS, F.M.S.

Worthing, Dec. 4th, 1877.

Rainfall at Worthing. Height above sea, 18 ft.; height above ground, 1 ft.

	in.	in.	in.	in.	in.	in.	in.	in.
1	...	5 0·07	9 0·39	13 0·05	17 ...	21 0·26	25 0·03	29 0·51
2	0·02	6 0·13	10 0·62	14 0·01	18 0·12	22 ...	26 0·34	30 0·45
3	...	7 0·26	11 0·59	15 ...	19 0·64	23 0·35	27 0·42	—
4	0·10	8 0·23	12 0·83	16 0·04	20 ...	24 1·46	28 0·27	Sum 8·19

W. J. HARRIS, F.M.S.

REVIEWS.

Weather Warnings for "Watchers." By "THE CLERK" himself. Houlston & Sons, London. Post 8vo, 96 pages. 1877.

POPULAR, and no mistake. Why, the cover alone ought to sell this little manual, and yet there are 67 additional engravings inside, and there is a great deal of light information on elementary branches of Meteorology.

We are rather inclined to be inquisitive as to the credentials of the gentleman who signs himself "The Clerk of the Weather," because though he shows himself to be well acquainted with the catalogue of an optician who is, and shall remain, nameless, he, on the other hand, trips in spelling many of the names which should be quite familiar to him, *e.g.*, we have Réaumur for Reaumur, Fitzroy for FitzRoy, Sanssaure for Saussure, Dyne for Dines, Drebel for Drebbel, and Glashier for Glaisher. As to Latitudes and Longitudes, he gets into a muddle which would disgrace a schoolboy.

The errors which are of importance are extremely few, and we need perhaps only mention that, as regards lightning, "a galvanized iron wire rope is" [*not*] "the best possible conductor," and is [*not*] the "material now generally employed for the purpose." Copper is so much less liable to oxidation, and has so much greater conducting power that galvanized iron wire rope is rarely used. A caution as to the very great doubt if the camphor and water "Storm glasses" are of any use, should have been given.

As the title is "Weather Warnings," it is rather droll that we cannot find the official signals, drums, or cones, mentioned anywhere except in the Preface. There is also a scarcity of weather proverbs.

With all its small failings, it is a capital shillings-worth, and there are few who would not learn from it something that they did not know before.

Stanford's Orographical Map of Europe, showing the contoured levels of the land and the depths of the sea. Edited by PROF. A. C. RAMSAY, LL.D., F.R.S. London, Stanford.

THIS map has no date, but we know that it is at least a twelvemonth since it was sent to us for review. But we do not approve of reviewing works which we cannot thoroughly test. We were competent to examine the similar map of the British Isles which Mr. Stanford

published previously ; we tested it in many ways, found it accurate, and said that it was so.

But it did not follow that because Mr. Stanford published an accurate picture of the altitude of the soil of the British Islands, his similar publication of a map of the whole of Europe would be correspondingly good. Our own knowledge of continental altitudes was insufficient to check it, nor would examining the British Isles suffice, as they would merely be reduced from the larger scale map, and the heights of well known mountain peaks or passes were hardly likely to be wrong. It did not seem easy to say whether the map was good or bad, and therefore for at least a year we said nothing. Among a lot of books which have recently come into our hands was a copy of Major Fils's work, entitled "*Barometer Höhen-Messungen von dem Kreise Schleusingen im Königl. Regierungsbezirk Erfurt.*" This contains a very carefully contoured map, on a scale of nearly four inches to the mile, of the country S.W. of the Thuringian Forest. Whether Mr. Stanford's draughtsmen have seen this map or not is immaterial ; if they have and have reproduced its features as nearly as the scale of their map will allow, it is fair to assume that other parts of Europe have received equal attention ; if they have not seen it, and yet are approximately correct, it is equally in their favour.

This test the map bears very well, but we have given it a more severe one. We have compared the altitudes of many of the Russian Meteorological Stations as given in the official publications, with the map, and have only found *one* discrepancy. Gulyнки, Lat. $54^{\circ} 15' N$, Lon. $40^{\circ} W$, is reported by Dr. Wild to be about 305 feet above the level of the sea. Mr. Stanford's map indicates that it is more than 500 feet. We could hardly give the map higher praise than by stating that this is the only blemish we have discovered.

Climate of New South Wales : Descriptive, Historical and Tabular.

By H. C. RUSSELL, B.A., F.R.A.S., F.M.S., &c., Government Astronomer for New South Wales. Charles Potter, Acting Government Printer, Sydney, 1877. Large 8vo. viii. - 189 - 66 (= 263) pages, 6 plates.

EVERY one who wishes to learn anything about the climate of New South Wales ought to obtain this book. We do not know whether copies can be purchased in this country, but being an official publication the Sydney price is very low [3s. 3d.], and they would still be extremely cheap if the carriage over here cost as much as their original price. We mention this matter of cost because the book is so essentially one for reference that meteorologists ought to get copies for themselves, and not be satisfied with skimming over a review, or borrowing the copy from the library of the Meteorological Society.

We do not intend to review this book, but to give a few extracts.

INTRODUCTORY.

"In the following pages an attempt has been made to put into a form suitable

for convenient reference, such facts concerning the climate of New South Wales as may be useful to the student of meteorology, as well as to the general public.

"The historical part has been prepared under difficulties, and it is no exaggeration to say that 'the facts were buried under a thousand times their bulk of other matter.' A short abstract of some of these facts was first published by Mr. Jevons in his valuable work on 'The Climate of New South Wales,' but in many cases most important information was passed over; and in going over some of the same ground again, it has seemed better to give complete details, and a great many additional facts, which rewarded a diligent search, as well as to correct some mistakes caused by an error in Ford's Almanac. Many facts have been added derived from sources not made use of before, and from living authorities, who must, of course, pass away in time. The effort has been to make this so complete that it shall not be necessary to go over other works of reference, whenever it is thought desirable to re-open the important question of *periodicity* in our climatic changes, or to ascertain the state of the weather in any particular year, or period in the history of the Colony. How far I have succeeded others must judge; but I hope the following pages will at least be found to meet a want that has often been felt, viz., for a work of reference on the droughts, floods, and climatic condition of the past years of the Colony, as well as an answer to many book statements which have been published without sufficient inquiry.

LAKE LEVELS AS INDICATORS OF SEASONS.

"As Lakes George and Bathurst form one of the best indexes to the state of the seasons, all the information that could be obtained about them has been given. I have, however, reason to believe that there are some persons unknown to me who could give valuable information about these lakes. Should they detect in the following accounts of the lakes an omission of any facts which they could supply, I hope they will make them public, or allow me to do so for the public information."

DROUGHTS AND FLOODS—EXAGGERATIONS.

"The literature specially devoted to the subject of our climate is very small, though many notices about it may be found in works on the Colonies generally, and on New South Wales in particular; unfortunately many of them have been made on most imperfect information, and have given rise to grave misconceptions both as to droughts and floods. Of the former, it has been stated that not a drop of rain fell in Sydney for many months (Stokes), November, 1838, to March, 1839, and now newspaper and other extracts for this date show that rain fell several times during this period said to be without rain. It is worth while mentioning also that the actual measurements of rain now extend over thirty-six years, nearly half the period since the foundation of the Colony, and may fairly be taken as an index of possible weather. From these observations it appears that there never has been during those years one whole calendar month absolutely without rain—though in October, 1848, it was only 0·070 in., and in April, 1868, only 0·060 in. October, November, and December, in 1867, passed over with a total fall of only 1·26 in., and July, August, and September, 1871, with only 1·34 in.

"So with regard to floods, which are stated to have been from 93 to 96 feet above the ordinary level, I have been able to prove that the highest of these floods was only about 50 feet (see great flood, March, 1809)."

CLIMATIC EXTREMES.

"The extreme dryness of the climate may be judged from the following:—In October, 1876, it was stated on good authority that at one station on the Darling no rain had fallen for thirty months, and Mr. L. S. Donaldson, who took meteorological observations at Cowga, on the Bogan River, 80 miles above Gongolgan, from 1864 to 1868 inclusive, says—'In these five years, thirty-seven months have been absolutely without rain, unless perhaps for five or ten minutes; eleven months

have been distinguished by only one or two good showers, or perhaps a day or two very light rain, leaving only twelve months in which there has been good rain. The river has only run five times in five years through to the Darling; two other slight freshes have only gone part of the way down."

"At Newcastle, however, the heaviest downpour of rain ever recorded in Australia occurred on the 18th March, 1871. On that morning the sea was going down, and the southerly gale that had been blowing from the 15th was waning at S.E.; by 2.30 p.m., however, the wind backed to south, with barometer at 29.736; at 1.30 p.m. a fearful squall of wind and rain came on with thunder and lightning, and lasted to 4 p.m., when the rain was measured, and found to be 10.610 inches for the 2½ hours."

"Within the Colony of New South Wales may be found all climates, from the cold of Kiandra, where the thermometer sometimes falls eight degrees below zero, and frost and snow hold everything in wintry bonds for months at a stretch, and where upwards of 8 feet of snow sometimes falls in a single month, to the more than tropical heat and extreme dryness of our inland plains, where frost is never seen, and the thermometer in summer often for days together reads from 100° to 116°, and sometimes in hot winds reaches 130°, and where the average annual rainfall is only 12 to 13 inches, and sometimes nil for a whole year."

"Generally parallel to the coast, but varying in distance from 20 to 120 miles, runs the Dividing Range or Blue Mountains, the altitude of which varies from 1,500 to 7,000 feet, but is generally between two and three thousand feet. The highest point is Mount Kosciusko, in lat. 36° 23' south, and long. 148° 19', which is the highest known mountain in Australia. Snow may be found in sheltered places all the year round, though the altitude, 7300 feet, is far below the snow-line for that latitude. In winter snow lies on a large part of the range near this elevated peak, many feet thick, and before the severity of the climate was known many cattle caught in snow-storms in the mountains perished. The mountains generally are well wooded, but owing to bush fires and strong winds the timber is often poor, and a few peaks are bare. In the valleys abundance of fine timber may be found.

"By this mountain range the Colony is divided into two great districts, the meteorological characteristics of which are very diverse."

"The actual temperature of the wind varies from 80° to 110° in Sydney, but it seldom reached 100°, and only twice in twenty years has it reached 106°·9, the highest recorded temperature at this Observatory. Inland the heat is much greater, and in Central Australia Capt. Sturt says his thermometer rose to 131° in the shade on the 21st January, 1845. The heating effects of this wind are well known, and little protection is afforded by doors and windows, for a house rapidly heats, and it is only the greater heat outside that makes it endurable, which is manifest directly the cool 'burster' displaces it, for the house then feels like an oven."

"1791.—In January and February, the colonists experienced several weeks of excessive heat, and the settlement was visited by myriads of flying foxes, which died in such numbers about the fresh water as to render it unfit for use; hot winds also prevailed on several occasions about the beginning of the year, being the first visitation of the kind which they had experienced. Birds dropped dead from the trees, and almost every green thing was burnt up.

"In February the surveyor was employed clearing and deepening the stream of water which supplied Sydney, and which through the long drought was at this time very low. Fresh water was scarce everywhere, and most of the streams about the cove were dry. On the 16th and 11th of February, 1791, on which days the temperature at Sydney stood in the shade at 105°, the heat was so excessive at Parramatta, made worse by the bush fires, that immense numbers of large fox-bats were seen to drop from the trees into the water, and many dropped dead while on the wing. At Sydney about the harbour in many places the ground was found covered with small birds, some dead, others gasping for

water. At Parramatta, an officer of the relief guard left the boat to find a drink of water, and had to walk several miles in a dry watercourse before he found it, and many birds dropped dead at his feet. The wind was north-west, and burned up everything before it. Persons whose business obliged them to go out declared that it was impossible to turn the face for five minutes to the wind."

"From the *Gazette* of Thursday, June 30, 1836 :—'On Tuesday morning, June 28, between the hours of 8 and 9 o'clock, there was a heavy fall of snow in Sydney, which lasted for half an hour, a thing unprecedented in the memory of the 'oldest inhabitant.'"

"On the longest day of 1851 (21st to 22nd December), I was in camp just under the summit of Kosciusco, and my blankets lay on full 40 feet of hard dry crystallised snow that had been melted and re-frozen times without number. From November to May I was never out of sight of the snow along the ranges from Kosciusco to the head of the Murrumbidgee. I watched it day by day, and saw it gradually melting away under the summer's sun ; but I was driven off the snowy plain afterwards by a fearful snow and wind storm in May, and the day before I had found dry snow in the hollows of the granite rocks on that plain, on the Gungahlin River."—*W. B. Clarke.*

In addition to a mass of information like that we have quoted, and to a series of tables of the numerical data observed in the Colony up to the end of 1875, this work contains a reprint of a paper by Mr. Russell read before the Royal Society of Sydney, in October, 1876. It is entitled *Meteorological Periodicity*, and is the best article on the subject which we have yet seen ; it occupies 20 octavo pages, but we need hardly say more than that he quotes believers in periods of two years, three years, five years, between six and seven years, nine years, eleven years, twelve years, thirteen years, seventeen years, eighteen years, nineteen years, thirty years, and one of fifty-nine years. Truly here is variety enough to suit sun-spots or anything else.

Monats-und Jahresresumés der beobachtungen der meteorologischen stationen in Russland. [Aus den annalen des physicalischen central-observatoriums, Jahrgang, 1875.] St. Petersburg, 1876. 4to. xlix.—46 pages and one map.

THIS is the Russian contribution to the system of uniform meteorological publications recommended by the Vienna Conference. It is printed throughout in Russian and German, and while it is in all respects strictly conformable to the decisions of the Conference, it exceeds them in some important points. We may note especially, and we do it with much pleasure, the full information which is given respecting each station, of which the following is a specimen.

SSEMIPALATINSK is in lat. 50° 24' N., and long. 80° 13' E., and, therefore, upon the river Irtysh, in Western Siberia, not very far from the centre of Asia. The altitude of the barometer above mean sea level is unknown. Its correction is believed to be + .044 in. The thermometers are verified ones, of which the corrections are known, and are 10½ ft. above the ground. The hygrometer is placed in one of the stands supplied by the Central Observatory at St. Petersburg. [We wish M. Wild would engrave one, in position.] The rain gauge

was also supplied from St. Petersburg, and the station is provided with a wind vane and pressure plate or anemometer. The station was established through the friendly offices of the Governor, General-Major Poltaratzkij, and supplied with instruments from the Central Observatory. The observations are made by M. Ssubbotin, superintendent of Ssemipalatinsk School, and in his absence they are made by his wife. The zinc thermometer screen, with the psychrometer (dry and wet), hair hygrometer and minimum thermometer, is placed, in accordance with instructions, in the court yard of the school, in a wooden shed, 4 ft. 6 in. long, 4 ft. 2 in. broad, and 4 ft. high. The rain gauge is fixed on the top of this shed, 10 ft. 5 in. above the soil. The wind vane is upon a separate pole, 39 ft. 8 in. high, and overtops the surrounding buildings, which are quite 40 ft. distant. The syphon barometer, Turrettini No. 6, was filled through a capillary tube, and not boiled. The correction of the barometer for the presence of air in the vacuum, as determined by many observations of the diminution of the vacuum (raising the mercury), gives for a barometer reading of 750 mm. at 20° C. a correction of +1.1 mm. A table has been computed from these observations, whence the observer takes out the correction corresponding to the observed temperature and barometer reading.

Perhaps our readers may like to see some of the results from this station; we will therefore convert some of those for 1875 into English values—

Mean barometer, 29.390; max., 30.516; min., 28.654; range, 1.862; mean temperature, 37°·8; max., 100°·0; min., -42°·0; range, 142°·0; mean humidity, 65; mean cloud, 5.1; total rain and snow, 9.70 in.; max. in 24 hours, 0.64 in., on April 22nd; days with rain or snow, 111; snow alone, 56; hail, 2; thunder and lightning, 11; clear, 75; overcast, 71; and stormy, 38.

The range of temperature will be seen to be very great—truly continental, and accordant with the locality; the minimum, however, though very low, is not so extreme as at the neighbouring station of Akmolinsk (lat. 51° 12' N., lon. 71° 23' E.,) where it fell to -52°·4.

Lastly, it may be well to give the temperatures for Kischinew (lat. 46° 59' N., lon. 28° 51' E.,) the nearest station to the European seat of war—

Mean temperature, 46°·2; max., 94°·1; min., -18°·0; range, 112°·1.

We need only add that there is a good map of the stations, and a carefully compiled list of errata in previous publications. No one likes to print a long list of errata, but on the other hand it shows conclusively that the Editor is conscious that his duties do not terminate with the publication of a mass of figures, but extend onwards to their subsequent verification.

GREENWICH EXTREME TEMPERATURES.

The extreme Shade Temperatures of the month of November at the Royal Observatory, Greenwich, during the past 36 years.

Year.	Maximum.		Minimum.		Year.	Maximum.		Minimum.	
	deg.	date.	deg.	date.		deg.	date.	deg.	date.
1841	58·3	29	22·6	16	1859	60·4	6	25·5	14
1842	55·9	12	31·1	5	1860	55·3	1	28·5	3
1843	57·5	7	27·4	12	1861	57·8	26	23·2	19
1844	58·1	16	27·4	26	1862	57·0	3, 4	24·8	23
1845	59·6	6	26·6	3	1863	60·8	4	28·1	10
1846	61·5	4	23·4	29	1864	54·4	28	25·9	10
1847	67·3	8	24·5	19	1865	56·4	24	31·0	5
1848	57·3	21	25·9	5	1866	59·6	5	26·5	21
1849	61·7	11	23·5	28	1867	64·0	1	27·5	28
1850	61·3	2	27·9	15	1868	57·1	1	26·1	6
1851	53·4	1	24·3	19	1869	58·8	15	26·8	21
1852	63·8	5	32·6	25	1870	58·9	24	24·3	19
1853	60·8	1	25·8	23	1871	51·0	3, 15	20·3	19
1854	61·6	1	25·9	27	1872	61·8	5	32·3	18
1855	58·0	6	25·7	16	1873	55·2	3	25·8	13
1856	58·0	23	19·4	30	1874	62·6	6	25·0	27
1857	64·3	3	30·0	12	1875	58·5	4	28·3	30
1858	58·0	26	20·5	24	1876	63·3	14	25·5	10

Extremes in 1877, Max. : 58°·7 on 8th ; Min. : 31°·9 on 17th and 26th.

	Year.	Max.	Date.	Min.	Date.	Year.
Means of 36 years	...	59·1	10	26·1	17	...
Highest	1847	67·3	8	32·6	25	1852
Lowest	1871	51·0	3, 15	19·4	30	1856
Range .....	...	16·3	...	13·2	...	...

Addiscombe, 8th Dec., 1877.

EDWD. MAWLEY.

[We regret to state that Mr. Brumham, who originally extracted the data in the above table, and also that for previous months, for Mr. Mawley, has detected about a dozen errors, some in the Greenwich publications and some in his extracts. Under these circumstances we purpose reprinting in a re-arranged form the whole of the tables corrected for all the errors which a thorough re-examination can detect.—*Ed.*]

SUPPLEMENTARY TABLE OF RAINFALL IN NOV., 1877.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see Met. Mag., Vol. XI., p. 28., but the list is under revision.]

Div.	Station.	Total Rain.	Div.	Station.	Total Rain.
		in.			in.
II.	Acol	3·87	XI.	Llanfrechfa	8·46
„	Hailsham	7·04	„	Solva	4·12
„	St. Lawrence, I. of W....	9·13	„	Castle Malgwyn	6·99
„	Andover.....	5·90	„	Carno	6·78
„	Strathfield Turgiss	4·92	„	Rhug, Corwen	7·35
III.	Addington Manor.....	3·78	„	Port Madoc	9·83
„	Oxford	3·69	XII.	Melrose	3·56
„	Northampton	2·86	XIV.	Cessnock, Glasgow	7·24
„	Cambridge.....	2·96	XV.	Gruinart	7·96
IV.	Sheering	3·28	XVII.	Keith	3·27
„	Ipswich	3·80	XVIII.	Dalwhinnie .....	...
„	Diss	3·00	„	Auchnasheen	11·05
„	Swaffham	3·07	„	Springfield, Tain	3·58
V.	Compton Bassett	5·58	XX.	Skibbereen .....	...
„	Dartmoor	16·78	„	Glenville, Fermoy	5·56
„	Teignmouth	6·80	„	Tralee.....	9·16
„	Langtree, Torrington ..	8·40	„	Newcastle W., Limerick ..	6·69
„	Cosgarne, St. Austell ..	7·95	„	Kilrush	7·79
„	Taunton.....	5·56	XXI.	Kilkenny	4·10
VI.	Bristol	5·62	„	Kilsallaghan	3·87
„	Sansaw	2·73	„	Twyford, Athlone	6·29
„	Cheadle	3·48	XXII.	Ballinasloe.....	6·37
VII.	Coston, Melton Mowbray ..	2·32	„	Kylemore	18·25
„	Bucknall	2·42	„	Carrick on Shannon.....	4·87
VIII.	Walton, Liverpool	5·53	XXIII.	Rockcorry	4·84
„	Broughton-in-Furness ..	10·93	„	Warrenpoint	5·67
IX.	Stanley, Wakefield	2·17	„	Carnlough, Larne.. .....	...
X.	Gainford	2·71	„	Bushmills	5·24
„	Shap	13·12	„	Buncrana	6·69

BOOKS RECEIVED.

AUSTRALIA.

ELLERY, R. L. J. Monthly Record of the Observations taken at the Melbourne Observatory, Nov. 1. 8vo.

Zeitschrift der Oesterreichischen Gessellschaft für Meteorologie, Aug. 15 to Nov. 15, 1877. 8vo.

BELGIUM.

HOUSSEAU, J. C. Annales de l'Observatoire Royal de Bruxelles, March and April, 1877. 4to.

„ „ AND BUYS-BALLOT, C. H. D. Observations Météorologiques faites aux Stations Internationales de la Belgique et des Pays-Bos. April-June, 1877. 4to.

CEYLON.

FYERS, A. B., Lieut.-Col., R.E. Results of Meteorological Observations in Ceylon, May-July, 1877. Single sheets folio.

NOVEMBER, 1877.

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 1860-5	Greatest Fall in 24 hours.		Deg.	Date.		Deg.	Date.	In shade	On grass.		
				Dpth	Date.									
		inches	inches.	in.										
I.	Camden Town	3·88	+ 1·47	·88	11	22	59·1	16	31·2	26	2	11		
II.	Maidstone (Hunton Court)...	5·15	+ 2·12	·87	24	19	...	...	...	...	...	...
"	Selborne (The Wakes).....	7·96	+ 4·42	2·00	11	24	58·0	1	29·0	17	5	12		
III.	Hitchen	3·94	+ 1·80	1·31	11	22	54·0	6	29·0	5, 23	12	...		
"	Banbury	3·09	+ ·89	·94	11	23	50·0	7	28·0	14	13	...		
IV.	Bury St. Edmunds (Culford)...	2·77	+ ·38	·55	27	21	58·0	16	28·0	23	7	15		
"	Norwich (Sprowston).....	2·10	...	·60	27	20	...	...	...	...	...	...
V.	Bridport	7·70	+ 4·54	1·52	24	23	...	...	...	...	...	...
"	Barnstaple	8·77	+ 4·63	·88	11	25	60·0	16	35·0	25	0	...		
"	Bodmin	8·26	+ 3·28	1·35	11	28	58·0	1	36·0	25	0	2		
VI.	Cirencester	4·60	+ 1·81	1·03	26	21	...	...	...	...	...	...
"	Shifnal (Haughton Hall) ...	2·89	+ 1·32	·42	11	21	55·0	6, 9	27·0	24	11	16		
"	Tenbury (Orleton)	3·32	+ ·85	·96	11	22	59·6	6	27·7	14	8	11		
VII.	Leicester (Belmont Villas) ...	2·70	...	·51	11	20	58·2	6	32·0	24	1	...		
"	Boston	1·99	— ·15	·33	26	16	58·0	6	30·0	24	4	...		
"	Grimsby (Killingholme)	1·95	...	·31	11	20	56·0	6	31·0	26	1	...		
"	Mansfield	2·67	...	·39	11	24	57·6	6	27·6	24	5	14		
VIII.	Manchester .....	...	...	...	...	...	...	...	...	...	...	...
IX.	York	2·23	+ ·25	·64	21	15	58·0	15	30·5	14	...	...
"	Skipton (Arncliffe)	10·63	+ 4·18	2·02	21	26	56·0	6	26·0	24	6	...		
X.	North Shields	1·42	— 1·28	·25	14	16	57·4	15	30·0	24	6	10		
"	Borrowdale (Seathwaite).....	23·47	+ 11·80	4·06	5	27	...	...	...	...	...	...
XI.	Cardiff (Crockherbtown).....	6·54	...	1·06	24	25	59·2	9	32·0	14	1	...		
"	Haverfordwest	8·16	+ 2·49	1·00	6, 21	23	57·0	6	31·0	13	1	6		
"	Aberdovey	6·44	...	1·11	6	27	65·0	8	32·0	24	1	...		
"	Llandudno	6·35	+ 3·19	·89	11	22	62·0	15	35·0	24	0	...		
XII.	Dumfries (Crichton Asylum)...	7·79	+ 4·53	·85	28	25	58·2	4	27·0	25	11	13		
"	Hawick (Silverbut Hall)	3·69	...	·47	29	22	...	...	...	...	...	...
XIV.	Kilmarnock (Annanhill).....	5·81	...	·76	5	25	57·6	16	29·0	25	2	6		
XV.	Castle Toward .....	...	...	...	...	...	...	...	...	...	...	...
XVI.	Mull (Quinish)	12·49	...	1·10	26	30	...	...	...	...	...	...
"	St. Andrews (Cambo Ho.) ...	2·80	...	...	...	...	...	...	...	...	...	...
"	Grandtully	5·92	...	1·00	11	25	...	...	...	...	...	...
XVII.	Braemar	4·69	+ 1·87	·73	22	22	55·8	16	21·9	24	7	19		
"	Aberdeen	4·94	...	·73	28	21	57·3	16	28·1	24	4	19		
XVIII.	Gairloch	6·81	...	·67	2, 6	29	...	...	...	...	...	...
"	Portree	15·69	+ 5·21	1·48	11	30	...	...	...	...	...	...
"	Inverness (Culloden)	2·67	+ ·08	·84	20	17	57·1	15	27·8	25	5	15		
XIX.	Helmsdale	5·45	...	·90	6	27	...	...	...	...	...	...
"	Sandwick	7·00	+ 3·00	1·22	29	25	53·0	2	30·0	24	1	6		
XX.	Caherciveen Darrynane Abbey	9·27	...	1·08	10	30	...	...	...	...	...	...
"	Cork	4·37	...	·72	11	24	...	...	...	...	...	...
"	Waterford	6·35	+ 2·40	·80	11	27	60·0	15	29·0	24	4	...		
"	Killaloe	9·23	+ 4·34	·90	21	26	61·0	1	26·0	24	7	...		
XXI.	Portarlington	4·31	+ ·39	·63	22	28	55·0	15	30·0	24	2	...		
"	Monkstown, Dublin	2·37	— ·52	·59	21	20	56·0	15	30·0	3	3	3		
XXII.	Galway .....	...	...	...	...	...	...	...	...	...	...	...
"	Ballyshannon	7·64	...	1·00	21	29	...	...	...	...	...	...
XXIII.	Waringstown	4·00	...	·70	22	24	56·0	15	28·0	23	8	16		
"	Edenfel (Omagh)	5·35	...	·71	21	20	53·0	5, 14	28·0	23	7	...		

METEOROLOGICAL NOTES ON NOVEMBER.

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

ENGLAND.

SELBORNE.—A very foggy month, fog every morning after the 3rd; more R on the 11th (2.00) than on any day for many years, with the exception of July 13th, 1873, when 2.16 fell, and July 14th, 1875, when 2.14 fell; much wind from S. and S.W. on 9th; TS at 4 a.m. on 10th, and T on 12th and 22nd; 24th, a few flakes of S.

HITCHIN.—Heavy gale on 6th; TS on 10th; terrific gale on 11th and again on 22nd.

BANBURY.—L on 9th; high wind on 11th, ceased suddenly at 9.50 p.m., also on 21st, 28th and 29th.

CULFORD.—A wet and very stormy month; high wind on the 10th, 22nd, and 24th, and a gale on the 11th.

OAK LODGE, SPROWSTON.—Rainfall slightly below average; several gales during the month, that on night of 11th unroofed stacks and twisted large branches off trees; the gale on 22nd from W. was very strong, followed on 24th and 25th by another from E., which did much damage to shipping on E. coast.

HAUGHTON HALL.—A wet stormy unpleasant month, only 8 days without R, and this following the continuous R of last month sadly impeded farming operations; heavy R on the night of 9th, with T L and H at 3.30, and another heavy fall on 11th; frost on 11 nights, but none severe; bar. most unsettled throughout.

ORLETON.—Generally cloudy, rainy and damp, with a few bright days. Rapid changes of temperature and pressure, with rough gales of wind; great wind and fall of R on 11th and again on 29th; strong gale on 22nd; L was seen on the nights of 9th and 22nd, and very distant T heard on 8th; mean temp. $2\frac{1}{2}^{\circ}$ above average.

LEICESTER.—Very changeable weather; temp. generally above the average; very little frost; very heavy gales on 11th and 22nd; wind S.W. or W. on every day but two.

GRIMSBY.—Several pleasant days for the time of year, and less fog and gloom than usual; but the weather was very unsettled, and gales were very frequent. The three barometrical depressions lasting for a long time, were a very rare, if not unprecedented, occurrence. L at night on 9th.

ARNcliffe.—Bar. unusually low on 11th, 12th, 22nd and 30th.

NORTH SHIELDS.—Lunar halo on 21st; very large bright meteor on 23rd.

SEATHWAITE.—L on 11th and 28th; falls of R exceeding 1 in. on 14 days, and on the 5th a fall of 4.06 in.

WALES.

HAVERFORDWEST.—A very wet, stormy month; very little frost. The weather about the 9th to 12th, and from the 22nd to the end, exceedingly wild, characterized by sudden and violent squalls, with H, T and L.

ABERDOVEY.—An unusually wet month; very heavy R on 6th, stormy on 8th 9th and 10th, accompanied by L and H. TS on the 11th. A large meteor crossed from N. to S., visible for several seconds about 8 p.m., on the 21st.

LLANDUDNO.—A wet, but warm, month; rainfall more than double the average; temp. nearly 3° above the average. Though the weather was variable, there were several very fine days; but only eight without R. No frost during the month, the min. being 35° . A large and splendid meteor, followed several minutes after by a long and loud explosion, at 8.30 p.m., on 23rd.

SCOTLAND.

DUMFRIES.—A very wet and stormy month. Bar. greatly below and temp. considerably above the average. Heavy gales from W. and S.W., but not so severe as in some parts of the country.

SILVERBUT HALL.—A mild and wet month, with very little sunshine. A very

pretty nosegay of wild flowers could have been gathered here before the frosts of the 20th cut them down. A very brilliant meteor on the night of the 23rd.

ANNANHILL.—Barometric pressure less than last month; mean temp. $3^{\circ}6$ lower; ozone well developed. Winds principally south-westerly, usually moderate to strong. On the 4th, 11th, 12th, 14th, 15th, 25th and 28th, the wind rose to a gale. T and L on 13th, 14th and 22nd; H on the 11th and 27th.

QUINISH.—The largest amount of R recorded in one month since the gauge was established in 1866; the nearest approach being Sept., 1874, when 11.23 in. fell.

ABERDEEN.—A month of mild wet weather, with remarkably low bar., and frequent heavy gales.

PORTREE.—A wet, stormy month; gales on 11th and 15th, with H, T and L; doing much damage to houses and corn stacks. Harvest operations not yet finished, and nothing can save either grain or straw, but dry frosty weather.

SANDWICH.—Uncommonly wet and stormy. The storm of the 16th exceeded any that I have experienced since Dec. 25th, 1806; from 2.30 to 3.30 a.m. it travelled 80 miles an hour, unroofing houses, blowing down stacks, and strewing them over the fields, and in a few cases over the sea. Several vessels were driven on shore and wrecked, and many boats that were thought to be safely laid up on land for the winter were knocked to pieces. Aurora on 8th and 9th.

IRELAND.

DARRYNANE.—R every day. Wind S.W. to N.W., except on 24th, when it was N.N.E. Very heavy gale on 22nd, and heavy sea. Heavy gales on 29th and 30th. Mountains covered with S on morning of 24th; H on 27th and 29th; T and L on 9th and 29th.

WATERFORD.—Stormy on 11th, 19th, 21st, 22nd and 26th. Lunar halo on 16th and 20th.

KILLALOE.—Rainfall much above average, with frequent and heavy gales, chiefly from S.W. Altogether a very wild and wintry month. Gale of the 11th not severe here. Very heavy squalls on 22nd, and squally to the end of the month. S on hills on morning of 28th.

WARINGTOWN.—Wet and stormy. Temp. above the average.

EDENFEL.—Storms and R prevailed all the month to a degree remarkable even for November. On the night of the 11th the bar. uncorrected stood at 27.60, the lowest reading in 15 years.

RAINFALL OF NOVEMBER.

To the Editor of the Meteorological Magazine.

SIR,—The rainfall during the past month of November having been excessive, you may think it interesting to know the amount that fell here, viz., 9.750 in. This was collected on 24 days; on three of these more than an inch fell, the heaviest fall being on the 5th, viz., 1.400 in. Only once during the last sixteen years has this amount been exceeded in any single month, and this was as long ago as October, 1862, when 10.38 in. fell.

There was a flood on the 12th November.

The rain which fell on the 30th is included in the 9.75 in.—I am, yours truly,

H. DODGSON.

Derwent House, Cockermouth, 7th Dec., 1877.

P.S.—The rainfall for this year is already much above the average.

SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CXLIV.]

JANUARY, 1878.

[PRICE FOURPENCE
or 5s. per ann. post free.]

OUR PAST.

WE believe that the last number of the first twelve volumes of this Magazine could scarcely be more appropriately occupied than by a summary of the leading subjects treated of during the past twelve years. The 143 numbers contain about a thousand articles; it is therefore obvious that only a very small proportion of them can be noticed, and that great brevity must be maintained if anything like a fair notion of the contents of the volumes is to be given.

Vol. I. (1866) commences with an article on the *Storage of Water* for country villages, with plans for accomplishing it, and with a lithographic illustration of the variation in the *depth of water in wells* sunk in different geological formations, and the effect of the rainfall thereupon. Other articles treat of *Minimum Temperature on Grass*, enquiring as to the proper length, and quality of grass, the size of the plot, &c., points still far from being satisfactorily defined. Mr. Cunningham, then Secretary to the Board of Northern Lights, sent a list of *Remarkably Low Sea-level Pressures* on December 31st, 1865, at twenty Scottish stations: they were all at or below 28·50 in.; they averaged 28·14 in., and at three of them (in the Hebrides and Orkneys) the pressure was below 28 inches. Another note suggests the possible *Periodicity of a Shower of Soft Hail* on March 8th. Under the title, *Equivalent Expressions of Wind Force*, are given tables of Lind's anemometer, the land scale 0-6, Beaufort's scale 0-12, velocity in miles per hour, and pressure in pounds per square foot. A code of rules is given for determining the *Temperature and Depth of Wells*, illustrated by a table, for 1864, of the temperature of eight wells in Scotland, and the air temperatures at the same stations. After a somewhat severe critique upon a little book entitled *Black Rain*, we have the rather celebrated letter of "A Lazy Man," asking for some *Simple Rule for Measuring Heights barometrically*, followed by several replies, notably Mr. Strachan's rule of multiply by 9, of which the latest form is that adopted in Mr. Symons's *Pocket Altitude Tables*. Details are given of the wonderfully beautiful *Meteor Shower* of Nov. 13-14th, 1866, when nearly 4000 must have been visible in a single hour. The last number of this volume contains, under the title *Cold*

Winters, a very full list of minimum temperatures during the frosts of 1838 and 1860, and a short one for 1867. It also contains a table of the *Lowest Temperature* in London and its suburbs, from 1794 to 1867.

Vol. II. (1867) contains further details of the *Frosts of the Present Century*, articles upon the *Measurement of Snow* and other points indicative of the *Low Temperature* then prevailing. A table gives a summary of seventeen years' observations on the *Direction of the Wind* at Linton Park, Kent. A list of nearly a hundred summers is given by Mr. Brumham, and the frequent repetition of similar seasons after a lapse of twenty-nine years is pointed out. A series of articles describe *Lind's*, *Robinson's*, *Casella's*, *Osler's*, and *Cator's Anemometers*. *Sausure's Hygrometer* is also illustrated. There is a long notice, with map, of the *Excessive Rainfall* on July 26th, 1867, when nearly five inches fell near Sittingbourne, in Kent. A *Storm* of exceptional violence occurred in the West Indies on October 29th, 1867, and details are given from Tortola, St. Thomas's, and Sombrero; the barometer is reported to have fallen two inches in $2\frac{1}{2}$ hours at St. Thomas's, and 1.85 in. in two hours at Sombrero. On November 1st a *Cyclone* occurred in Bengal, and returns are given from Calcutta and other stations in that Presidency. An article discusses the question—"Is the *Royal Charter Gale* (Oct. 25th) periodic?"

Vol. III. (1868) commences with a continuation of the last-mentioned discussion. In a short note on the *Frost of January on the Continent* we find records of great intensity, e.g., at Montpellier the temperature is reported as steady at 18° F., and the houses and roads covered with snow. Among other subjects may be mentioned the *Climate of Sidmouth*, *Rainfall* in Sierra Leone, in Norway, on St. Bernard, in South Australia, in Abyssinia, in the South of France, and in the Mauritius. The Abyssinian war occurred during the publication of this volume, and one of the officers sent regular reports of temperature, &c. We notice here one of the many suggestions thrown out in these pages, and adopted by "the powers that be," viz., that the Kew certificates should carry upon them a caution as to the rising of the mercury in thermometers which depends upon their age. Among instruments mentioned we find *Cassella's Bifurcated Minimum Thermometer* and *Pastorelli's Altameter*, also the suggestion that a *Minimum Thermometer for Grass* ought to have an enamelled tube, to be divided on the stem, and the stem alone (not the bulb), enclosed in an exhausted tube. Nine years later this apparent impossibility was accomplished by Messrs. Negretti and Zambra. The July number contains two papers of more than passing interest, the first entitled, *Thunderstorms and Tidal Disturbances*, not only starts a question still unanswered, but also contains the first [or second (?)] notice of the "Pocky Cloud," which has since become well known. The second article gives an epitome of several investigations respecting the *Moon's influence on the Weather*. Details are given of the *Heat in July*, 1868, showing, by verified thermometers, temperatures on Glaisher and Stevenson stands ranging from 95° to

99°·9. In this volume we also have the commencement of the long enquiries by Messrs. Kesteven, Stow, Nunes, and Symons upon *Solar Radiation Temperatures*, which have led to the previously uncomparable instruments being succeeded by others which agree within a few tenths of a degree. We have also a series of articles upon *Thermometer Stands* with reference to the comparisons of them then in progress at Strathfield Turgiss. Three articles on *The Temperature of the Earth at great depths* give, firstly, a summary of the broad, general features of earth temperature, and, secondly, an account of the arrangements made for determining the temperatures in a well at Kentish Town, upwards of 1,000 feet deep.

Vol. IV. (1869) is largely devoted to descriptions of *Thermometer Stands*, but we find notices of *Rainfall* at Malta, New Zealand, Cape of Good Hope, Norway, Devonshire and Northumberland, and a table of *Time Intervals and their Equivalent Distances*, that is to say of the distances travelled by sound in every number of seconds from 1 to 70. An excellent letter, entitled *Pre-instrumental Meteorology*, unfortunately produced no result. We regret this so much that, after the lapse of eight years, we bring the subject again forward in case it may now receive that support which we thought, and still think, it deserves. We do not see that the subject could be more succinctly stated than it was by our correspondent, and therefore we do not hesitate to reprint his letter.

“PRE-INSTRUMENTAL METEOROLOGY.

“*To the Editor of the Meteorological Magazine.*

“SIR,—Will you allow me to raise the above subject for discussion in your pages? I cannot help thinking that very much is to be learned from old chronicles; although some of them were doubtless guilty of exaggeration, yet ‘in the multitude of counsellors,’ &c., and so if anything like a comprehensive collection was made, these faults would soon be detected. You stated (*British Rainfall*, 1868, p. 58) that one of your deceased correspondents had been comparing farm registers some two centuries old with contemporary rain returns, and had found a close accordance. I wish to suggest a similar course on a large scale, believing that many most important results could thereby be deduced. I wish some one to volunteer (I have not time myself) as superintendent, and I wish all your readers, each so far as in him lies, to assist. Vague suggestions generally produce poor results; I would therefore venture to suggest details, and that will be best done by an example. I recently borrowed from a friend a pamphlet, entitled ‘*Annals of the Diocese of Lichfield, Past and Present, being a Supplement to the Lichfield Church Calendar, 1861*’; therein I find a series of extracts from the oldest register of Ashley Church, two of which will serve as types of the whole:—

‘1614, Feb. 28th.—Predicta hiemalis intemperies a vicesimâ die Januarii a decimam quartam Martii.’

(A winterly severity of weather, as predicted, from the twentieth day of January to the fourteenth day of March.)

'1634. June 23rd.—Circiter occasum solis mirandus tonitruī fulguris et grandinis increbuit horror una cum pluviae immensā copiam circa Shrawardine in comitatu Salopiæ perierunt segetes plurimæ grandine demissæ longique labor periit initus anni.

(About sunset there prevailed a wonderful and terrible storm of thunder, lightning, and hail, together with an immense quantity of rain, around Shrawardine, in the county of Salop. A great deal of corn was destroyed, being cut down by the hail, and the undertaken labour of the long year was lost.)

My idea is, that each of your readers should, before copying any extracts, send a line to the superintendent, and ask if the book they propose to search has already been undertaken by anyone else; this would avoid waste of labour. The superintendent or secretary should have some cards printed after this style:—

DEAR SIR,

The work you mention has.....been searched.

Yours very truly,

It would take very little time to fill in the word 'not,' when required; and by keeping an alphabetical list of books searched, it would be easy to be sure whether the 'not' should be inserted or omitted. All persons making extracts should write on one side of the paper only, and they should be very careful to give correctly the title, date, volume, and page whence each separate extract is made. The duties of the secretary would simply consist in sending the above-mentioned cards, and in filing the extracts in the order of their date. It would obviously be inexpedient to think of printing them until the collection approached completion.

I hope that it will not be asking too much if I request that you will receive offers of assistance in this matter, and I trust that none of your readers will refrain from offering their aid through mistaken ideas of the greater capability of others. It is pre-eminently a work in which all can and all should help, so far as in them lies.

"I am, Sir, your obedient Servant,

"K. C. T."

If any one doubts the utility of this undertaking we trust that he will write and say so, and we would then give the reasons which induce us to support it; but our own impression is so strongly in its favour that we do not at present occupy further space on its behalf, except to say that, while we should much prefer that some one with a little leisure should undertake the secretarial office, we would do it ourselves rather than that the scheme should fall through. Another neglected suggestion is the utility of *Well-constructed Wheel Barometers*, not, of course, as standard instruments, but as friendly monitors to the regular observer, telling him of the least change in the mercurial column and also the extremes reached during his absence. A series of articles entitled *Indications of the Sky* urge greater attention to the appearance of the clouds, and the use of the *Cyanometer*. A brilliant meteor occurred on Nov. 6th, and led to several articles upon *True Time* and, we believe, to

much greater care being bestowed by observers upon their time-keepers than had previously been the case. A good cheap clock beating seconds is, however, still a desideratum.

Vol. V. (1870) commences with an article upon, and engravings of, some *Remarkable Solar Halos* seen in Aberdeenshire, in which a hint is given which might perhaps with advantage be developed by some good physicist, viz., the various supplementary rings are numbered and the entire system, of which only fragments were seen at any one station, is completed. Various *Rainfall* returns are given, a translation of Prof. Raulin's paper, *Sur le régime pluvial du bassin Occidental de la Méditerranée*, being especially worthy of notice; it is accompanied by a map showing the mean fall in English inches at about fifty stations on, and near, the shores of the Mediterranean. The average is apparently under 30 inches, but it varies from 17 or 18 inches in East Spain to 51 inches at Genoa. Considerable space is occupied by records of the *Heat, Drought, and Thunderstorms* of 1870, and also by an examination of the *Squall of October 19th, 1870*, which, though of small diameter, traversed a large portion of England at an average velocity of 50 miles per hour. Full details are also given of the *Christmas Frosts of 1870-71*.

Vol. VI. (1871) commences with a series of *Thermometric Observations during the Eclipse* of December 22nd, 1870, but discussions of the question *How ought Temperature and Rainfall to be entered?* and on the amendment of the *Rules for Rainfall Observers* occupy much space. A description of the *Anemometric Results* obtained at Kensington by Mr. R. H. Barnes, is finished by that gentleman stating that although his anemometer was above all surrounding objects, still it was influenced by them, and that "to give anything like true results as regards velocity, an anemometer should be in a tolerably open country, and well raised above the ground on a narrow building." With this we cordially agree; but how many anemometers now at work (and it is nearly seven years since this was written) fulfil these conditions? Can any one refer us even to two strictly comparable anemometric registers? On March 17th a rather sharp *Shock of Earthquake* was felt across England and in North Wales, and Dumfries-shire; unfortunately the reports as to time are not sufficiently accurate to afford positive proof, but they seem to indicate that the shock emanated from North Lancashire. We hope that when the next one occurs every observer will try to report the *true time*. Several fine *Auroræ* occurred about this period, and one of them led to the following remark by Mr. Backhouse, of Sunderland:—

"The heights of auroræ seem to be very imperfectly known. I do not see why it should be so; if a systematic series of observations were made in distant places, I have no doubt our knowledge on the subject would soon be greatly increased. I, for one, should be very willing to co-operate in such an undertaking."

This suggestion is certainly worthy of adoption. The next subject mentioned is the *Periodical Return of the Seasons*, and a natural history

calendar, suggested by the Rev. C. H. Griffith, and now being carried out for the Phrenological Committee of the Meteorological Society by the Rev. T. A. Preston. Under the heading *Weather Maps*, a short sketch of such publications in this and other countries was given, and enquiry made, Why have we not a daily Weather Map of the British Isles? Not many months elapsed before the present Daily Weather Charts were first published. The only other papers claiming special notice are a series on *Dew Point and other Hygrometers*.

Vol. VII. (1872). On January 24th a very deep *Barometric Depression* passed across England from Cornwall to the Wash, yielding minima below $28\frac{1}{4}$ inches at sea level at many stations, and one reading of 28.135, at Upwey, near Weymouth; the returns received were so numerous that they were handed over to the Meteorological Society, and a series of *Isobaric Charts for each consecutive hour* were constructed by Mr. Marriott and published by the Society. Under the heading *Another Meteorological Conference* is given a history of the Brussels Conference of 1853, and an analysis of Dr. Ballot's *Suggestions on a Uniform System of Meteorological Observations*. The *Thunderstorms* in the summer of 1872 seem to have been exceptionally violent, and much space is occupied by reports upon them. A rather long discussion occurred under the title *Heat as measured by Natural v. Artificial means*, in which it was suggested that the state of the crops was as well worthy of being recorded as that of the thermometer, and it was urged that records of the crops could be obtained for many places and years where no thermometric register had been kept. It is needless to point out that this falls in with the remarks we have already made upon the subject of *Pre-instrumental Meteorology*.

Vol. VIII. (1873) opens with an account of a *Barometric Depression* on January 20th, almost as remarkable as that on nearly the same date in the previous year; and the next number contains accounts of an equally rare *High Barometer*, reaching 30.82 in. at several stations. The *Report of the Leipzig Conference* having been published by Government, but the information being classified rather according to the speakers, than the subjects, it was condensed as much as possible and reprinted arranged according to subjects; this reprint occupies much space, but gives a very terse summary of the views of the leading meteorologists on many disputed points. There is an interesting discussion between Dr. Burder and the Rev. W. Clement Ley upon the terms *Cyclone and Anti-Cyclone*. On November 30th an extremely *Violent Whirlwind* occurred near Banbury; its effects were carefully examined and mapped by Mr. T. Beesley and Mr. Symons; full details of the phenomenon, as well as plans, are given. In a review of the Report of the Director of the New York Meteorological Observatory for 1872 we have the first notice of the scheme now adopted by the *New York Herald*, of sending *Storm Warnings for England from America*. After dealing with the project, the review finishes in the following words:—"It would be still better if the Atlantic Telegraph Company would grant the same privilege to meteorologists as

they have to astronomers, and allow Mr. Draper to send, free of cost, four words about three times in each month. All that would be required would be 'Storm due Feb. 8.' Six months' trial would be worth years of post-facto compilations." This suggestion has been carried out, and we should like to see an official report upon the result.

Vol. IX. (1874) commences with articles on the *Direction of the Wind in violent Storms*, and on the amount of incurvation of the wind in cyclones by Messrs. Meldrum, Birt, Clement Ley and others. The relation between estimated and actual *Wind Force* is quoted from a paper by Mr. Scott, published by the Meteorological Society. This is followed by a note *Concerning Anemometers and the real Force of the Wind*, in which the present system of perching anemometers "among and slightly above the chimney pots on a building of any shape, and any height above the ground," is vigorously condemned. Under the title of *Indian Meteorology in Parliament*, a report is given of Mr. Egerton Hubbard's speech upon the subject, which was speedily followed by the appointment of Mr. Blanford as meteorologist to the Government of India. The July number contains a long article on the *Water Supply of North Western Europe* during 1874, with tables of the rainfall in France, Belgium, Holland, and the British Isles. The same number contains the suggestion of holding a British Association Meteorological Breakfast, but it seems doubtful whether it should be continued or not, because though many seem to approve of it, scarcely any one exerts himself to extend, maintain or improve it. Description, with engraving, is given of the plan of correcting the *Barometric Error in Clocks* adopted by Messrs. E. Dent & Co. In a review of the report of the Meteorological Committee there is a strong protest against the interruption of the storm-warning system on Sundays, and, as most of our readers know, the service has since been continued daily without interruption.

Vol. X. (1875) begins with a long notice of Governor Rawson's work on *The Rainfall and the Sugar Crop of Barbados*, showing how closely the latter can be computed from the former. Much space is occupied by reviews, and among them is scattered a variety of information, *e.g.*, a complete meteorological summary for Archangel, an epitome of anemometric results for Modena, others of the climate of Senegal, of Fécamp, Trieste, and Bodenbach, Bohemia. *Redier's Barograph* is engraved and fully described; we regret that this cheap and effective instrument is not more used in this country; many are working well in France. An article with the title *Conferences and Congresses* calls attention to the various published reports of the proceedings at Vienna and Leipzig, and complains that the greater part of the time of the conferences had been spent upon observational questions, and little upon the really difficult problems of meteorology, and that much time had been spent upon points which a good optician could have settled in half a minute. At the end of June heavy snow fell on the north of the Pyrenees, and rain in the lower country

between there and Bordeaux, resulting in great *Floods in the South of France*, of which details are given, and attention is called to the desirability of establishing a system of warning respecting inundations similar to that in operation at Lyons. A full description is also given (with engravings) of a *Whirlwind at Baldock*. In July a *very heavy rainfall* passed over England and Wales, which is treated at length. Upwards of *five inches fell at several stations in twenty-four hours*. Under the title, *Extraordinary or Water Reflection Rainbow*, is given a summary of the descriptions of that phenomenon from the time of Descartes to the present day. In a review of a Canadian publication there is an appreciative note respecting the practice of the English meteorological office in printing on every publication a list of all the works it has issued; a bibliography of the publications connected with Toronto observatory is given, and the hope is expressed that others will follow the example of our meteorological office. We regret that the suggestion has not been adopted, in fact *Bibliographical Meteorology* seems to have no followers at all.

Vol. XI. (1876) has for its first article *Sunlight*, a review of M. Marchand's work upon that subject; then Mr. Ley follows with some notes on *Cirrus Observations*. *Barometrical Depression* on March 12th (London min. 28.447 in.), *Underground Thermometers*, and *Ocean Rainfall* are among the early articles; a very careful letter by Mr. Ley classifies, and specifies the conditions of, English *Thunderstorms*. The principal feature in the volume is the classified and illustrated description of the meteorological apparatus exhibited at the *Loan Collection of Scientific Apparatus at South Kensington*, which included barometer tubes reported to have belonged to Torricelli, the Magdeburg hemispheres, aneroids of nearly all sizes from 6 ft. diameter to half-an-inch, thermometers in endless variety (one reported to have been used by Galileo), rain gauges, hygrometers, anemometers, &c., showing, in fact, how terribly far we are from uniformity in meteorological researches. In the middle of August *Great Heat* prevailed, of which details are given showing maxima above 90° at several stations. A very violent whirlwind crossed the Isle of Wight on September 28th, which is reported under the heading *The Cowes Storm*. *Hail Storms—an Explanation needed*—calls attention to the fact that all hail insurance companies charge double rates for insuring crops growing within 12 miles of Somersham station, Huntingdonshire, and asks *Why?* To this no answer has yet been given. Is there any foundation for this surcharge? A *Low Barometer* on December 4th (London min. 28.364 in.) is reported, and attention called to the desirability of determining the cause and real amount of "barometric pumping" during gales. The floods of January, 1877, are chronicled under the heading *Floods, and a plea for Flood Marks*—a plea which has not met with so hearty a response as we desire.

Vol. XII. (1877). A long note *On Keeping a Meteorological Journal* points out the uses of so doing, and also the duties which those who do so ought to discharge, and sources of inaccuracy which require to

HIGHEST TEMPERATURE AT THE ROYAL OBSERVATORY, GREENWICH.

In each Month of the 37 Years, 1841-1877.

Year.	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.		Year.
	deg.	date.	deg.	date.	deg.	date.	deg.	date.	deg.	date.	deg.	date.	deg.	date.	deg.	date.	deg.	date.	deg.	date.	deg.	date.	deg.	date.	
1841	53.0	27	54.6	20	66.9	26	76.5	27	82.8	27	78.5	18	76.6	3	79.6	27	79.6	12	64.6	1	58.3	29	53.9	10	1841
1842	46.8	31	53.2	15	60.5	28	73.7	24	74.7	29	87.4	12	78.8	18	90.5	10	75.8	2	60.9	8	55.9	12	58.2	13	1842
1843	57.0	28	51.9	21	63.7	18	70.8	20	69.5	12	77.3	27	89.8	5	82.8	19	79.9	17	70.4	1	57.5	7	54.7	23	1843
1844	53.7	5	50.4	23	60.2	29	74.9	26	77.4	14	87.6	24	87.4	25	75.4	20	78.0	1	67.4	3	58.1	16	49.3	29	1844
1845	51.3	6	48.5	26	59.4	27	70.3	24	68.2	27	86.0	13	83.3	7	77.8	31	73.5	9	67.6	3	59.6	6	55.5	30	1845
1846	55.3	25	62.3	28	58.0	31	63.0	12	84.3	31	91.1	20	93.3	5	92.0	1	86.4	6	67.7	4	61.5	4	49.9	21	1846
1847	52.7	24	55.0	17, 18	64.2	17	63.8	12	86.2	28	80.4	2	89.4	12	87.7	1	72.5	11	74.4	12	67.3	8	59.5	7	1847
1848	50.4	3	55.0	24	71.5	31	74.6	3	83.0	15	79.0	15	84.5	14	74.7	3	80.5	22	73.6	6	57.3	21	62.4	10	1848
1849	56.4	14	58.0	22	60.7	17	64.3	30	75.0	5	80.7	5	84.1	8	82.5	9	79.0	6	69.7	19	61.7	11	56.3	15	1849
1850	53.1	25	58.2	15	58.0	31	66.9	7	76.5	31	85.1	23	87.0	16	81.0	5	70.5	2	64.5	7	61.3	2	56.5	15	1850
1851	56.5	1	57.1	18	58.4	20	64.1	17	74.2	29	87.0	27	84.4	2	82.0	12	76.6	1	70.1	10	53.4	1	54.8	10	1851
1852	55.5	16	57.4	2, 17	68.4	23	74.7	14	73.4	16	72.7	25	90.3	5	81.5	1	77.5	4	64.0	2	63.8	5	57.1	11	1852
1853	55.5	20	45.0	28	60.5	13	62.0	4	78.8	27	81.0	11	81.7	7	77.5	19	73.0	17	67.0	26	60.8	1	50.8	1	1853
1854	54.8	30	57.0	6	64.8	27	77.5	20	70.5	17	80.0	25	88.7	25	85.2	28	81.2	4	72.8	2, 5	61.6	1	55.0	14, 25	1854
1855	52.4	2	48.4	25	57.8	20	72.8	16	81.5	26	83.5	6	79.3	10	79.0	28	78.2	23	66.8	1	58.0	6	52.4	28	1855
1856	54.0	24	58.0	9	58.0	31	73.0	25	72.0	11	83.1	27	87.5	31	89.8	2	72.5	10	66.2	22	58.0	23	58.9	7	1856
1857	52.7	2	56.9	28	66.2	18	69.0	19	80.2	16	92.7	28	89.7	15	88.0	3	80.7	17	69.0	1	64.3	3	57.0	17	1857
1858	51.9	9	52.8	5	68.7	24	76.0	16	81.2	31	94.5	16	88.2	15	86.9	12	83.8	12	69.5	3	58.3	26	53.5	21	1858
1859	53.0	18	59.0	16	63.5	5	79.0	6	77.0	30	81.3	26	93.0	18	91.3	25	76.0	24	81.0	4	60.4	6	56.5	31	1859
1860	55.5	3	53.5	28	59.5	28	65.0	30	76.5	23	74.0	24	75.0	17	70.8	4, 16	69.7	7, 8	68.5	28	55.3	1	54.0	6	1860
1861	55.0	27, 29	56.0	17	61.8	24	63.5	12	80.2	23	81.8	19	76.3	1, 8	89.3	12	81.1	1	75.6	8	57.8	26	54.0	9	1861
1862	55.0	31	56.3	20	63.6	24	75.0	25	81.5	6	73.5	2	79.0	26	79.9	1	73.8	15	71.7	3	57.0	3, 4	57.1	7	1862
1863	55.2	29	55.7	28	64.0	3	69.3	20	79.7	29	84.0	3	86.0	15	84.9	9	71.8	19	66.5	4	60.8	4	54.2	3	1863
1864	54.0	27	53.8	13	58.0	4	73.8	20	81.0	18	78.4	7	85.6	20	88.6	5	75.5	8	67.2	19	54.4	28	53.7	5	1864
1865	50.2	10	52.7	28	58.7	31	81.5	27	78.5	21	87.6	23	85.0	15, 27	78.0	27	86.0	8	71.7	2	56.4	24	52.7	7	1865
1866	54.3	22	57.0	1	64.0	30	79.0	27	73.1	28	86.5	27	87.2	13	78.5	26	71.0	28	68.1	3	59.6	5	56.3	6	1866
1867	55.0	27	57.1	16	59.1	24	64.8	19, 23	83.6	7	82.1	12	81.5	5	89.0	14	79.9	1	64.8	14	64.0	1	55.2	1	1867
1868	51.9	14, 17	61.7	25	58.5	27	63.9	30	87.0	19	88.0	20, 27	96.6	22	90.5	5	92.1	7	66.6	12	57.1	1	57.8	6	1868
1869	55.9	31	61.6	5	53.6	5	79.1	14	70.5	26	87.5	7	90.9	22	89.0	28	80.0	5	73.9	9	58.8	15	55.8	16, 18	1869
1870	50.9	8, 14	55.6	28	61.1	2	78.7	20	85.4	21	90.2	22	89.7	8	81.0	1, 6	72.6	1	68.6	3	58.9	24	57.4	14	1870
1871	46.7	16	57.0	27	70.9	24	66.5	12	79.5	25	77.2	15	82.6	17	89.2	13	82.0	1	68.4	18	51.0	3, 15	48.8	19	1871
1872	52.7	31	57.9	9	60.8	7	69.9	12	73.2	28	86.0	17	90.9	25	81.7	17	81.4	3	66.6	2	61.8	5	55.4	22	1872
1873	53.8	10	50.1	26	64.6	29	76.8	15	70.9	26	81.2	27	88.7	22	87.3	8	72.5	27	75.1	3	55.2	3	56.3	16	1873
1874	55.0	20	55.9	28	65.4	23	79.7	23	77.6	22	83.7	2	92.0	9	81.2	19	78.1	25	69.6	1	62.6	6	53.3	6	1874
1875	53.7	20	51.3	15	57.4	8	71.5	30	81.9	15	83.3	4	77.5	29	85.4	16	81.0	18	68.8	5	58.5	4	54.5	22	1875
1876	56.1	31	59.0	18	64.7	31	70.2	8	73.6	21, 30	83.9	21	94.0	17	93.8	14	72.5	21	72.2	6	63.3	14	56.2	3	1876
1877	56.1	19	59.1	7	59.4	29	66.0	4	67.6	26	85.5	29	88.2	31	83.3	20	73.4	11	68.8	14	58.7	8	55.0	6	1877
Mean..	53.6	18	55.4	18	62.0	21	71.5	18	77.5	22	83.3	17	86.0	15	84.0	13	77.6	11	69.2	8	59.1	10	55.1	14	Mean..
Highest	57.0	1843	62.3	1846	71.5	1848	81.5	1865	87.0	1868	94.5	1858	96.6	1868	93.8	1876	92.1	1868	81.0	1859	67.3	1847	62.4	1848	Highest
Lowest	46.7	1871	45.0	1853	53.6	1869	62.0	1853	67.6	1877	72.7	1852	75.0	1860	70.8	1860	69.7	1860	60.9	1842	51.0	1871	48.8	1871	Lowest
Range.	10.3	...	17.3	...	17.9	...	19.5	...	19.4	...	21.8	...	21.6	...	23.0	...	22.4	...	20.1	...	16.3	...	13.6	...	Range..

LOWEST TEMPERATURE AT THE ROYAL OBSERVATORY, GREENWICH,

In each Month of the 37 Years, 1841-1877.

Year.	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.		Year.
	deg.	date.	deg.	date.	deg.	date.	deg.	date.	deg.	date.	deg.	date.	deg.	date.	deg.	date.	deg.	date.	deg.	date.	deg.	date.	deg.	date.	
1841	4.0	8	12.4	3	29.5	1	31.8	10	41.2	13	40.3	15	44.3	12	45.5	12	36.6	5	32.2	21	22.6	16	24.3	18	1841
1842	23.2	23	26.4	18	29.9	23	28.0	5	36.4	9	44.7	2	45.5	6	47.5	30	41.1	21	28.3	20	31.1	5	30.8	27	1842
1843	24.0	2	20.3	14	26.5	4	27.2	11	35.4	6	42.9	4	44.6	23	47.2	10	34.0	28	28.5	18	27.4	12	25.6	12	1843
1844	18.8	2	20.0	13	24.1	5	33.4	7	33.9	17	43.4	2	47.1	16	42.8	27	34.8	29	30.8	22	27.4	26	21.1	6	1844
1845	24.4	31	7.7	11	13.1	13	29.5	6	34.4	10	43.8	28	44.6	29	43.2	1	33.4	23	31.4	25	26.6	3	28.0	12	1845
1846	29.4	4	26.9	10	26.5	20	33.3	20	38.3	15	49.4	1	49.1	25	47.5	13	39.2	29	35.0	28	23.4	29	18.0	30	1846
1847	24.0	10	11.2	11	16.9	10	23.0	16	36.1	2	41.4	8	45.4	23	42.3	3	33.1	27	33.0	25	24.5	19	25.0	21	1847
1848	16.8	28	30.2	18	28.0	4	30.3	27	34.5	1	39.7	3	42.7	1	43.1	9	33.2	13	33.1	31	25.9	5	22.4	23	1848
1849	19.9	3	23.5	13	27.7	25	26.8	18	36.4	12	38.6	14	39.5	1	42.4	5	42.7	18	31.5	10	23.5	28	18.8	29	1849
1850	22.0	8	30.0	14	20.0	26	34.0	29	31.7	3	36.2	16	43.5	10	40.0	22	39.0	7	31.5	27	27.9	15	24.2	21	1850
1851	26.6	24	23.7	17	29.8	9	28.6	6	33.5	5	38.5	1	38.9	5	42.2	31	37.6	10	34.7	17	24.3	19	24.9	27	1851
1852	28.1	5	24.9	21	21.3	5	26.7	10	29.3	3	41.0	1	49.2	23	49.9	4	37.9	17	31.0	17	32.6	25	31.7	1	1852
1853	30.8	19	20.5	19	20.8	25	32.3	25	32.6	11	39.9	4	48.3	1	45.8	18	37.5	27	31.7	3	25.8	23	18.0	29	1853
1854	13.5	3	23.5	14	24.6	3	28.3	25	34.8	19	41.4	1	44.0	29	43.0	18	37.9	29	31.3	27	25.9	27	26.5	11	1854
1855	16.2	19	11.1	19	24.5	10, 11	25.9	2	28.3	5	39.3	3	43.7	5	47.3	14, 30	34.1	27	35.0	28	25.7	16	16.9	22	1855
1856	24.3	15	27.5	1	24.7	30, 31	30.6	21	29.8	5	41.1	6	44.0	10, 3	45.0	23	40.0	20, 21	31.4	29	19.4	30	18.5	28	1856
1857	20.0	30	20.0	1	27.7	22	28.2	24	31.5	4	38.8	14	45.7	8	48.8	28	41.5	21	37.8	31	30.0	12	30.8	31	1857
1858	20.9	6	23.5	26	23.6	11	27.2	2	32.1	7	45.3	28	43.8	29	43.3	29	41.5	25	33.0	30	20.5	24	30.3	7	1858
1859	28.5	9	30.5	5	28.9	31	25.3	1	32.1	6	43.5	25	46.5	25	46.5	31	41.5	12, 20	26.5	24	25.5	14	14.0	19	1859
1860	27.5	28	23.2	11	23.5	10	28.2	11	32.5	7	43.5	6	41.6	5	45.5	7	35.7	12	32.4	12	28.5	3	8.0	25	1860
1861	16.0	8	24.4	12	29.1	14	26.8	21	33.4	9	42.9	10	48.4	11	46.2	31	37.7	27	39.6	29	23.2	19	23.5	28, 30	1861
1862	20.4	19	24.4	8	22.5	4	26.7	13	37.8	3	43.4	10	44.6	22	44.7	24	39.2	23	28.5	30	24.8	23	33.4	22	1862
1863	27.7	12	27.2	18	28.1	18	28.3	1	31.4	1	42.1	1	38.7	19	46.0	21	35.0	30	34.0	24	28.1	10	26.5	23	1863
1864	14.3	7	20.1	10	26.9	24	33.4	13	33.4	30	42.3	2	45.8	8, 15	38.1	27	40.9	12	37.5	6	25.9	10	17.3	18	1864
1865	19.6	22	15.5	15	23.7	21	31.9	2	31.4	1	41.2	12	47.0	12	43.2	3	40.2	23	33.5	20	31.0	5	29.2	24	1865
1866	23.7	13	24.2	18	22.5	1	34.2	5, 30	32.6	4	42.2	17	46.0	31	45.0	19	41.3	25	31.0	27	26.5	21	27.7	31	1866
1867	6.6	5	32.9	3	24.5	16	30.5	1	31.9	24	40.5	29	43.3	30	40.9	3	35.5	25	30.8	5	27.5	28	21.2	9	1867
1868	22.8	3	26.7	9	28.1	30	28.9	12	33.9	7	44.7	1	48.2	5	47.8	26	43.6	11	29.3	20	26.1	6	31.5	31	1868
1869	26.3	24	31.7	13	27.3	8	29.3	2	33.3	2	35.6	1	49.1	5	42.1	31	41.2	1	27.9	28	26.8	21	21.3	28	1869
1870	19.6	28	19.4	11	23.1	14	26.0	4	29.8	9	41.4	6	44.8	2	41.0	31	37.4	25	32.4	11	24.3	19	9.8	25	1870
1871	18.3	13	25.0	11	28.9	15	29.1	7	34.0	12	38.7	5	46.8	31	46.1	28	39.0	23	31.2	13	20.3	19	18.6	8	1871
1872	28.3	15	32.4	28	26.1	26	29.6	20	32.6	20	40.6	7	47.0	18	45.0	28	34.5	23	29.1	14	32.3	18	27.1	12	1872
1873	26.0	25	25.0	24, 25	27.2	14	28.7	26	34.0	20	42.0	7	46.4	19	47.9	29	38.2	22	26.7	29	25.8	13	22.1	10, 29	1873
1874	28.1	25	21.0	11	22.6	11	30.5	30	31.1	10	37.5	13	46.2	18	44.0	24	43.4	19	36.0	23	25.0	27	18.5	31	1874
1875	18.2	1	23.3	24	25.5	5	27.8	25	36.6	31	41.0	1	42.5	13	43.6	2	44.6	1	33.5	13, 17	28.3	30	23.3	5	1875
1876	17.4	8	21.8	13	25.5	19	29.2	12	31.5	3, 5	40.1	11	44.7	12	41.1	26	41.6	13, 18	34.5	31	25.5	10	28.3	23	1876
1877	27.7	21	24.7	28	23.5	1	32.1	20	28.1	4	44.2	7, 25	42.6	8	40.5	24	33.3	25	28.2	18	31.9	17, 26	28.7	28	1877
Mean..	21.7	14	23.2	14	25.0	15	29.2	14	33.3	9	41.4	9	45.0	15	44.4	19	38.3	20	32.0	21	26.3	18	23.3	21	Mean..
Highst	30.8	1853	32.9	1867	29.9	1842	34.0	1850	41.2	1841	49.4	1846	49.2	1852	49.9	1852	44.6	1875	39.6	1861	32.6	1852	33.4	1862	Highst
Lowest	4.0	1841	7.7	1845	13.1	1845	23.0	1847	28.1	1877	35.6	1869	38.7	1863	38.1	1864	33.1	1847	26.5	1859	19.4	1856	8.0	1860	Lowest
Range.	26.8	...	25.2	...	16.8	...	11.0	...	13.1	...	13.8	...	10.5	...	11.8	...	11.5	...	13.1	..	13.2	..	25.4	...	Range.

be avoided. Under the title *Governmental Meteorology*, the report of the Treasury Committee upon the administration of the meteorological office by the late Meteorological Committee is sharply criticized. Under the heading of *Easter at the Sorbonne* is given a report on the principal meteorological papers read at that meeting, and a notice of M. Alluard's observatory on the Puy-de-Dôme. A long paper on *The Climates of the various British Colonies* is printed in extenso. Among other subjects we may mention the *French Agricultural Storm Warning System*, *Sea Temperature and the Herring Fishery*, *Tornado of March, 1875*, *Sun Spots and Famines*, *the Climate of Brest*, *Anemometers*, and *Why are not Hygrometers as generally used as Thermometers?* A series of tables of *Greenwich Extreme Temperatures* extracted by Mr. Brumham for Mr. Mawley are given during the year, and some errors having been detected, they are reprinted in a compact form in the present number.

SUPPLEMENTARY TABLE OF RAINFALL IN DEC., 1877.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see Met. Mag., Vol. XI., p. 28., but the list is under revision.]

Div.	Station.	Total Rain.	Div.	Station.	Total Rain.
		in.			in.
II.	Acol	4.68	XI.	Llanfrechfa	4.45
	Hailsham	1.77		Solva	3.58
"	St. Lawrence, I. of W....	2.04	"	Castle Malgwyn	3.35
"	Andover.....	1.47	"	Carno	3.82
"	Strathfield Turgiss	1.57	"	Rhug, Corwen	3.13
III.	Addington Manor.....	2.06	"	Port Madoc	5.55
"	Oxford	1.76	XII.	Melrose	1.77
"	Northampton	1.67	XIV.	Cessnock, Glasgow	5.60
"	Cambridge.....	1.75	XV.	Gruinart	7.96
IV.	Sheering	1.85	XVII.	Keith	2.46
"	Ipswich	2.29	XVIII.	Dalwhinnie	5.01
"	Diss	2.13	"	Auchnasheen .....	...
"	Swaffham	2.03	"	Springfield, Tain	2.31
V.	Compton Bassett	2.06	XX.	Skibbereen .....	...
"	Dartmoor	4.99	"	Glennville, Fermoy	3.91
"	Teignmouth	1.63	"	Tralee.....	5.92
"	Langtree, Torrington ..	3.99	"	Newcastle W., Limerick	3.59
"	Cosgarne, St. Austell ...	4.08	"	Kilrush	4.55
"	Taunton.....	1.66	XXI.	Kilkenny	3.31
VI.	Bristol	2.02	"	Kilsallaghan	2.78
"	Sansaw	1.93	"	Twyford, Athlone	5.23
"	Cheadle	2.86	XXII.	Ballinasloe.....	4.39
VII.	Coston, Melton Mowbray	1.75	"	Kylemore	13.01
"	Bucknall	1.75	"	Carrick on Shannon....	4.20
V III.	Walton, Liverpool	3.79	XXIII.	Rockcorry	3.76
"	Broughton-in-Furness ..	7.15	"	Warrenpoint	5.11
IX.	Stanley, Wakefield	2.09	"	Carnlough, Larne. ....	...
X.	Gainford	1.55	"	Bushmills	4.14
"	Shap	5.43	"	Buncrana	4.78

RAINFALL OF MUSWELL HILL & LONDON COMPARED.

To the Editor of the Meteorological Magazine.

SIR,—The following comparison of the rainfall at Camden Square for the past year as given by you in the *Times* of the 3rd inst., with that here, may possibly be of interest to some of your readers. The distance between the two places is about three miles and a half, as the crow flies, and they are nearly North and South of each other; the summit of Highgate Hill very nearly intervenes. The excess of the rainfall here over that at Camden Square—3·91 inches, or about 14 per cent. on the total (28·17 in.) at the latter place—is no doubt chiefly owing to the greater elevation, Muswell Hill being about 200 feet higher than Camden Square—310 feet against 111 feet. The fact that this spot is considerably wooded may also partly account for the larger quantity of rain that falls. The second table, giving the totals of the six years 1872–1877 for the two places, shows that the difference ranges from 6 to 14 per cent., and averages 11 per cent. :—

	Total in Month.		Diff. from average Camden Square. 1860-5.	Diff. from average Muswell Hill. 1872-6.	No. of days Camden Square.	No. of days Muswell Hill.
	Camden Square.	Muswell Hill.				
January	4·74	5·01	+ 2·79	+ 2·49	25	25
February.....	1·78	1·80	+ ·56	+ ·24	17	20
March	2·38	2·69	+ ·30	+ ·81	20	21
April	2·59	2·94	+ 1·46	+ 1·56	16	18
May	1·91	2·41	— ·49	+ ·64	15	17
June	·42	·52	— 2·63	— 1·91	6	8
July.....	3·94	3·78	+ 2·15	+ 1·35	14	15
August	2·23	3·79	— ·41	+ 1·57	17	17
September	·83	1·07	— 1·43	— 1·85	10	11
October	1·97	2·08	— ·62	— 1·43	16	14
November	3·88	3·96	+ 1·47	+ ·91	22	23
December	1·50	2·03	— ·00	— 1·01	17	18
	28·17	32·08	+ 3·15	+ 3·37	195	207

The above shows that out of the twelve months the departure from the average has been alike in both places in nine months out of the twelve. In the three months where this is not so, May has a deficient total at Camden Square, whilst at Muswell Hill it was in excess. August is the same, the heavy rain at the latter place on the 25th of that month (1·14 in.) is alone sufficient to account for the difference, being more than double that of same date at Camden Square (·55 in.), that is to say that the same fall at the latter place would have brought the month's total above the average. December had just its average at Camden Square, whilst it was about an inch deficient at Muswell Hill. This discrepancy in these three months would not probably have occurred if it had been possible to compare the *same* years, but I

have not the returns of the *months* for 1872-6 at Camden Square at hand.

Rainfall at Camden Square and Muswell Hill from 1872 to 1877.

	Camden Square.	Muswell Hill.	Excess over Camden Square.	Per cent. (about).
1872.....	33·86	37·91	4·05	12
1873.	22·67	24·70	2·03	9
1874.....	18·82	21·22	2·40	13
1875.....	28·44	30·20	1·76	6
1876	26·16	29·55	3·39	13
1877.....	28·17	32·08	3·91	14
Average ...	26·35	29·27	2·92	11

—I am, Sir, yours obediently,

J. W. SCOTT.

Muswell Hill, Middlesex, January 5th, 1878.

THE WEATHER AT CAMBRIDGE IN 1875, 1876 & 1877.

	1875.	1876.	1877.
Mean temperature.....	47°·7	48°·2	47°·4
Hottest by Day	August 16 80°	August 14 86°	June 18, July 31 77°
Coldest by Day	January 1 28°	January 8 28°	Dec. 25, 27 & 28 34°
Hottest by Night	Aug. 10, 16 & 17 60°	August 17 63°	August 20 64°
Coldest by Night ...	January 1 11°	January 11 18°	Feb 27 & 28 23°
Days on which the max. was at or under 32°.....	12	8	0
Nights on which the min. was at or under 32°.....	70	66	56
Mean of Barometer	29·85	29·87	29·98
Barometer highest.....	October 6 30·50	January 15 30·60	October 6 30·64
Barometer lowest	November 9 28·40	December 4 28·40	November 11 28·76
Rainfall	26·59 in.	24·63 in.	24·84 in.

J. NUTTER.

Beech House, January, 1878.

BROMLEY COMMON, KENT.

METEOROLOGICAL REPORT FOR YEAR 1877.

Thermometer. — Highest, 84° on the 31st July; Lowest, 21° on the 11th March.
Mean maximum, 57°·7. Mean minimum, 41°·2.
Mean of Year, 49°·5. No. of Frosts, 63.
Greatest diurnal range 35° on May 8th.

Barometer. — Highest, 30·38 on the 19th Dec.; lowest, 28·50 on the 1st January.

Rain—Total fall, 34·28 in., being 6·22 in. above the mean yearly fall of 10 years.
Most in 24 hours from 9 a.m. on the 11th to 9 a.m. on the 12th.
November, 1·72.

No. of days on which more than ·01 fell, 188.

A. RAWSON.

GREAT METEOR.

To the Editor of the Meteorological Magazine.

[Dr. Nicol, of Llandudno, favoured us with a notice of the violent explosion resulting from this meteor; it appeared to us better to forward the letter to Capt. Tupman, whom we knew to be investigating the subject. He has permitted us to print the following note.—Ed.]

SIR,—I am much obliged to you for communicating Dr. Nicol's observation of the great meteor of Nov. 23rd.

I have made out its path very satisfactorily from a great many fairly accordant observations. It began as an ordinary shooting star, 90 miles* high, 5 m. N. of Derby, became wonderfully brilliant 50 m. over Liverpool, and burst at the height of 26 miles 15 m. N.N.W. of Great Orme's Head. From no less than 25 estimations of its duration, the velocity was between 18 and 19 miles per second. Assuming it to have been moving in the parabola deduced from the radiant point, $63^{\circ} + 15^{\circ}$, the actual velocity was 17 miles per second, a very satisfactory agreement, leaving no doubt that its orbit was sensibly parabolic.

The neighbourhood of Aldebaran has long been known to yield very large meteors about Nov. 21–23.

No comet has yet been discovered with elements similar to these. That of 1702 has similar elements except in the long. of the node, but from the very small inclination this discordance loses much of its significance. It is just possible these visitors may be stragglers from that comet.

Yours very truly,

G. L. TUPMAN.

1, Vanbrugh Park, Blackheath, Dec. 30th, 1877.

WARM NIGHTS ON HILL-TOPS.

To the Editor of the Meteorological Magazine.

SIR,—The village in which I live is 700 feet above the sea level. It is supposed to be "Siberian" in its climate. To my surprise I find we have far less frost than our neighbours. As we rise on either side from the Valley of the Itchen, or the Wey, the amount of frost diminishes in a proportionately descending scale. When the geraniums in the gardens on the lower ground are entirely cut off, ours will remain often for many weeks untouched. Gilbert White tells us that he was "disturbed at this unexpected reverse of comparative local cold," when he found 20° less frost on the high ground at Newton Valence than at Selborne, which must be at least 200 feet lower. Such being an undoubted fact, may I ask at what elevation this would cease to hold good? Can you ascertain where about would be the limit of diminishing frost, supposing, I mean, our ground went on

* Nautical miles throughout, 6080 ft.

rising as on a mountain side? In other words, when does the height begin to produce *more* frost instead of *less*? And what do you consider to be the cause of this difference in the amount of frost on the higher and lower ground? Is it owing only to the difference in the amount of moisture in the atmosphere?—I am, Sir, yours faithfully,

A HAMPSHIRE HIGHLANDER.

January 4th, 1878.

GREENWICH EXTREME TEMPERATURES.

The extreme Shade Temperatures of the month of December at the Royal Observatory, Greenwich, during the past 36 years.

Year.	Maximum.		Minimum.		Year.	Maximum.		Minimum.	
	deg.	date.	deg.	date.		deg.	date.	deg.	date.
1841	53·9	10	24·3	18	1859	56·5	31	14·0	19
1842	58·2	13	30·8	27	1860	54·0	6	8·0	25
1843	54·7	23	25·6	12	1861	54·0	9	23·5	28, 30
1844	49·3	29	21·1	6	1862	57·1	7	33·4	22
1845	55·5	30	28·0	12	1863	54·2	3	26·5	23
1846	45·9	21	18·0	30	1864	53·7	5	17·3	18
1847	59·5	7	25·0	21	1865	52·7	7	29·2	24
1848	62·4	10	22·4	23	1866	56·3	6	27·7	31
1849	56·3	15	18·8	29	1867	55·2	1	21·2	9
1850	56·5	15	24·2	21	1868	57·8	6	31·5	31
1851	54·8	10	24·9	27	1869	55·8	16, 18	21·3	28
1852	57·1	11	31·7	1	1870	57·4	14	9·8	25
1853	50·8	1	18·0	29	1871	48·8	19	18·6	8
1854	55·0	14, 25	26·5	11	1872	55·4	22	27·1	12
1855	52·4	28	16·9	22	1873	56·3	16	22·1	10, 29
1856	58·9	7	18·5	28	1874	53·3	6	18·5	31
1857	57·0	17	30·8	31	1875	54·5	22	23·3	5
1858	53·5	21	30·3	7	1876	56·2	3	28·3	23

Extremes in 1877, Max. : 55°·0 on 6th ; Min. : 28°·7 on 28th.

	Year.	Max.	Date.	Min.	Date.	Year.
Means of 36 years	...	55·1	14	23·3	21	...
Highest	1848	62·4	10	33·4	22	1862
Lowest	1871	48·8	19	8·0	25	1860
Range .....	...	13·6	...	25·4	...	...

Addiscombe.

EDWD. MAWLEY.

DECEMBER, 1877.

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 1860-5	Greatest Fall in 24 hours.		Max.		Min.					
				Dpth	Date.				Deg.	Date.	Deg.	Date.	
													inches	inches.	in.
I.	Camden Town	1.50	.00	.57	28	17	54.2	6	28.3	28	11	16	
II.	Maidstone (Hunton Court)...	2.29	+	.67	.70	28	13	...	...	...	...	...
III.	Selborne (The Wakes).....	2.62	—	.13	.71	28	16	52.0	6	28.2	25	8	
IV.	Hitchen	2.02	+	.71	.59	28	20	49.0	29	25.0	var.	19	
V.	Banbury	2.13	+	.46	.62	28	19	51.0	6	24.0	26	15	
VI.	Bury St. Edmunds (Culford).	2.22	+	.73	.58	28	17	50.0	12	24.0	25	11	
VII.	Norwich (Sprowston).....	2.07	...	...	.41	28	18	...	...	...	...	...
VIII.	Bridport	1.69	—	1.68	.58	28	9	...	...	...	...	...
IX.	Barnstaple.....	4.12	+	1.00	.80	28	28	54.0	30	32.0	15	...	
X.	Bodmin	4.10	—	1.14	.68	5	23	56.0	6	31.0	28	2	
XI.	Cirencester	1.96	—	.33	.75	28	12	...	...	...	...	...
XII.	Shifnal (Haughton Hall) ...	1.71	+	.03	.37	28	19	50.0	6, 22	24.0	25	16	
XIII.	Tenbury (Orleton)	1.64	—	.82	.49	5, 28	17	54.0	29	23.8	25	13	
XIV.	Leicester (Belmont Villas)...	1.73	...	...	.61	28	16	52.5	6	27.0	26	5
XV.	Boston	1.65	+	.16	.46	28	16	50.0	30	26.0	19	12	
XVI.	Grimsby (Killingholme)	1.92	...	...	.27	11	17	50.0	11	25.5	27	4
XVII.	Mansfield	2.52	...	...	.57	5	25	50.5	6	24.0	26	11
XVIII.	Manchester .....	...	...	...	...	...	...	...	...	...	...	...
XIX.	York .....	...	...	...	...	...	...	...	...	...	...	...
XX.	Skipton (Arncliffe)	6.59	+	2.04	1.12	30	23	48.0	6	19.0	26	10	
XXI.	North Shields	2.15	—	.05	.63	30	17	55.3	22	25.0	25	9	
XXII.	Borrowdale (Seathwaite)....	18.12	+	1.17	3.17	11	21	...	...	...	...	...
XXIII.	Cardiff (Crockherbtown)....	...	...	...	...	...	...	...	...	...	...	...
XXIV.	Haverfordwest	6.02	+	1.19	1.80	26	15	53.0	11	28.0	12*	11	
XXV.	Aberdovey	4.42	...	...	1.24	28	23	52.0	6	33.0	2, 3†	0
XXVI.	Llandudno	3.88	+	1.68	1.03	30	23	55.5	12	34.4	26	0	
XXVII.	Dumfries (Crichton Asylum)	4.10	+	.08	.85	28	19	50.8	7	24.0	27	10	
XXVIII.	Hawick (Silverbut Hall).....	1.85	...	...	.35	11	21	...	...	...	...	...
XXIX.	Kilmarnock (Annanhill).....	5.45	...	...	.79	28	26	52.4	12	25.0	28	7
XXX.	Castle Toward .....	...	...	...	...	...	...	...	...	...	...	...
XXXI.	Mull (Quinish)	7.78	...	...	1.61	12	23	...	...	...	...	...
XXXII.	St. Andrews (Cambo Ho.) ...	2.30	...	...	...	...	...	...	...	...	...	...
XXXIII.	Grandtully	2.95	...	...	.70	11	12	...	...	...	...	...
XXXIV.	Braemar	2.36	—	1.41	.37	5, 23	15	49.3	22	9.0	26	14	
XXXV.	Aberdeen	2.55	...	...	.39	6	19	52.2	22	19.9	26	7
XXXVI.	Gairloch	6.22	...	...	.68	9	26	...	...	...	...	...
XXXVII.	Portree	11.92	—	3.71	1.21	21	29	...	...	...	...	...
XXXVIII.	Inverness (Culloden)	2.68	+	.75	.56	12	20	51.3	22	24.0	26	6	
XXXIX.	Helmsdale	3.20	...	...	...	...	...	...	...	...	...	...
XL.	Sandwick	4.10	+	.13	.54	10	23	51.8	22	25.6	28	5	
XLI.	Caherciveen Darrynane Abbey	7.03	...	...	.75	18	29	...	...	...	...	...
XLII.	Cork	4.02	...	...	.60	4	20	...	...	...	...	...
XLIII.	Waterford	4.71	+	.29	1.05	5	16	53.0	6, 15	27.0	15‡	12	
XLIV.	Killaloe	6.42	+	3.00	1.08	28	24	54.0	29	25.0	28	11	
XLV.	Portarlington	3.12	—	.07	.41	28	30	53.5	10	27.0	2	14	
XLVI.	Monkstown, Dublin	2.32	—	.30	.58	28	15	54.0	8	27.0	21	12	
XLVII.	Galway .....	...	...	...	...	...	...	...	...	...	...	...
XLVIII.	Ballyshannon	5.12	...	...	.51	7	25	...	...	...	...	...
XLIX.	Waringstown	3.25	...	...	.65	28	24	57.0	22	26.0	26	15
L.	Edenfel (Omagh)	3.93	...	...	.56	28	27	50.0	17§	24.0	26	14

* And 27th; + And 16th; ‡ And 28th; § And 22nd.

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

METEOROLOGICAL NOTES ON DECEMBER.

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

ENGLAND.

SELBORNE.—Dull and foggy throughout the month, especially on the 19th and 20th. Much white frost on the 14th; S on the 25th and 28th, that on the 28th very heavy, but it all melted next day.

BANBURY.—A very foggy month, with several showers of S, sleet, or H. High winds on 23rd and 30th.

CULFORD.—A very dark and sunless month, with much fog and damp weather. On the 25th winter appeared to set in; a considerable depression of temperature took place, and S fell slightly; S also on the 26th, and again on the 28th; but this soon changed to R, and the weather again became damp and mild. The last day of the month (and year) was remarkably fine. The mean temp. was 39°, and Polar winds prevailed during five days.

SPROWSTON.—There was very little S during the month, but there were several frosts, some of them rather sharp; but on the whole the month was dull and wet, especially at its close.

HAUGHTON HALL.—The rainy weather of last month continued with short intervals throughout this, varied by a fall of S on the 25th (producing .37 in. when melted), following a rapid fall of the bar. of 1.13 in., which commenced on the 20th, when it was unusually high. Although frosts occurred on 22 nights on the grass, they were very slight, except on the 25th, when a min. of 21° was registered. Fog and mist frequent; high wind on the night of the 10th; the year closed with the finest day of the month.

ORLETON.—Cloudy, damp and foggy in general, with frequent light falls of R, and very few fine days, nevertheless the rainfall was much below the average. Frequent strong gales of wind, especially on the 6th, 12th, 22nd, and 24th. A deep fall of S on the evening of the 28th, and a rapid thaw the next morning. There were frosts on many of the nights, but the mean temp. of the month was more than half a degree above the average.

LEICESTER.—About 2 inches of S fell on the 26th, but it all disappeared after a heavy R on the night of the 28th. Weather mild for the season, with very little frost during the month, the mean temp. being 39°·9; bar. high in the middle of the month.

BOSTON.—A damp month, with frequent rather than heavy R; S on two days.

GRIMSBY.—A fine month on the whole, and the days not so dark as is often the case; dense fog on the 20th; S on the 25th.

ARNcliffe.—S on two days only during the month. Very rapid rise of bar. on the 1st, 1.10 in. in 24 hours.

NORTH SHIELDS.—A fine month on the whole, though there was frequent but not heavy R; fog on four days; S on the 24th, 25th, and 28th.

WALES.

HAVERFORDWEST.—More fine days in this month than in the two preceding months; some fine frosty days about the middle and at Christmas time, followed by heavy rainfall on the 26th and 27th; at present there does not appear to be any sign of change in this dismal damp climate.

ABERDOVEY.—A mild but damp month; no frost or S in these parts; max. temp. in shade has averaged from 40° to 49°. A heavy fall of R on the 28th. Chrysanthemums in full blossom throughout the month; furze also here and there in fine bloom.

LLANDUDNO.—Weather dull and damp throughout the month, but mild, the temp. being about 2°·5 above the average; there was very little S during the month, but R was very frequent, and though the amounts were not large, the total is 1.68 in. above the average.

SCOTLAND.

DUMFRIES.—The year closes with another wet month, but much drier than November; the rainfall and mean temp. are both above the average. A sharp frost, accompanied by a considerable snowfall, occurred on the 24th, but only lasted a few days. Winds as a rule have been light, with an easterly direction at the beginning of the month, S.W. and W. in the middle, and N. and N.W. towards the close.

SILVERBUT HALL.—There were six days, from the 22nd to the 28th, which were very wintry, but the month otherwise was one of the mildest for December seen here for many years.

ANNANHILL.—Barometric pressure in excess of last month; mean temp. $3^{\circ}7$ degrees lower. Winds principally Westerly and South-Westerly; gales took place on the 6th, 11th, 13th, 22nd, 23rd, 24th, and 29th. A good deal of frost was registered during the month; T and L on the 13th, S on 24th, 26th, and 28th. On the 3rd a butterfly was caught in the garden.

BRAEMAR.—An unusually fine month for December. Lunar halo on the 19th.

ABERDEEN.—A month of rather fine weather on the whole, but with frequent high winds; there was a good deal of hoar frost at the middle and towards the close of the month; S fell on the 23rd, 24th, 25th, and 26th, that on the 25th and 26th being specially heavy; fog on the 2nd, 3rd, and 21st.

PORTREE.—A cold stormy month. Gale on the 6th from S., and on the 26th and 27th from W. with snow drift, which continued for 48 hours, such as has not been seen in this island for many years, however all the S disappeared by the 29th. The last of the corn was secured in the second week of the month in very bad condition; provender for cattle is very scarce.

CULLODEN.—First part of the month fine, with fog on the 10th and again on the 16th; some heavy R in the middle of the month, and from the 23rd to the 27th inclusive there were frequent showers of sleet and S.

SANDWICK.—A mild winter month till the 23rd, when the ground was covered with S, which remained till the 29th, when a thaw set in, and next day all the S was cleared off the plains. There were gales of from 50 to 60 miles an hour on the 6th, 11th, and 24th.

IRELAND.

DARRYNANE ABBEY.—Gale on 6th from N.W., on 11th from S.W., and on 24th and 26th from N.; hail on 6th, 12th, and 13th. Except 1872 this has been the wettest year of the last eight, both in total fall and number of days.

WATERFORD.—Stormy on the 5th, lunar halo on the 15th and 16th, fog on the 18th, 20th, and 21st.

KILLALOE.—Rainfall for the month nearly double the average; a good deal of thick mist and heavy fog; there were some squalls, but no continuous or heavy gales; temp. high on the last three days of the month, and still continues so.

MONKSTOWN.—A variable month, with more frosty nights than usual, the intensity being, however, much less, as shown by many plants such as mignonette, tea roses, &c., being still in flower; S fell on 26th and 28th, but not in any quantity.

BALLYSHANNON.—The year has closed with continued wet and cold weather; during the last week the mountains have been covered with S, which has, however, now disappeared. The lands are saturated with wet, and in many cases unable to absorb it.

WARINGSTOWN.—Mild month, temperature much above the average; many summer bedding plants still alive; S on the 25th and 26th.

EDENFEL, OMAGH.—Continuous R, and almost continuous storms, varied by three days of frost, snow, and sleet, during the last week.

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