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SEVERE WINTERS AND VEGETATION.

WE picked up, a week or two since, from a Paris bookstall, the work by M. Baltet, mentioned below,* and on our return to London we found awaiting us Mr. Henslow's report upon the same subject.† The coincidence in time was remarkable, considering that nearly eight years have elapsed since the frost to which they refer, while the fact of both being 8vo., and one occupying 340 pages and the other 338, is a curious addition to the parallelism. It will be noticed, however, that the French report was published five years before the English one, and yet Prof. Henslow does not appear to have seen it. The style of the two books is as dissimilar as possible. M. Baltet's memoir was submitted for examination to M. J. A. Barral, and we can hardly give a better epitome than by translating M. Barral's report presented in August, 1881.

"A manuscript memoir on the action of frost on vegetation, has been forwarded to the Society by M. C. Baltet, nurseryman at Troyes (Aube), well known by important contributions to forestry and horticulture; the Commission considers that it is its duty to call special attention to this memoir, which is in all respects worthy of it.

"After comparing the severe winter of 1879-80 with the celebrated winters of 1709, 1788, 1795, 1829, 1838 and 1871, M. Baltet examines successively the condition of vegetation during the persistence of the cold, the effects traceable to snow, the action of sunshine on frozen vegetation, and the deterioration of its tissues.

"Then he considers the effects of the frost on trees and shrubs, in nurseries and gardens, in woods and forests, and on the vines. The chief part of the work is an alphabetical list of shrubs and trees,

* *Société Nationale d'Agriculture de France. De l'action du Froid sur les végétaux pendant l'hiver, 1879-80, par M. C. BALTET. 340 pages 8vo. J. Tremblay, Paris, 1882.*

† *Journal of the Royal Horticultural Society The Frost Report. On the effects of the severe frosts on vegetation during the winters 1879-80 and 1880-81, by Rev. G. HENSLOW, M. A., F.L.S. 338 pages 8vo. London, 1887.*

giving for each its popular and its botanical name with that of the family to which it belongs, and the country of its origin, and an account of its behaviour during the frost. This alphabetical arrangement renders it very easy to find all the data respecting any plant.

"The whole work shows profound knowledge and keen observation on the part of the author. The facts collected by M. Baltet as to the relative hardihood and frost-resisting power of various species and varieties of fruit trees will be of great value to agriculturists, and the same may be said with respect to decorative trees.

"Wherefore the Commission recommends the Society (1) to award a gold medal to the author, and (2) to print his memoir *in extenso*."

So far M. Barral. For ourselves we own to a feeling of regret at not being able to quote many pages from this most pleasantly written book. We can hardly better indicate its character than by taking a few items from the table of contents—the head line of each chapter is in italics. I. *Principal causes of the severity of the frost of 1879-80*. Intensity of the cold in France. Temperatures of -22° F. (*i.e.* 54° below freezing point) are reported from five Departments, and in Aube -33° F. is reported, but M. Baltet quotes it with a caution, as he is not sure about the accuracy of the thermometer. Previous severe winters. Primary and secondary causes of the severity of the frost. II. *Effects of the persistency of the frost on vegetables and animals*. Temperatures and the number of consecutive days of frost in various parts of France. Comparison with previous winters in which the cold had been more intense, but of shorter duration. Effects on animals, birds, insects, and fishes. Influence on migratory birds. III. *Relation between altitude and cold*. Movement of cold air-currents. Effect on the firs in la Sologne and in the Vosges. Vegetation near stagnant and near running water. (IV). *Effect of snow*. Comparative experiments by M. Becquerel on bare and on snow-covered ground. Depth of frozen soil in various parts of France. (V). *Action of the sun on frozen plants*. Actinometry, Influence of aspect. Effects due to alternations of frost and of thaw. Effect of the drought in the spring of 1880. (VI). *Abnormal state of vegetation when the frost began*. The cold spring and wet summer of 1879, had rendered vegetation late. Relative state of vegetable tissues after dry and after wet seasons. (VII). *Deterioration of tissues by frost*. Mechanical effect of frost. Action upon evergreens. (VIII). *Effects of frost in nursery grounds*. (IX). *Effects in parks, gardens and along the roads*, also in the squares, &c., in the town of Troyes, and on the indigenous vegetation. (X). *Effects of the frost on woods and forests*. (XI). *Effects in orchards*. (XII). *Effects on the vines*. (XIII). *Alphabetical list of trees and shrubs destroyed, damaged, or uninjured, by the frost*. (XIV). *Meteorological observations at Troyes*.

We now turn to the English volume which is a wonderful mass of statistics rather than a memoir—the labour expended in getting it ready and in working it up has been immense, and as a storehouse of

facts it is without equal or precedent, but it seems as if one wanted another volume to summarize the information. First we have a preface of two pages explaining that the materials were collected by a sub-committee of the Royal Horticultural Society, and that other works have been referred to in order as far as possible to eliminate all doubtful records. Then follows an introduction of sixteen pages, which would more appropriately have been called the report, since there is nothing else in the way of a general summary. This introduction is really the only part of the volume that one can read straight away, all the rest is formed of tables or of reports from individual stations. It deals with—(1). An epitome of the characters of the severe winters from 1837 to 1881. (2). The distribution of temperatures. (3). The grouping of counties into divisions. (4). The effect of soils. (5). Subterranean frost and delayed evidence of injuries. (6). Age and its effects. This is followed by very carefully compiled indices of—(1). Counties. (2). Low temperatures. (3). Plants (arranged alphabetically), but (unfortunately we think) not in column. (4). Species, varieties and individuals, shewing different degrees of injury and hardiness. (5). Miscellaneous matters. These indices are perfect trophies of industry, and as far as we have examined them are wonderfully free from errors. In fact—the collecting and classifying of the data is exceptionally well done, and we want only a few short chapters with some such headings as those of M. Baltet, but dealing with the phenomena as observed in the British Isles.

By-the-bye, neither author refers to details of injury by the frost of 1709, yet they are to be found in an 8vo. book published in 1717, with some such title as :—

“Lives of the French, Italian and German Philosophers, with abstracts of their choicest pieces; on the Feathers of Birds * * * Trees killed by the frost of 1709, &c.”

FLOODS IN DEMERARA.

Disastrous floods of an unprecedented kind have been experienced on the east coast of this Colony, by which the poor inhabitants of the district are suffering severe losses and indescribable privations. The following description of the scene is taken from the *Argosy* :—Many villages with their provision and pasture ground annexes are (or were, for we are glad to be able to say that the rains are abating) from two to four feet under water, the villagers' huts looking like bathing machines in a placid sea, water up to the doorstep, frequently above it, no road to be seen, not a blade of grass for cow or mule, or a dry foot of ground for the smaller stock. The people were helpless and no help could be extended to them in the way of relieving their lands of the deluge; they had simply to sit and suffer, to awake in the morning with nothing to do, their farms all lost to sight, crops ruined, and all attempts at cultivation impossible.

ROYAL METEOROLOGICAL SOCIETY.

At the meeting of this Society on April 20th, Mr. W. Ellis, F.R.A.S., President, in the chair, Mr. Robert Barnes, M.D., F.R.C.P., and Mr. L. L. La Trobe-Bateman were balloted for, and duly elected Fellows of the Society.

The following papers were read :—

(1.) "The Storm and Low Barometer of December 8th and 9th, 1886," by Mr. C. Harding, F.R.Met.Soc. This gale will long be remembered as the one in which 27 lives were lost in the lifeboat disaster off Formby through the capsizing of the Southport and St. Anne's lifeboats. The violence of the storm was felt over the whole of the British Islands, as well as over a great part of the Continent of Europe, a gale blowing simultaneously from Norway to Spain. The strongest force in the United Kingdom was experienced in the west and south-west, and the highest velocity recorded by any anemometer was 80 miles in the hour, registered at Fleetwood ; while at Valencia, Scilly, and Holyhead the velocity reached 70 miles in the hour. The most exceptional feature of the storm was the extraordinarily low reading of the barometer and the long time that the mercury remained at a low level. The absolutely lowest authentic reading was 27·38 in. at Belfast, and the barometer fell below 28 inches over a great part of England, Scotland, and Ireland. At Aberdeen the mercury was below 28 inches for 18 consecutive hours, and below 29 inches for more than 60 hours, whilst in the north of England the barometer readings were equally exceptional.

(2.) "Report of the Wind Force Committee," drawn up by Mr. G. Chatterton, M.A., F.R.Met.Soc. In this report, which is a preliminary one, the Committee has dealt mainly with that portion of the investigation relating to Beaufort's Scale of Wind Force and the equivalent velocity in miles per hour. The Committee has compared the velocities recorded by the anemographs at Holyhead, Falmouth, and Yarmouth, with the entries of Beaufort's Scale in the logs of the neighbouring lightships and lighthouses for the year 1881, and gives the results in a table. After a careful consideration of the whole of the results of this investigation, the Committee is of opinion that the velocities shown by the Yarmouth anemograph, corresponding to Beaufort's Scale as recorded on board the lightships, are too high, and that the velocities shown by the Falmouth anemograph are probably too low. The Committee, however, has not yet had before it sufficient data to determine with any degree of certainty the relation between Beaufort's Scale of Wind Force and the equivalent velocity in miles per hour ; neither is it able to recommend any existing scale that can be adopted or modified.

(3.) "A new form of Velocity Anemometer," by Mr. W. H. Dines, B.A., F.R.Met.Soc. In this instrument an attempt has been made to measure the velocity of the wind by the rotation of a small pair of windmill sails, the pitch of the sails being altered automatically,

so that the rate may always bear the same ratio to that of the wind. The mechanical details are briefly as follows—A helicoid is fixed at the front, and a small pair of sails of variable pitch at the back of a steel rod, and just behind the helicoid a light fan, which can turn on the same axis, but is independent of the helicoid and sails. If the rotation be too rapid the fan turns in the same direction as the helicoid, and by its motion alters the pitch of the sails, so that their motion is retarded; if, on the other hand, the friction be increased, or from any other cause the motion become too slow, the fan is turned in the other direction, and the rate is increased. The motion is communicated to a vertical rod which passes down the hollow pivot on which the instrument turns. It is kept facing the wind by a vane. It is convenient to connect the vertical shaft to the recording dial by a light flexible wire, all that is necessary being to place the dial approximately beneath the anemometer. By this means the trouble of ascending a high tower or ladder is avoided, except when oil is required.

(4). "Description of Two New Maximum Pressure Registering Anemometers," by Mr. G. M. Whipple, B.Sc., F.R.Met.Soc. The simplest instrument is a modification of the Lind's, Hagemann's, or Pitot's water pressure anemometer, provided with an apparatus for registering the maximum height the water attained during the period which elapsed since the last setting of the instrument. The second form of registering maximum pressure anemometer is derived from the ordinary pressure plate instrument. A circular metallic disc of $9\frac{5}{8}$ in. diameter, exposing a surface of half a square foot is kept at right angles to the wind by means of a suitable vane. This disc is perforated by eight circular apertures, each of $1\frac{3}{8}$ in. diameter. Behind each aperture a disc of $1\frac{1}{4}$ in. diameter is loosely held *in situ* by means of a bent lever loaded with a weight. These weights are arranged so as to press upon the different discs with pressures proportionate to the values usually assigned to wind pressures measured by the various degrees of the Beaufort scale. On noticing which is the most heavily weighted disc displaced, one sees at once the maximum pressure.

THE WINTER AT PAU.

We have been favoured by one of our correspondents who has been passing the winter at Pau, with a record of the total rainfall in each month. They have had as much in five months as London gets in a year.

1886.			1887.		Total
Oct.	Nov.	Dec.	Jan.	Feb.	
5·60	3·10	8·30	7·49	·54	25·03

The record shows a fall of 8 or 9 inches of snow on December 20th, and temperatures of 14° F and 20° F on December 22nd and January 3rd respectively.

REVIEWS.

Observations upon the Climate of Uckfield, Sussex, and its neighbourhood from 1843 to 1870. Second Edition, with some additional observations and statistics of rainfall to the end of the year 1885. By C. LEESON PRINCE, M.R.C.S., F.R.A.S., F.R.Met.Soc., &c. 8vo. Lewes, 1886.

ABOUT fifteen years since, we reviewed the first edition of this work, and all the praise it then received is equally due to this edition. And indeed the book is more valuable in the ratio of 14 to 9, because whereas the former dealt with the years 1843 to 1870, this deals with those years plus 1871 to 1885.

We need not again describe the work in detail ; we will deal with only three items.

A rainfall record, quite continuous and only very slightly affected by change of position during 43 years, is rather a *rara avis*. It, therefore, becomes important to determine some of the constants :—

		inches.			
The mean	1850-9	= 30·025	=	99	per cent. of 43 years mean.
	1860-9	= 31·236	=	104	„ „ „
	1870-9	= 31·020	=	103	„ „ „
	1843-63	= 29·207	=	97	„ „ „
	1843-70	= 29·392	=	98	„ „ „
	1843-85	= 30·060	=	100	„ „ „
	1864-85	= 30·874	=	103	„ „ „
The wettest	1852	= 50·55	=	168	„ „ „
The driest	1847	= 17·58	=	58	„ „ „

A very useful table is given of all rains of 1 inch and upwards in 24 hours, which is remarkable for the few large entries ; there are only four which reach or exceed 2 inches

1852, Oct. 4	.....	2·12 inches.
1856, Sept. 27	.....	2·38 „
1865, Oct. 18	.....	2·40 „
1868, July 11	.....	2·10 „

A remarkable record of a hailstorm on June 24th, 1872, is contributed by Coventry Patmore, Esq., who was then residing at Heron's Ghyll, near Uckfield. "The hailstorm was quite unlike anything I have ever before or since seen or heard of. The afternoon was fine and quiet, when I saw a dense grey veil, apparently a furlong or so in breadth, approaching the house from the south. It was about a mile off when I first noticed it, as I knew by its obscuring in its course certain objects which lay at that distance. Sunshine was on each side of it. In a few minutes it reached the house. There was one clap of thunder, whether at the time of its arrival or a little while before I cannot recollect. For somewhat less than two minutes the hail came down, with a sudden but not very violent blast of wind, in such quantities that nothing could be seen thirty yards from our windows. In those two minutes my rain gauge measured nearly 1½ in.—that is to say, about as much as falls in an ordinary heavy downpour of twenty-four hours' duration. The

forms of the hailstones and their way of falling were not less remarkable than their quantity. About half of them were ordinary hailstones as to spherical shape and construction, in concentric layers, only they were about the size of ordinary marbles. The other moiety were clear discs of ice of about the diameter of a penny piece and twice as thick, perfectly well formed, and in numberless cases having small projections on one or both sides, which made them look like the covers of small stewpans with their handles.* Here and there was a mass of clear ice of a different form. The largest I picked up was about the size of a bantam's egg, hollow, and formed with spiral ridges. I did not weigh any of these hailstones, but a neighbour told me that he had picked up eight which weighed an average of two ounces each. I do not think that I saw any of more than half that weight. But what surprised me more than their size was their way of coming down. In my eagerness to examine the stones, I hastened out of the window from which I was looking without my hat on. I felt the blows of the ice-balls almost as little as if they had been snow-flakes. No glass was broken, no trees or shrubs injured; and a friend who was driving two high-spirited horses through the thickest of it told me that they took no notice of it whatever, though he should have been sorry to have been driving them through an ordinary hailstorm. The only way I can see of accounting for this extraordinary fact is the supposition that these masses of ice were formed and sustained in a funnel of wind, of which the extreme point or nose did not reach the earth, although it passed close above it; so that when the weight of the stones overcame the sustaining force of the hurricane, they had only a hundred or two feet to fall through."

On page 271, Mr. Prince refers briefly to the phenomenal sunsets of the winter of 1883. He considers that dust alone would not explain the phenomena, but seems to think that they may be explained as due to dust *and* vapour jointly projected to a great height by the eruption of Krakatoa.

Katalog der Meteorologischen Beobachtungen in Russland und Finland.

VON E. LEYST. Vierter Supplementband zum Repertorium für Meteorologie. 4to, xxii.—435 pages. St. Petersburg, 1887.

THIS is a sort of life-history of the observations made at upwards of 1,100 towns and villages in Russia. We have tested it in sections with which we were familiar, and have not found a single error. In a few cases we think that a letter or a post card (if they have such handy things in Russia—we have had them from nearly every other country in Europe, but never saw a Russian one) would have solved difficulties now left in this book for future generations—but real errors seem very scarce.

* Almost identical with the pattern described and engraved in a letter from Col. Ward, from Bavaria.—See *Met. Mag.*, vol. xv. (1880) p. 134.—ED.

Concerning Nishne-Tagilsk,* M. Leyst says he has seen no later publication by Prince Demidoff (or Demidow as he prints it), than that for the year 1865, but that he is not sure whether subsequent years have been published or not. We believe that 1865 is the last; we have not seen anything later, and 1865 is the last at the Royal Meteorological Society, at the Royal Observatory Brussels, or on our own shelves. We had been hesitating the account of which station to translate so as to give our readers an idea of the mass of information given, and we decided upon Baku—known from time immemorial for its Fire-temples, and now of almost untold importance as the centre of a mineral oil trade of the magnitude of which not one Englishman in a thousand has the faintest idea. But we are confronted by $1\frac{1}{4}$ pages, quarto of small type—say 3 pages of this magazine—this is too much, so we will abridge it so as to give the general drift of it without the details.

BAKU (SOUTHERN CAUCASUS).

Lat. $40^{\circ}22'$ N. Lon. $49^{\circ}50'$ E. (of Greenwich). Altitude 7 ft. above sea.

Prof. Abich established a station in 1847 at the old hospital, the observations being taken by the dispenser, but after six months the instruments were transferred to the Customs, and the observations made by the director of Customs. In 1852, on the recommendation of Prof. Abich, they were returned to the hospital, and the original observer, E. Andreew, continued the records until his death in 1857.

After a short interruption the Director of Customs resumed the observations in 1857, and has continued them till the present time. Up to November 10th, 1858, the observations were made close to the Custom House, since that time they have been made at the observer's residence in the suburbs. Details are given of the observation hours, which were too frequently changed, but were generally 7 a.m., 1 p.m., 9 p.m. All the usual elements were observed. Then follows a list of the observations which have been published, stating when, where, how and by whom, and finally it is stated that the original observation books are in the observatory at Tiflis.

A second set of observations was established by the Navy on June 1st, 1850, which besides the usual elements included the level of the water, and the temperature at the surface and at $3\frac{1}{2}$ fathoms. The observations seem to have been at first carefully taken, but about 1874 they were so evidently untrustworthy that none have since been published.

A third series was started at the Naval Hospital in 1881, under the care of the Principal and Assistant Medical Officer, and these observations are in progress at the present time.

We should have been glad had the volume contained a series of maps showing the sites of all the stations, as although the latitude and longitude is given for nearly every station, it leaves a heavy task for readers to produce maps of the stations for themselves.

* This used to be written Nijné Taguilsk.

Lastly, we are glad to see that the author has adopted strict rules for the reproduction in ordinary type of Russian place names. This is a step in the right direction, and though it puzzles one to see Enisseisk where we used to have Yeniseisk, or Jenisseisk, Yakoutsik has definitely taken its place among the J's as Jakutsk, which curiously enough does not agree with either of the eight ways of spelling the name quoted in *Meteorological Magazine*, Vol. XX. (1885). p. 69. Again, Katharinenburg and Ekaterinenburg both disappear to be replaced by Ekaterinburg. A very large number of places of which the name began with hard C (like cup, which obviously ought to be spelled kup) have been removed from the C to the K, but we are puzzled to know why Catharina not far from Dorpat is left among the C's, while the compounds of Katharine, Katharinenburg, Katharinenslaw, and Katharinenstadt are all among the K's.

APRIL SNOW STORMS.

Snow fell at Shrewsbury for about two hours on 26th, and at times the fall was very heavy.

There was a heavy fall of snow, followed by rain, at Wolverhampton, and the weather was very cold.

In Birmingham on Tuesday, 26th, the weather was intensely cold, and shortly after noon snow commenced to fall heavily, and continued without cessation for two hours. On the roofs and in exposed places it lay, and gave the town a wintry appearance. Severe weather is also reported from several of the midland districts.

North-East Lancashire was visited by a heavy snowstorm on the night of the 26th. The flakes were large, but melted on the ground. The weather was bitterly cold.

A Kendal correspondent states that the whole of the Lake District presented quite a wintry aspect on Wednesday, 27th. Snow began to fall between six and seven o'clock, and continued for about an hour. The storm was a sharp one, two or three inches of snow having fallen. Coming after comparatively mild weather, much harm will be done to fruit trees and vegetation. From the hill districts of Cumberland very wild weather is reported, causing sheep farmers much anxiety.

The weather in Monmouthshire has been very severe, and heavy snowstorms have prevailed. The mountain ranges in North Wales were covered with snow on Tuesday.

Further downfalls of snow occurred in North Wales on Wednesday morning, covering the mountain ranges. Snow lies to the depth of many feet on Snowdon, Cader Idris, and the other lofty peaks.

A remarkably heavy storm of snow fell all over Western Perthshire on the 26th, and, although the snow melted on the low ground, there was a depth of from one to two inches on the hills. The temperature was very low.

INJURY BY LIGHTNING.

To the Editor of the Meteorological Magazine.

SIR,—You were kind enough to reprint as leading article in the last issue of your excellent Magazine a translation, published by the U.S. Signal Service, of the general conclusions drawn from my investigations into the injury done by lightning in Germany. The anonymous writer has translated pretty well, except Section VIII., where is stated just the contrary of what I wrote and meant. You and your readers may judge by the following juxtaposition :—

Translator.

8. In Hesse the parts protected best are regions along the Rhine, where the encircling hills and mountain sides are interposed to protect them. But the danger is increased where, as in the case of Rhine-Hesse, the country above is wooded.

Author (Translated by himself).

8. In Hesse the risk of danger from lightning is increased in the low-lands of the Rhine-valley, while the mountainous districts of the "Odenwald" and of the "Vogelgebirge," are the parts protected best. In the latter case the protection is due to the situation of the villages in deep valleys overtopped by higher objects (as peaks, rocks, trees, &c.,) but the danger becomes much greater for houses situated in the flat land along the Rhine, especially, if there are so few forests as in Rhine-Hesse.

I think your idea to establish a pamphlet exchange a most happy one, which I hope will be made much use of. I propose to send by the same post for this exchange, copies of some of my last papers.

Yours very truly,

GUSTAVUS HELLMANN.

Berlin, S. W. Ritterstr. 67.

EARLY METEOROLOGY.

An almanac three thousand years old, found in Egypt, is in the British Museum. It is supposed to be the oldest in the world. It was found on the body of an Egyptian, who had doubtless regarded it with as much reverence as he did the Egyptian Bible—"The Book of the Dead"—and, indeed, it is strongly religious in character. The days are written in red ink, and under each is a figure, followed by three characters, signifying the probable state of the weather for that day. Like other Egyptian manuscripts, it is written on papyrus. It is written in columns. It is not in its integrity, but was evidently torn before its owner died. It clearly establishes the date of the reign of Rameses the Great, but contains nothing else of value.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, NOV., 1886.

STATIONS. (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
England, London	58·8	1	30·0	23	50·0	39·3	41·1	88	82·1	22·2	2·71	14	6·0
Malta.....	76·8	14	48·0	24	68·6	56·9	53·8	79	125·7	42·3	4·07	13	5·2
<i>Cape of Good Hope</i> ...	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>Mauritius</i>	82·3	30	64·8	3	79·0	68·3	62·3	70	136·6	58·3	1·19	14	5·8
Calcutta	85·8	1	60·0	30	82·8	67·1	65·9	76	147·3	47·9	·00	0	2·6
Bombay.....	91·8	3	69·9	12	86·2	74·7	71·4	74	144·7	61·0	·61	2	2·6
Ceylon, Colombo	92·0	27	71·6	26	86·6	73·8	71·0	73	146·0	65·0	6·45	14	6·6
Melbourne.....	95·4	24	43·8	15	73·2	51·4	49·2	65	146·8	33·5	2·67	6	5·5
Adelaide	99·1	10	46·5	14	79·9	55·8	47·5	48	156·3	36·8	1·07	6	3·7
Wellington	69·3	28	39·0	11	62·1	49·7	50·3	83	145·0	35·0	4·27	12	4·3
Auckland	75·0	20	47·0	12	68·0	54·0	52·4	74	150·0	36·0	1·41	11	6·4
Jamaica, Kingston.....	95·8	3	63·8	29	91·9	69·5	69·5	77	...	...	·05	3	3·0
Barbados	83·0	1	69·0	26	80·0	71·0	71·3	80	145·0	...	19·01	21	7·0
Toronto	62·0	2	14·5	30	42·0	29·0	29·4	75	...	12·0	2·65	17	7·0
New Brunswick, Fredericton	62·7	7	10·2	28	42·1	27·7	30·4	78	...	...	6·07	18	7·0
Manitoba, Winnipeg	55·9	1	— 22·0	29	27·6	5·3	13·8	79	...	...	·57	8	5·0
British Columbia, Victoria	57·0	3	28·0	8	50·0	36·4	...	...	...	...	1·92	14	...

a And 28. b And 25. c And 26. d And 24.

REMARKS, NOVEMBER, 1886.

MALTA.—Mean temp. 61°·4; mean hourly velocity of wind 8·4 miles. TSS on 9th, 16th and 21st, the last accompanied by H. Etna visible on 27th, covered with S to the sea line. Sea temp. fell from 71° to 66°. J. SCOLES.

Mauritius.—Mean temp. of air and of dew point each 1°·1, and rainfall 20 in. below average; pressure slightly above average; mean hourly velocity of wind 11·7 miles, 0·3 miles above average; extremes 27·2 miles on 6th, and 3·3 miles on 9th; prevailing direction E. C. MELDRUM, F.R.S.

Melbourne.—Mean temp. of air 1°·7, of dew point 0°·8, rainfall 17 in., and pressure slightly above their respective averages; mean humidity and mean amount of cloud slightly below average. Prevailing winds S. and S.W., strong on five days; L on 3rd, 24th, and 29th; TS on 12th; H on 12th. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean temp. 1°·1, rainfall 11 in., and pressure 1041 in. above their respective averages; mean amount of cloud 1·0 below average. C. TODD.

Wellington.—Weather generally fine, but very strong N.W. wind prevailed with frequent gales, and showers at intervals during the month; rainfall average; mean temp. 0°·6 below, and pressure 181 in. above average. Slight earthquakes were felt on 10th and 14th, and a smart shock on 26th. R. B. GORE.

Auckland.—An unusually fine month, with less than half the average R; pressure considerably, and mean temp. slightly above the average. T. F. CHEESEMAN.

Barbados.—Pressure steady; mean temp. (76°) 2°·2 below the average; rainfall greatly above the average, and only once exceeded in 35 years; max. fall 4·75 in. on 3rd. Prevailing wind N.E. on 25 days, S.E. on five days; mean hourly velocity seven miles, one mile below the average; extremes 15·2 miles and one mile. TSS on 7th and 19th. Eleven days were overcast. R. BOWIE WALCOTT.

SUPPLEMENTARY TABLE OF RAINFALL, APRIL, 1887.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger	1·94	XI.	Castle Malgwyn	1·42
„	Margate, Birchington...	1·60	„	Rhayader, Nantgwillt..	2·50
„	Littlehampton	1·02	„	Carno, Tybrith	2·14
„	Hailsham	1·60	„	Corwen, Rhug	1·38
„	Ryde, Thornbrough	1·21	„	Port Madoc	1·96
„	Alton, Ashdell.....	1·66	„	I. of Man, Douglas	1·45
III.	Oxford, Magdalen Col...	1·11	XII.	Stoneykirk, ArdwellHo.	2·92
„	Banbury, Bloxham	1·43	„	New Galloway, Glenlee	3·52
„	Northampton	1·18	„	Melrose, Abbey Gate...	1·33
„	Cambridge, Beech Ho...	1·04	XIII.	N. Esk Res. [Penicuik]	1·60
„	Wisbech, Bank House..	1·20	XIV.	Ballantrae, Glendrishaig	2·69
IV.	Southend .....	...	„	Glasgow, Queen's Park.	2·06
„	Harlow, Sheering ...	1·08	XV.	Islay, Gruinart School..	2·28
„	Rendlesham Hall	1·39	XVI.	St. Andrews, PilmourCot	1·59
„	Diss	1·21	„	Balquhider, Stronvar..	2·28
„	Swaffham	1·29	„	Dunkeld, Inver Braan..	1·89
V.	Salisbury, Alderbury ...	1·13	„	Dalnaspidal H.R.S. ...	2·37
„	Warminster	1·42	XVII.	Keith H.R.S.	1·92
„	Calne, Compton Bassett	1·21	„	Forres H.R.S.	1·81
„	Ashburton, Holne Vic..	2·01	XVIII.	Strome Ferry H.R.S....	3·94
„	Holsworthy, Clawton...	·96	„	Tain, Springfield	1·47
„	Hatherleigh, Winsford.	...	„	Loch Shiel, Glenaladale	5·37
„	Lynmouth, Glenthorne.	1·57	„	S. Uist, Ardkenneth ...	2·14
„	Probus, Lamellyn	·90	„	Invergarry	1·90
„	Wincanton, StowellRec.	1·21	XIX.	Lairg H.R.S. ....	...
„	Taunton, Lydeard Ho ...	1·36	„	Forsinard H.R.S.	1·83
„	Wells, Westbury	1·33	„	Watten H.R.S.	1·88
VI.	Bristol, Clifton	1·96	XX.	Dunmanway, Coolkelure	2·38
„	Ross	1·21	„	Fermoy, Gas Works ...	2·07
„	Wem, Clive Vicarage ...	1·30	„	Tralee, Castlemorris ...	2·46
„	Cheadle, The Heath Ho.	·85	„	Tipperary, Henry Street	1·54
„	Worcester, Diglis Lock	·73	„	Newcastle West .....	...
„	Coventry, Coundon	·94	„	Miltown Malbay	1·97
VII.	Melton, Coston	·88	XXI.	Gorey, Courtown House	1·01
„	Ketton Hall [Stamford]	1·13	„	Navan, Balrath	1·64
„	Horncastle, Bucknall ...	1·02	„	Mullingar, Belvedere ...	1·35
„	Mansfield, St. John's St.	1·34	„	Athlone, Twyford	2·23
VIII.	Macclesfield, The Park.	·91	„	Longford, Currygrane...	1·53
„	Walton-on-the-Hill.....	·89	XXII.	Galway, Queen's Coll...	2·19
„	Lancaster, South Road.	1·76	„	Clifden, Kylemore	3·76
„	Broughton-in-Furness ..	2·49	„	Crossmolina, Enniscoe..	2·78
IX.	Wakefield, Stanley Vic.	·55	„	Collooney, Markree Obs.	2·03
„	Ripon, Mickley	1·10	XXIII.	Rockcorry	1·41
„	Scarborough, West Bank	1·01	„	Warrenpoint	1·36
„	EastLayton[Darlington]	·97	„	Newtownards .....	...
„	Middleton, Mickleton..	1·57	„	Belfast, New Barnsley..	2·27
X.	Haltwhistle, Unthank..	1·54	„	Cushendun	1·47
„	Shap, Copy Hill	3·51	„	Bushmills	2·19
XI.	Llanfrechfa Grange	1·75	„	Stewartstown	1·52
„	Llandoverly	2·53	„	Buncrana	1·81

APRIL, 1887.

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 1870-9	Greatest Fall in 24 hours.		Max.		Min.					
				Dpth	Date.				Deg.	Date.	In shade.			On grass.
		inches	inches.	in.				Deg.	Date	Deg.	Date.		
I.	London (Camden Square) ...	1.41	— .61	.30	24	10		68.2	19	26.2	17	2	18
II.	Maidstone (Hunton Court)...	1.65	— .20	.39	6	11		...	...	...	...	...	...
III.	Strathfield Turgiss	1.17	— .74	.43	23	9		70.3	19	21.9	17	10	20
III.	Hitchin	1.18	— .77	.36	23	12		62.0	19	25.0	16	9	...
IV.	Winslow (Addington)	1.28	— 1.03	.38	23	9		65.0	19	23.0	15e	11	19
IV.	Bury St. Edmunds (Culford)	1.19	— .60	.54	28	11		64.0	19	21.0	16	16	...
	Norwich (Cossey)	1.30	— .56	.52	27	10		...	...	...	...	...	...
V.	Weymouth (Langton Herring)	.77	...	.30	23	7		60.0	19	29.0	15	3	...
	Barnstaple	1.46	— .92	.47	26	7		64.0	13	28.0	15	...	...
	Bodmin	1.09	— 2.24	.44	26	9		58.0	12	29.0	15	...	25
VI.	Stroud (Upfield)	1.65	— .80	.69	26	10		66.0	19	28.0	14	6	...
	Churchstretton (Woolstaston)	1.22	— 1.10	.41	26	9		62.0	18c	27.5	8, 14	10	24
	Tenbury (Orleton) .....	.76	— 1.41	.18	26	9		66.7	18c	21.2	15	16	22
VII.	Leicester	1.00	...	.61	26	10		63.5	18	29.0	17f	9	...
	Boston .....	.85	— 1.04	.35	23	8		70.0	17	26.0	17	9	...
	Hesley Hall (Tickhill) .....	.90	...	.30	28	11		64.0	1	28.0	16e	10	...
VIII.	Manchester (Ardwick)	1.49	— .54	.33	29	9		57.0	...	30.0	...	...	...
IX.	Wetherby (Ribston Hall) ...	.52	— 1.99	.16	27	7		...	...	...	...	...	...
	Skipton (Arncliffe)	2.38	— .68	.38	27	16		59.0	13	26.0	23	13	...
	Hull (Beverley Road)	1.37	— .34	.52	26	15		66.0	19	29.0	10	5	14
X.	North Shields .....	.72	— 1.28	.27	21	12		63.0	19	26.5	15	10	11
	Borrowdale (Seathwaite)	9.22	+ 4.28	2.40	20	12		64.0	12	27.0	8	12	...
XI.	Cardiff (Ely)	1.46	— .88	.32	26	10		...	...	...	...	...	...
	Haverfordwest	1.14	— 1.68	.38	25	9		64.0	12	23.0	14e	17	24
	Plinlimmon (Cwmsymlog) ...	2.30	...	.55	4, 26	10		...	...	...	...	...	...
	Llandudno	1.02	— .86	.33	4	10		53.8	12	30.5	15	1	...
XII.	Cargen [Dumfries]	1.17	— 1.12	.29	4	8		62.0	11	26.0	5	14	...
	Jedburgh (Sunnyside)	1.00	— .70	.25	20	11		61.0	11	25.0	10	17	...
XIV.	Old Cumnock	2.52	+ .86	.53	20	11		65.0	11	24.0	7	17	...
XV.	Lochgilthead (Kilmory)	2.93	+ .30	.70	20	13		...	...	...	...	...	...
	Oban (Craigvarren)	2.72	...	.68	20	11		61.6	11	29.0	7	5	...
	Mull (Quinish)	3.53	...	.93	22	14		...	...	...	...	...	...
XVI.	Loch Leven Sluices	1.50	— .71	.50	22	6		...	...	...	...	...	...
	Arbroath	1.60	— .31	.57	20	8		59.0	18	30.0	8	5	...
XVII.	Braemar	1.61	— .47	.35	20	14		61.2	11	23.0	8	16	24
	Aberdeen	1.82	...	.52	21	16		67.0	17	29.0	7g	7	...
XVIII.	Lochbroom	2.53	...	.32	19a	15		...	...	...	...	...	...
	Culloden	1.26	— .09	...	...	...		58.0	17	30.0	5, 27	8	23
XIX.	Dunrobin	2.07	...	.48	4	12		55.7	19	29.7	26	7	...
	Kirkwall (Swanbister) .....	...	...	...	...	...		...	...	...	...	...	...
XX.	Cork (Blackrock) .....	.93	— 2.17	.20	22	12		67.0	19	26.0	14	11	...
	Dromore Castle	2.48	...	.34	23	13		65.0	12	28.0	3	...	...
	Waterford (Brook Lodge) ...	1.07	...	.26	21	12		60.0	12	23.5	15	7	...
	O'Briensbridge (Ross)	1.33	...	.25	21	12		58.0	18	30.0	...	19	...
XXI.	Carlow (Browne's Hill)	1.59	— .98	.36	24	14		...	...	...	...	...	...
	Dublin (Fitz William Square)	1.76	— .35	.44	29	10		62.2	18	31.5	15	1	20
XXII.	Ballinasloe	1.64	— .62	.56	25	13		56.0	12d	26.0	7	20	...
XXIII.	Waringstown	1.98	+ .09	.28	20b	12		64.0	19	25.0	8h	16	23
	Londonderry (Creggan Res.) ..	2.39	...	.52	25	16		...	...	...	...	...	...
	Omagh (Edenfel)	2.64	+ .64	.48	23	14		57.0	18	28.0	8, 30	17	21

a And 20. b And 21. c And 19. d And 23. e And 17. f 30. g And 14, 15. h And 13, 15.
+ Shows that the fall was above the average ; —that it was below it.

METEOROLOGICAL NOTES ON APRIL, 1887.

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

ENGLAND.

STRATHFIELD TURGISS.—With the exception of a few showers of sleet, the first three weeks were fine, dry and cold, with brilliant sunshine by day and white frosts at night. Vegetation, therefore, was at a standstill, although no damage was done to the crops. Towards the end of the month a much softer atmosphere prevailed and a general though light rainfall. The nights were still frosty, so that vegetation made no progress. Humble bee seen on 6th, thrush's nest with four eggs on 14th, brimstone butterfly on 17th, swallow on 27th, cuckoo heard on 17th, and nightingale on 25th.

ADDINGTON.—A dry cold month, all the nights being cold, the highest min. temp. being 44° on 22nd and 23rd. Vegetation was very backward. Swallow seen on 13th, cuckoo heard on 22nd. S, R and high wind on 1st, very high wind all day on 6th.

CULFORD.—The coldest April remembered; vegetation very backward; mean temp. 42° .

LANGTON HERRING.—The third dry month in succession and the coldest April in 16 years, the mean temp. at 9 a.m. being only $44^{\circ}9$; the next coldest was April, 1879, with a mean temp. of $45^{\circ}2$. The mean min. temp. was as low as $36^{\circ}3$, which is $0^{\circ}4$, lower than that of January for 15 years, and as much as $1^{\circ}2$ lower than the mean min. of April, 1879. Mean temp. $2^{\circ}6$ below the average. The weather was, on the whole, very fine, but the want of R and the cold seriously retarded the growth of grass.

BODMIN.—Mean temp. ($44^{\circ}5$) $5^{\circ}9$ below the average of 38 years. The mean of 25 nights min. temp. on grass was $28^{\circ}3$, which is very remarkable and quite unprecedented in my long experience.

STROUD.—A very cold, dry month. Slight S on the hills on 6th; T, L and H on 24th.

WOOLSTASTON.—A cold, dry, and very backward month; mean temp. $42^{\circ}7$. S on 5th, 25th, 26th and 27th. [The mean temp. for March was $37^{\circ}2$, not $30^{\circ}6$ as printed.]

ORLETON.—A very cold and dry month, with much sun in the daytime and clear frosty nights. The mean temp. was $3^{\circ}5$ below the average of 26 years, and was lower only in 1879, and equal in 1877. The prevailing wind was strong from N. and E. Rainfall very small, and pressure generally high and steady. All vegetation was very late, plums, damsons and cherries coming into blossom about the 28th. The cuckoo was generally heard about the 21st, but the other summer birds were later than usual, the swallow and willow wren not appearing till after the 23rd. No L was seen or T heard. High wind on 1st. Hills covered with S on 27th.

LEICESTER.—A dry, cold month.

BOSTON.—Very cold, with constant frosts at night; all vegetation very backward. The 17th was a remarkable day, pressure very high, max. temp. 70° , min. temp. 26° , a difference of 44° in 12 hours. This is the lowest temp. recorded in April during 23 years. S on 13th.

MANCHESTER.—Fine but cold, with several night frosts and a cold E. wind, keeping vegetation in a backward state.

HULL.—A cold and ungenial month. S on 14th and 27th; T and L on 25th.

WALES.

HAVERFORDWEST.—April commenced cold and cloudy, with E. wind. From 4th to 11th the wind was very strong, almost reaching the force of a gale from N.E. on the 8th, the air being very cold and dry. Three days of bright warmth then occurred with frosty nights, followed by a sudden change back to weather of the bleakest character, with keen blasts from E. and N.E.; severe night

frosts, and very low temp. Most of the days were magnificently fine, the air being exceedingly dry. After the 21st, the weather broke up with E and H, and on the 26th, 27th and 29th S covered the Precelly range. The month maintained its wintry character to the end. I never before registered so many frosty nights or such low temperatures in the month of April. Mean temp. $42^{\circ} \cdot 8$. One of the driest ApriIs in the last 39 years, with no growth of grass.

LLANDUDNO.—As regards Llandudno, April is the driest month of the year, this year the E was 41 per cent. below the average. From the 6th to the 20th, inclusive no R fell. Polar winds were rather prevalent, but owing to the extreme dryness of the air and the large amount of sunshine (167 hours), the cold was not much felt, and the weather was altogether very enjoyable. Vegetation was very backward at the close. The storm which began on March 31st, ended on April 1st, and there was another moderate gale from N.E. on the 6th, continuing about 24 hours. The storm which was prognosticated for the 23rd to 25th, was scarcely felt, though pressure fell considerably. The mean temp. ($44^{\circ} \cdot 1$) was $4^{\circ} \cdot 4$; the mean daily range ($10^{\circ} \cdot 6$) $2^{\circ} \cdot 8$, and the monthly range ($30^{\circ} \cdot 5$) $2^{\circ} \cdot 1$ below the average.

SCOTLAND.

CARGEN.—The temp. of the month was remarkably low, the mean ($41^{\circ} \cdot 2$), being $5^{\circ} \cdot 3$ below the average, and the lowest recorded here during 27 years. The mean min. temp. was only $30^{\circ} \cdot 5$, and it is a rare occurrence even in pretty severe winters that this low mean min. temp. is reached; only nine or ten times during 27 years has the mean min. been lower in any month. The average mean min. for January is $33^{\circ} \cdot 7$, and the same for December. E. winds prevailed on 15 days. Sunshine a little above the average. H showers on 24th and 26th. T on 29th. S on surrounding hills on 25th.

JEDBURGH.—Rainfall $\cdot 59$ in. below the average of 22 years, and temp. lower than for many years. Little or no growth of pastures occurred, while cereals and all tree and bush fruits were very backward. The seed was well got in, and as the land was dry it was easily cleaned. Heavy S showers fell on 5th, the ground was covered on the morning of 13th, and S fell for about three hours on 25th. The river Jed was frozen over on the morning of 15th, and there was ice on pools on 5th, 6th, 16th and 29th. Frequent H showers occurred on 25th and 27th, and T and L on 24th.

ABERDEEN.—With the exception of the rainfall, which was below the average, there is little to note, the weather having been of the usual character for April. S on 4th, H on 30th. Brilliant aurora on 15th.

LOCHBROOM.—A very cold, dry month. Frost prevailed almost every night, and S lay on the low ground frequently (on six days to some depth), while it was almost every day on the heights, and the high hills were deeply covered with it at the close, and the air was dry, cold and piercing from E. or N.E.

CULLODEN.—Very dry, no R falling from 6th to 21st. The nights were cold, with considerable frost, and vegetation was backward at the close. S fell to a depth of some inches on 5th.

IRELAND.

BLACKROCK.—April weather prevailed to the 5th, followed by 14 days without E, but bright and cold; thence to the end it was bright and cold, with some H. T on 29th and 30th. Mean temp. ($45^{\circ} \cdot 1$) $3^{\circ} \cdot 4$ below the average of 11 years.

DROMORE.—The beginning of the month was very fine, but in the last week the weather turned very cold, with N.N.W. winds, heavy S showers and H.

WATERFORD.—S on 6th and 25th. H showers daily, from 23rd to 29th. T on 29th and 30th. Swallows seen on 24th. Cuckoo on 28th. Severe frost on 15th.

O'BRIENSBRIDGE.—The general character of the month was adverse to all vegetation. Frequent, but not severe frosts prevailed, and there was a

deficiency of genial spring showers. Frequent H showers occurred from 20th to the close. Prevailing winds E. and N.E.

DUBLIN.—A cold, generally bright, dry month with high pressure and frequently a large diurnal range of temperature, amounting to 20° or upwards on five days. The precipitation was almost entirely in the form of H or sleet, but was limited to ten days, an absolutely dry period accompanying an anticyclone from the 6th to the 20th inclusive. With the exception of 1879, this was the coldest April since records were commenced in 1860. Lunar corona on 22nd, auroræ on 11th and 25th. Fog on five days, electrical disturbances on five; high winds on seven days, but on no occasion attaining the force of a gale. S or sleet on five days; H on ten. Prevailing winds N.E. and W.N.W.; mean humidity 76; mean amount of cloud 4·8.

EDENFEL.—Up to the 20th, the weather was fine, dry and generally clear, with E. and N.E. winds and night frosts, an excellent seed time, but with no vegetation. The remainder of the month was raw, cold and unsettled with R, H, sleet and S in varying succession.

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