

SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

CCLVII.]

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SOME NEW WEATHER CHARTS.*

WE have received the first two parts of the above work from the Council of the Meteorological Office in the form of two great cardboard rolls, each 26 in. long and 4 in. in diameter. Each of these contains the charts for three months and one week in the form of separate sheets. This is an extremely inconvenient form, especially as each separate chart is only about 8 by $6\frac{1}{2}$ inches, while every sheet measures no less than 24 by 19 inches. The only way to make them handy for reference is to cut each sheet into three.

The materials for every day are plotted on two charts, one of which gives isobars, wind and weather; the other isotherms for air and sea surface temperatures, with the weather symbols repeated. Three of each kind of chart are printed on each sheet, but we cannot see any advantage in the employment of such unwieldy sheets of paper when smaller ones would have been equally efficient.

The charts are well reproduced in three-colour lithography, and though we cannot think that they equal in clearness or artistic appearance the maps that were published by Le Verrier as long ago as 1869, still they are an immense improvement on the last set of big maps issued by the Meteorological Office.

The conical projection is, however, still retained, and this is much to be regretted. If charts are to be of any use to seamen, they must be on the Mercator's projection, to which sailors are accustomed. If the scientific meteorologist wishes to study the lie and motion of depressions round the world, he may perhaps prefer a stereographic projection. The conical projection has the disadvantages of both the above, without the advantages of either. The shapes of cyclones are no doubt better delineated near the central meridian of the chart by a conical than by any other projection, but the great defect is that the distortion of any figure—say a circle—is not the same at every place in the same latitude. The distortion, say in latitude 50° ,

* *Synchronous Weather Charts of the North Atlantic for every day, from 1st August, 1882, to 31st August, 1883.* Published under the authority of the Meteorological Council.

will be the same everywhere on a stereographic projection ; but on a conical one the deformation varies according to the distance from the central meridian.

The isobars and winds are all truly synchronous for noon at Greenwich, but the isotherms have been dealt with in a most unsatisfactory manner. The designers of these charts have of course had to face the problem of diurnal range of temperature, and their solution is as follows: The isotherms over America are for Greenwich noon; those over the sea for local noon; those over Europe for about 8 a.m. local. The consequence is that all the labour which has been put on the temperature charts is practically wasted, as the three systems of isotherms do not join into one another, and it is hardly possible to draw any deductions about anything from the lines as they are drawn. The object of isotherms is to show:—(1). The distribution of temperature over the world; and (2), the causes of the fluctuations of heat and cold from day to day; but none of these phenomena can be studied when the three portions of the same map—Europe, the Atlantic, America—are charted on different systems.

The fears of the designers are clearly indicated in the prefatory explanatory notes: "The diurnal changes of temperature, though not great would, if synchronous observations at Greenwich noon were used, introduce an appearance of permanent higher temperature to the east as compared with the west . . . a difference of temperature which would not have any true physical significance so far as probable consequent changes of pressure or general weather were concerned."

The attempted cure is worse than the original disease. The charts as now constructed represent no physical fact at all. If they had been constructed synchronously for any hour we should have had an accurate picture of the distribution of temperature over the world at that particular moment; and, with a little practice, it is comparatively easy to realise how the diurnal isotherms, as explained by Abercromby, *Quar. Jour. Roy. Met. Soc.* X., p. 247, modify the changing distribution of temperature due to the radiation of cyclones and anti-cyclones, or of hot and cold winds. We can allow for diurnal isotherms, but we can do nothing with the supposed-to-be-corrected-isotherms we find on these charts.

In the weather symbols, we find drizzle grouped with hail and passing showers, and not with rain or snow. This we think is a mistake. Drizzle is usually the prelude of steady cyclonic rain, and is rarely associated with either hail or passing showers.

But though we think this publication, like every other, is open to some criticism, we must draw the attention of our readers to the enormous amount of careful and accurate work contained in these charts, and to the exceptional value of the isobaric portion of the maps. Any one who compares these charts with those of Le Verrier in 1869 or those of the Meteorological Office for August, 1873, will

be struck with the much greater accordance between the direction of the wind as recorded by ships not far from one another. In the older charts it was nothing uncommon to see two ships close by, reporting winds from exactly opposite directions; now we often find 5 or 10 neighbouring ships recording directions of wind that are practically identical.

It is gratifying to know that this improved result is greatly due to the efforts of our own Meteorological Office, and it remains only to express the hope that now that the Council have collected so much valuable material they will take care to have the information discussed by some competent person.

REDIER'S SMALL MERCURIAL BAROGRAPH.

OUR readers have doubtless seen from time to time in the reports of the meetings of the Royal Meteorological Society, notices of the marvellous accuracy with which the barograph constructed for Mr. E. T. Dowson, of Beccles, by M. Redier, of Paris, works. (By-the-by we are glad to see that in the *Meteorological Magazine* for April, 1875, we said "We have not had an opportunity of testing the instrument ourselves, but from an examination of the curves we incline to believe that (excepting only the desperately expensive King's barograph) it is much the best non-photographic barometer yet known"). Our original opinion was, therefore, not far wrong.

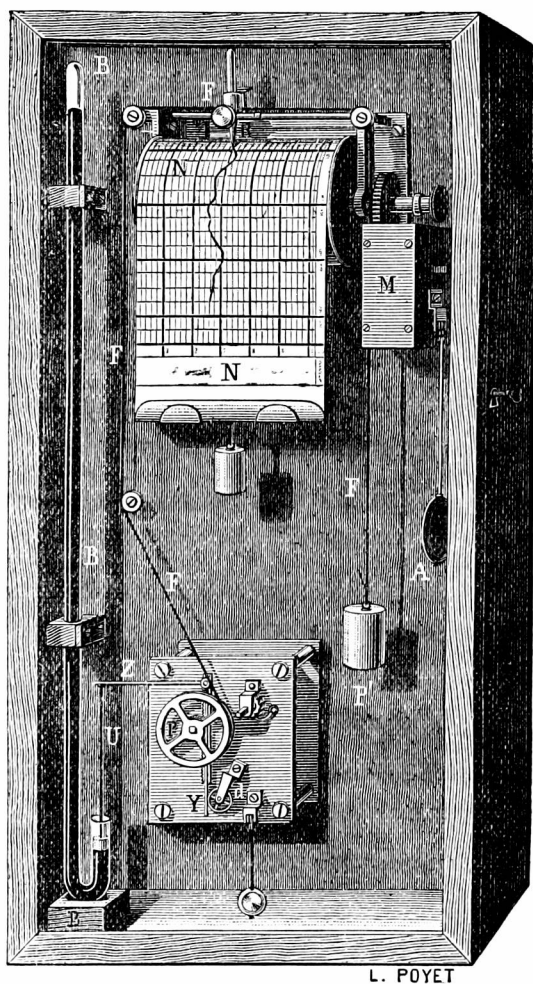
M. Redier has recently brought out a smaller instrument at 220 francs (say £9), of which the following engraving gives an accurate representation. In general principle, as regards the small and constant work thrown upon the barometer, the differential train, &c., the new pattern closely resembles the old; the only essential difference being that the barometer tube is now fixed, and not moved by clockwork as in the original pattern.*

We shall, therefore, describe only cursorily its mode of action. BBB is a syphon barometer; when the atmospheric pressure decreases, the mercury rises in the short leg and carries up the rod U, this lifts the bell-crank-lever Z, which allows certain clockwork to turn the large wheel, and so pay out more of the cord FFFF, and as this cord is kept tight by the weight P', the pencil in the carriage R is drawn towards the clock M. When the pressure increases precisely the reverse action ensues. The clock M is solely occupied in unrolling the paper N from the cylinder on which it is wound. Each sheet of paper lasts a week, and the clock runs for the same time. In the diagrams from the small pattern here described, the variations of pressure are represented twice their natural scale, *i.e.*, each barometric inch is represented by 2 in., and each day by 2·84 in.

We think that in order to facilitate transport, a steel tube should

* *Quar. Jour. Roy. Met. Soc.*, Vol. II., p. 412, and *Met. Mag.*, Vol. X., p. 33.

be used instead of a glass one, and then the instrument could with ease and safety be sent anywhere.



REDIER'S BAROGRAPH (SMALL PATTERN.)

ROYAL METEOROLOGICAL SOCIETY.

The usual Monthly Meeting of this Society was held on May 18th, at the Institution of Civil Engineers, 25, Great George Street, Mr. W. Ellis, F.R.A.S., president, in the chair.

Mr. A. S. Marriott and Captain Paul Mordovin were balloted for and duly elected Fellows of the Society.

The following Papers were read :—

(1.) "Brocken Spectres, and the Bows that often accompany them," by Mr. H. Sharpe. The author has collected all the original

descriptions of the Brocken spectre, which is really the shadow of the observer cast by the sun upon clouds. In some cases the shadow is surrounded by a bow, which the author shows is like the rainbow in colour, and in the order of colours. The head of a shadow is sometimes surrounded by another sort of phenomenon touching the head, and which the author names the "glory."

(2). "Results of Thermometrical Observations made at 4ft., 170ft., and 260 ft. above the ground at Boston, Lincolnshire, 1882—86," by Mr. W. Marriott, F.R.Met.Soc. These observations were made on Boston Church Tower, which rises quite free from any obstructions in a very flat country, to the height of 273 ft. A Stevenson screen, with a full set of thermometers, was placed 4ft. above the ground in the churchyard; a similar screen and thermometers was fixed above the belfry at 170ft. above the ground, while a Siemens electrical thermometer was placed near the top of the tower, the cable being brought down inside and attached to a galvanometer on the floor of the church, where the indications were read off. The results showed that the mean maximum temperature at 4ft. exceeds that at 170ft. in every month in the year, the difference in the summer months amounting to 3° ; while the mean minimum temperature at 4ft. differs but little from that at 170ft, the tendency however being for the 4ft. to be slightly warmer in the winter and colder in the summer than the latter. The electrical thermometer showed that during the day hours the temperature at 4ft. was considerably warmer than at 260ft. The author, however, detailed several sets of readings which had been made during the night as well as the day, the results from which were of a very interesting character, dependent on fog, on the state of the ground, &c.

(3). "Snowstorm of March 14th and 15th, 1887, at Shirenewton Hall, near Chepstow," by Mr. E. J. Lowe, F.R.S.

During the evening the President presented to Dr. J. W. Tripe on behalf of the Fellows, a silver tea and coffee service, in acknowledgment of the many services which he had rendered to the Society during a period of over 30 years.

LIGHTNING.

The following circular has just been issued, and the object is so good that we with pleasure recommend it to the attention of all our readers. There are endless puzzles respecting lightning yet to be solved, and, as Prof. Tait stated some years since that the subject of thunderstorms was "scarcely understood at all," it is clear that there is much to be done. We notice that the Royal Meteorological Society suggest the employment of a "rapid plate;" and this seems rather necessary, as electricians tell us that a million consecutive flashes might occur between the two beats of a seconds-clock, and

therefore the plate has to be acted upon in less than $\frac{1}{1,000,000}$ of a second.

Royal Meteorological Society.

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30, GREAT GEORGE STREET,
WESTMINSTER, S.W.
June, 1887.

PHOTOGRAPHS OF LIGHTNING.

SIR,—The Council of the Royal Meteorological Society are desirous of obtaining photographs of flashes of lightning, as they believe that a great deal of research on this subject can only be pursued by means of the camera.

The Council would esteem it a great favor if you, or the Institution which you represent, could give them any assistance in this matter either,—

1. By sending them copies of any photographs of flashes of lightning that may have been already taken.

2. By endeavouring to procure them yourself; or to interest others in the work.

It may perhaps be well to mention that the photographing of lightning does not present any particular difficulties. If a rapid plate and an ordinary rapid doublet with full aperture be left uncovered at night during a thunderstorm for a short time, flashes of lightning will after development be found in some cases to have impressed themselves upon the plate. The only difficulty is the uncertainty whether any particular flash will happen to have been in the field of view.

The Council hope that now that the thunderstorm season is approaching, many photographers may be found willing to take up this interesting branch of their art.

I am, Sir,

Your obedient Servant,

WILLIAM MARRIOTT,
Assistant Secretary.

EAST WINDS IN SPRING.

To the Editor of the Meteorological Magazine.

SIR,—It is almost proverbial that we have east winds for six weeks every spring. In order to test the accuracy of this supposed fact, I instructed my gardener to compile the enclosed table from the record which he keeps for ordinary gardening purposes. It shows the number of days on which the wind was blowing from the north-east, east or south-east, during the first five months of ten com-

plete years and part of the current year. It appears that the average does not fall very far short of six weeks, but is extremely variable, the maximum being 63 days in 1879, minimum 21 days in 1882. The direction of the wind has been taken every morning at 9 a.m.

Excluding the present year, the average for 10 years gives—

N.E.	16·2
E.	12·4
S.E.	11·1

Total 39·7

Faithfully yours,

JOSEPH PAGET.

Stuffywood, Mansfield, Notts, June 9th, 1887.

Year	JANUARY.			FEBRUARY.			MARCH.			APRIL.			MAY.			TOTAL.		
	N.E.	E.	S.E.	N.E.	E.	S.E.	N.E.	E.	S.E.	N.E.	E.	S.E.	N.E.	E.	S.E.	N.E.	E.	S.E.
1877	2	1	...	1	...	...	2	..	2	5	13	5	11	3	6	21	17	13
1878	1	..	...	1	...	1	4	1	...	6	7	6	3	3	6	15	11	13
1879	5	8	5	...	3	2	...	7	5	8	3	5	10	2	...	23	23	17
1880	1	1	3	1	...	2	9	7	2	8	1	...	9	...	...	28	9	7
1881	...	2	...	2	2	4	...	3	4	8	3	1	5	1	...	15	11	9
1882	1	1	1	...	...	1	...	...	...	2	2	5	3	4	1	6	7	8
1883	...	3	5	...	...	5	3	2	2	1	4	1	1	...	1	5	9	14
1884	2	...	2	2	6	1	3	...	4	6	5	1	6	3	1	19	14	9
1885	1	3	8	...	...	1	1	1	1	5	...	2	2	...	1	9	4	13
1886	3	4	1	6	5	..	1	5	4	7	1	2	4	4	1	21	19	8
Mean	1·6	2·3	2·5	1·3	1·6	1·7	2·3	2·6	2·4	5·6	3·9	2·8	5·4	2·0	1·7	16·2	12·4	11·1
1887	...	3	...	2	2	...	5	5	2	9	2	...	13	1	...	29	13	2

[Similar data to the above must exist for many stations, and it would be interesting to compare them. It seems to us that although, as Mr. Paget remarks, his average of 39·7 days is very near the traditional six weeks, it is less than might have been expected. As the observations are made to only eight points, it is probable that any winds between N.E. and N.N.E. have been set down as N.E., and any between S.S.E. and S.E. as S.E., therefore the table really includes six out of the sixteen points. There are 151 days from January 1st to May 31st; therefore, if all winds were equally frequent, we ought to find 57 entries for N.E., E., and S.E., but we get only 40, so that after all, although the preponderance of westerly winds is less marked in the spring than in other seasons, easterly are not in the majority even then.—ED.]

REVIEWS.

Further Results of Meteorological Observations made at the Bath Royal Literary and Scientific Institution. By the Rev. LEONARD BLOMEFIELD, M.A., F.L.S., F.G.S., &c., President. 8vo, 16 pages and 3 folding tables, *Herald Office*, Bath, 1887.

IT has been our privilege on several occasions to review pamphlets by this author, and we have never, as far as we can recollect, had anything to say except that which was in praise of them. And now the venerable author (in his 88th year) sends us the above pamphlet, which is in all respects the equal of its precursors, and which undoubtedly contains more trustworthy values respecting the climate of Bath than have ever before been published, and we do not make this assertion without having reworked some of the tables and checked them by cross-casting, the surest way of picking up errors if any exist.

We may give a few facts, but must refer our readers to the pamphlet itself, for it is impossible to quote all that is worthy of quotation:—Mean sea level pressure, 1875—85 = 29·976 in. ; max. 30·978, January 18th, 1882 ; min. 28·337, December 4th, 1876 ; range 2·641 in. Temperature—mean, 1866—85, 50°·5 ; and as this period, if divided into two of 10 years each, gives 50°·5 for each, there cannot be much doubt about that value. Mr. Blomefield examines in detail the mean temperatures of the winters, which certainly seem very variable, that of 1878-79 being only 36°·4, and that of 1868-69 being 46°·3. The author then gives tables of rainfall, calling special attention to the wet period (1875-79), and concludes with a paragraph, which we reproduce partly because of its truthfulness, and also as a singular proof how firmly fixed is an author's mode of writing—the paragraph might be a verbatim quotation from some of the author's writings of 50 years back.* By-the-bye, it would be interesting and useful to give a list of them, of course omitting those on Natural History, otherwise we should fill some pages:—

“This leaves little more to be said on the present occasion. I have nothing further to state with respect to the temperature, rainfall and humidity, of Bath compared with other places, beyond what I stated in my former paper. Nor need I add anything to what was therein said respecting the general conditions of the Bath climate. I believe the results given in that paper are, as a whole, correct. Of course the longer the term of years for which the observations are continued, the more trustworthy they become ; while there are anomalous states of weather, in one or other of its aspects, sure to recur from time to time during long periods, which it is of interest to record ; while also they not unfrequently serve to correct former views as to the causes that combine to bring about the very variable states of weather characteristic of the English climate.”

WORKS BY THE REV. LEONARD BLOMEFIELD (previously to 1871 known as REV. LEONARD JENYNS.)

1830. Some remarks upon the late winter of 1829-30, and upon the general character of the weather which preceded and followed it. *Mag. Nat. Hist.* 1830, pp. 538—544.
1846. Observations in Natural History, with an Introduction on habits of observing, Calendar of Periodic Phenomena, &c. Post 8vo.
- [One of the earliest standard works on Phenological observation.]
1858. Observations in Meteorology, . . . being . . . the results of a Journal kept for nineteen years at Swaffham Bulbeck in Cambridgeshire. Post 8vo.
1864. The temperature and rainfall at Bath. *Brit. Ass. Rep.*, 1864. Sections, pp. 17—19.
1866. Report respecting the Meteorological Observations—41st *Rep. of the Committee of the Bath Roy. Lit. & Scien. Inst.*, pp. 16—17.
1869. Notes on the summer of 1868, particularly the temperature as observed in Bath, and compared with that of Greenwich and some other places. *Bath Nat. Hist. Club Proc.* I, pp. 43—70.
1871. St. Swithin and other Weather Saints. *Bath Nat. Hist. Club. Proc.* II. pp. 161—188.
1876. Results of Meteorological Obs. made at the Bath R. Lit. and Sci. Inst. March, 1865—Feb., 1875. *Bath Nat. Hist. Club. Proc.* III. p. 205.
1878. Gales of Wind. *Bath Nat. Hist. Club Proc.* IV.
1880. The Winter of 1878—79 in Bath, and seasons following. *Bath Nat. Hist. Club. Proc.* IV.
1887. Further Results of Met Obs. made at the Bath R. Lit. and Sci. Inst. *Bath Nat. Hist. Club Proc.*

TREES FROM A SANITARY ASPECT*.

As this is the usual time of the year for planting, pruning, and removing forest trees and shrubs, it is a fit time for considering the influence which trees exert on the sanitary surroundings of dwelling places. The recent Parliamentary Report on Forestry shows that trees are now of little commercial value in this country; and we may conclude, therefore, that they are chiefly grown for picturesque effect, and for the shelter from the sun and winds which they afford. The relation of forests to rainfall has been studied by meteorologists, but little attention has been given by medical climatologists to the share which trees take in determining local variations of climate and the sanitary condition of dwellings, notwithstanding they play as important a part as differences of soil, of which so much is said and written nowadays. This remark does not apply to large towns, where trees grow with difficulty and are comparatively few in number, and where they afford a grateful relief to the eye, shade from the sun, and to a very slight extent temper the too dry atmosphere, but to suburban and country districts, where it is the custom to bury houses in masses of foliage—a condition of things which is deemed the chief attraction, and often a necessary accompaniment of country life.

* By CHARLES ROBERTS, F.R.C.S., &c., in the *Lancet*.

Trees of all kinds exercise a cooling and moistening influence on the atmosphere and soil in which they grow. The extent of these conditions depends on the number of trees and whether they stand alone, in belts, or in forests; on their size, whether tall trees with branchless stems or thickets of underwood; on their species, whether deciduous or evergreen; and on the season of the year. The cooling of the air and soil is due to the evaporation of water by the leaves, which is chiefly drawn from the subsoil—not the surface—by the roots, and to the exclusion of the sun's rays from the ground, trees themselves being little susceptible of receiving and radiating heat. The moisture of the atmosphere and ground about trees is due to the collection by the leaves and branches of a considerable portion of the rainfall, the condensation of aqueous vapour by the leaves, and the obstruction offered by the foliage to evaporation from the ground beneath the trees. The experiments of M. Fautrat show that the leafage of leaf-bearing trees intercepts one-third, and that of pine trees half of the rainfall, which is afterwards returned to the atmosphere by evaporation. On the other hand, these same leaves and branches restrain the evaporation of the water which reaches the ground, and that evaporation is nearly four times less under a mass of foliage in a forest, and two and one-third times under a mass of pines, than in the open. Moreover, trees prevent the circulation of the air by lateral wind currents and produce stagnation. Hence as Mr. G. J. Symons has truly observed, "a lovely spot embowered in trees and embraced by hills is usually characterised by a damp, misty, cold, and stagnant atmosphere," a condition of climate which is obviously unfavourable to good health and especially favourable to the development of consumption and rheumatism, our two most prevalent diseases.

Now, if we examine the surroundings of many of our suburban villas and country houses of the better sort, we shall find them embowered in trees, and subject to all the insanitary climatic conditions just mentioned. The custom almost everywhere prevails of blocking out of view other houses, roads, &c., by belts of trees, often planted on raised mounds of earth, and surrounded by high walls or close palings, from a foolish ambition of seeming to live "quite in the country." This is the most unwise proceeding from a sanitary point of view, and should be protested against by medical men as strongly as defective drainage and bad water supply. Many houses stand under the very drip and shadow of trees, and "the grounds" of others are enclosed by dense belts of trees and shrubs, which convert them into veritable reservoirs of damp, stagnant air, often loaded with the effluvia of decaying leaves and other garden refuse, a condition of atmosphere very injurious to health, and answerable for much of the neuralgia of a malarious kind, of which we have heard so much lately. A very slight belt of trees suffices to obstruct the lateral circulation of the air, and if the sun be also excluded, the natural upward currents are also prevented. As far back as 1695 Lancisi recognised the influence of slight belts of trees in preventing the spread of malaria in Rome, and the cold, damp, stagnant air of spaces enclosed by trees is easily demonstrated by the wet and dry-bulb thermometer, or even by the ordinary sensations of the body. A dry garden, on gravel, of three acres in extent in Surrey, surrounded by trees, is generally three or four degrees colder than the open common beyond the trees; and a large pond in a pine wood twenty miles from London afforded skating for ninety consecutive days in the winter of 1885-6, while during the greater part of that time the lakes in the London parks were free from ice.

The speculative builder has more sins to answer for than the faulty construction of houses. He generally begins his operations by cutting down all the fine old trees which occupy the ground, and which from their size and isolation are more beautiful than young ones and are little likely to be injurious to health, and ends them by raising mounds and sticking into them dense belts of quick-growing trees like poplars, to hide as speedily as possible the desolation of bricks and mortar he has created. It is this senseless outdoor work of the builder and his nurseryman which stands most in need of revision from time to time in suburban residences, but which rarely receives it, from a silly notion, amounting to tree worship, which prohibits the cutting down of trees, no matter how injudicious may have been the planting of them in the first instance from a sanitary or picturesque point of view.

The following hints for planting and removing trees may be useful to those persons who have given little attention to the subject. A tree should not stand so near a house that, if it were to fall, it would fall on the house; or in other words, the root should be as far from the house as the height of the tree. Belts of trees may be planted on the north and east aspects of houses, but on the east side the trees should not be so near, nor so high, as to keep the morning sun from the bedroom windows in the shorter days of the year. On the south and west aspects of houses, isolated trees only should be permitted, so that there may be free access of the sunshine and the west winds to the house and grounds. High walls and palings on these aspects are also objectionable, and should be replaced by fences, or better still open palings, especially about houses which are occupied during the fall of the leaf, and in the winter. Trees for planting near houses should be chosen in the following order:—Conifers, birch, acacia, beech, oak, elm, lime and poplar. Pine trees are the best of all trees for this purpose, as they collect the greatest amount of rainfall and permit the freest evaporation from the ground, while their branchless stems offer the least resistance to the lateral circulation of the air. Acacias, oaks and birches are late to burst into leaf, and therefore allow the ground to be warmed by the sun's rays in the early spring. The elm, lime, and chestnut are the least desirable kinds of trees to plant near houses, although they are the most common. They come into leaf early and cast their leaves early, so that they exclude the spring sun and do not afford much shade in the hot autumn months, when it is most required. The lime and the elm are, however, beautiful trees, and will doubtless on this account often be tolerated nearer houses than is desirable from a purely sanitary point of view.

Trees are often useful guides to the selection of residences. Numerous trees with a rich foliage and a rank undergrowth of ferns or moss, indicate a damp, stagnant atmosphere; while abundance of flowers and fruit implies a dry sunny climate. Children will be healthiest where most flowers grow, and old people will live longest where our common fruits ripen best, as these conditions of vegetation indicate a climate which is least favourable to bronchitis and rheumatism. Pines and their companions, the birches, indicate a dry, rocky, sandy, or gravel soil; beeches, a dryish, chalky, or gravel soil; elms and limes, a rich and somewhat damp soil; oaks and ashes, a heavy clay soil; and poplars and willows, a low, damp, or marshy soil. Many of these trees are found growing together, and it is only when one species predominates in number and vigour that it is truly characteristic of the soil and that portion of the atmosphere in connection with it.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, DEC., 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.	Cloud.
	Temp.	Date.	Temp.	Date.									
°		°		°	°	°	0-100	°	°	inches		0-10	
England, London	53·9	6	19·7	20	41·3	31·3	31·9	82	66·4	12·2	4·34	18	5·2
Malta	67·8	19	45·5	30	62·3	50·8	48·5	81	114·8	40·0	3·98	15	5·1
<i>Cape of Good Hope</i> ...	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>Mauritius</i>	86·0	24	65·5	6	82·8	71·3	66·1	72	141·2	57·0	6·31	19	5·5
Calcutta	84·8	9	52·1	18	78·2	58·2	57·9	73	143·7	40·9	·00	0	1·7
Bombay	87·9	18	66·6	9	88·0	70·0	65·7	70	140·9	53·3	·00	0	2·5
Ceylon, Colombo	90·0	26	68·0	27	86·0	71·8	68·9	71	145·5	60·0	2·35	13	5·1
<i>Melbourne</i>	96·8	26	46·7	22	73·5	54·5	52·1	68	146·2	37·3	3·54	10	5·7
<i>Adelaide</i>	102·3	14	46·9	9	83·3	59·6	48·6	44	155·1	40·4	·61	4	3·3
<i>Wellington</i>	76·0	26	41·0	13	65·9	51·3	50·4	76	141·0	36·0	1·45	8	3·2
<i>Auckland</i> .....	...	...	...	...	...	...	...	...	...	...	...	...	...
Jamaica, Kingston	95·8	3	65·0	23	87·9	67·9	68·9	83	...	...	·70	...	8·3
Barbados	81·0	10 ^a	68·0	21	79·0	71·0	66·8	77	141·0	...	2·63	16	5·0
Toronto	44·1	16	0·2	30	27·7	14·0	19·4	81	...	—6·7	2·00	15	7·0
New Brunswick, Fredericton	47·8	1	—22·5	31	25·5	4·9	16·3	85	...	...	5·84	15	6·0
Manitoba, Winnipeg	33·5	9	—36·0	26	5·1	—12·7	1·0	94	...	...	·39	7	4·0
British Columbia, Victoria	57·0	13	21·0	26	48·1	38·8	...	...	...	..	7·16	25	...

^a And 17.

REMARKS, DECEMBER, 1886.

MALTA.—Mean temp. 55°·4; mean hourly velocity of wind 10·6 miles. Sea temp. fell from 66° to 60°. TSS on 7th and 31st; H on 2nd, 30th and 31st. J. SCOLFS.

Mauritius.—Rainfall ·87 in. above, mean temp. of air 0°·8, and of dew point 1°·7, below their respective averages; mean hourly velocity of wind 7·7 miles, 3·6 miles below the average; extremes 17·7 on 23rd, and 0·0 on 10th; prevailing direction E. by N. to N.E. by E. T and L on 24th; T on 25th, 30th and 31st; L on 26th.

COLOMBO.—TSS on 7 days.

C. MELDRUM, F.R.S.
F. C. H. CLARKE, Lt.-Col. R.A.

Melbourne.—Mean temp. of air average, of dew point 1°·7, rainfall 1·18 in., mean humidity 8, mean amount of cloud and mean pressure slightly above their respective averages. Prevailing winds S. and S.W., strong on 10 days; TSS on 8th and 15th; T on 3rd and 13th; L on 12th and 13th; aurora on 23rd. R. L. J. ELLERY, F.R.S.

Adelaide.—Pressure rather unsteady, especially during the latter half of the month. Mean temp., 71°·4, slightly above the average; mean amount of cloud below the average, the sky being clear on 11 days. Nice rains fell over the colony during the early part of the month, heavy in the north, and fine rains fell over the interior and northern territory between the 16th and 24th.

C. TODD.

Wellington.—Fine up to 9th, but with strong N.W. wind; from 10th to 20th showery, with N.W. and S.E. wind, often strong. Thence very fine, warm and dry to the close, with light winds, chiefly S.E. Rainfall 2·47 in., and mean temp. (58°·6) 2°·3, below their averages.

R. B. GORE.

Barbados.—Pressure steady; mean temp. 1°·5 below the average; rainfall greatly below the average. Prevailing wind N.E.; mean hourly velocity 11 miles, 1·6 miles above the average. Five days were more or less overcast. R. BOWIE WALCOTT.

SUPPLEMENTARY TABLE OF RAINFALL,
MAY, 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	1.74	XI.	Castle Malgwyn .....	...
„	Margate, Birchington... ..	1.82	„	Rhayader, Nantgwillt..	3.50
„	Littlehampton	1.06	„	Carno, Tybrith	2.67
„	Hailsham	1.32	„	Corwen, Rhug	2.09
„	Ryde, Thornbrough	1.31	„	Port Madoc	2.91
„	Alton, Ashdell.....	1.90	„	I. of Man, Douglas	1.64
III.	Oxford, Magdalen Col... ..	1.59	XII.	Stoneykirk, Ardwell Ho.	1.47
„	Banbury, Bloxham	1.67	„	New Galloway, Glenlee	1.70
„	Northampton	2.40	„	Melrose, Abbey Gate...	1.52
„	Cambridge, Beech Ho... ..	2.09	XIII.	N. Esk Res. [Penicuik]	2.35
„	Wisbech, Bank House..	1.60	XIV.	Ballantrae, Glendrisaig	1.79
IV.	Southend .....	...	„	Glasgow, Queen's Park.	.94
„	Harlow, Sheering	2.44	XV.	Islay, Gruinart School..	1.81
„	Rendlesham Hall	1.61	XVI.	St. Andrews, Pilmour Cot	.88
„	Diss	2.01	„	Balquhider, Stronvar..	.69
„	Swaffham	1.96	„	Dunkeld, Inver Braan..	.42
V.	Salisbury, Alderbury ...	1.39	„	Dalnaspidal H.R.S. ...	1.13
„	Warminster	2.21	XVII.	Keith H.R.S.	3.04
„	Calne, Compton Bassett	...	„	Forres H.R.S.	1.61
„	Ashburton, Holne Vic..	2.64	XVIII.	Strome Ferry H.R.S....	2.96
„	Holsworthy, Clawton... ..	1.56	„	Tain, Springfield.....	.52
„	Hatherleigh, Winsford.	3.43	„	Loch Shiel, Glenaladale	3.45
„	Lynmouth, Glenthorne.	2.92	„	S. Uist, Ardkenneth ...	1.40
„	Probus, Lamellyn	1.75	„	Invergarry	1.31
„	Wincanton, Stowell Rec.	2.05	XIX.	Lairg H.R.S. ....	.61
„	Taunton, Lydeard Ho ...	2.47	„	Forsinard H.R.S. ....	.80
„	Wells, Westbury.....	...	„	Watten H.R.S.	1.42
VI.	Bristol, Clifton	2.34	XX.	Dunmanway, Coolkelure	1.94
„	Ross .....	...	„	Fermoy, Gas Works ...	.80
„	Wem, Clive Vicarage ...	1.64	„	Tralee, Castlemorris ...	...
„	Cheadle, The Heath Ho.	1.70	„	Tipperary, Henry Street	1.29
„	Worcester, Diglis Lock	2.09	„	Newcastle West	1.04
„	Coventry, Coundon	1.31	„	Miltown Malbay.....	1.61
VII.	Melton, Coston	1.71	XXI.	Gorey, Courtown House	.94
„	Ketton Hall [Stamford]	1.89	„	Navan, Balrath	1.12
„	Horncastle, Bucknall ...	1.23	„	Mullingar, Belvedere...	1.46
„	Mansfield, St. John's St.	2.22	„	Athlone, Twyford	1.46
VIII.	Macclesfield, The Park.	1.64	„	Longford, Currygrane...	1.58
„	Walton-on-the-Hill.....	2.09	XXII.	Galway, Queen's Coll...	1.56
„	Lancaster, South Road.	2.06	„	Clifden, Kylemore	2.51
„	Broughton-in-Furness...	2.29	„	Crossmolina, Enniscoe..	2.17
IX.	Wakefield, Stanley Vic.	1.75	„	Collooney, Markree Obs.	2.36
„	Ripon, Mickley	2.46	XXIII.	Rockcorry.....	1.55
„	Scarborough, West Bank	1.89	„	Warrenpoint	1.02
„	East Layton [Darlington]	...	„	Newtownards .....	...
„	Middleton, Mickleton..	1.83	„	Belfast, New Barnsley .	2.71
X.	Haltwhistle, Unthank..	1.50	„	Cushendun	3.16
„	Shap, Copy Hill	1.53	„	Bushmills	2.78
XI.	Llanfrechfa Grange ...	2.78	„	Stewartstown	1.49
„	Llandovery	2.50	„	Buncrana	2.70

MAY, 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.	Differ- ence from average 1870-9	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.	London (Camden Square) ...	1·45	—	·47	·28	19	21	71·2	8	32·8	1	0	2
II.	Maidstone (Hunton Court)...	1·57	—	·45	·31	21	12	...	...	...	...	...	...
III.	Strathfield Turgiss	1·52	—	·16	·46	21	18	70·0	8	30·8	15	1	4
III.	Hitchin	2·39	+	·40	·43	31	21	68·0	31	34·0	14	0	...
IV.	Winslow (Addington)	2·09	—	·14	·32	6	21	69·0	8	30·0	1	2	8
IV.	Bury St. Edmunds (Culford)	1·95	+	·05	·37	6	18	73·0	31	28·0	14	2	...
V.	Norwich (Cossey)	2·43	+	·62	·60	6	17	...	...	...	...	...	...
V.	Weymouth (Langton Herring)	1·93	...	...	·33	1	16	67·0	31	35·0	1	0	...
"	Barnstaple	1·17	—	·93	·29	2	11	67·0	29	38·0	14	0	...
"	Bodmin	1·95	—	·89	·49	19	18	64·0	31	33·0	5	0	3
VI.	Stroud (Upfield)	1·89	—	·41	·33	2	20	67·0	9, 31	36·0	13	0	...
VI.	Church Stretton (Woolstaston)	2·42	+	·03	·56	19	19	68·0	8	32·0	15	1	6
"	Tenbury (Orleton)	2·20	—	·23	·47	19	20	72·0	8	29·2	1	2	3
VII.	Leicester	2·18	...	...	·32	21	22	70·5	8	29·8	1	1	...
"	Boston	1·60	—	·17	·39	27	16	72·0	8	29·0	1	2	...
"	Hesley Hall [Tickhill]	1·28	...	...	·30	19	13	71·0	17	28·0	1	2	...
VIII.	Manchester (Ardwick)	2·40	+	·17	·95	19	12	65·0	8	35·0	2	0	...
IX.	Wetherby (Ribston Hall) ..	1·62	—	·20	·54	20	9	...	...	...	...	...	...
"	Skipton (Arncliffe)	2·47	—	·65	1·20	19	16	...	...	...	...	...	...
"	Hull (Beverly Road)	1·61	—	·14	·41	19	17	71·0	8	30·0	1	2	2
X.	North Shields	1·49	—	·36	·38	19	14	74·0	8	31·0	1	2	3
"	Borrowdale (Seathwaite) ..	5·55	—	1·43	1·95	19	13	...	...	...	...	...	...
XI.	Cardiff (Ely)	2·23	—	·37	·70	19	13	...	...	...	...	...	...
"	Haverfordwest	1·62	—	1·07	·42	2	12	68·0	31	35·0	4, 6	0	7
"	Plinlimmon (Cwmsymlog) ..	2·67	...	...	1·20	19	10	...	...	...	...	...	...
"	Llandudno	1·51	—	·11	·49	19	14	64·0	31	36·2	1	0	...
XII.	Cargen [Dumfries]	1·13	—	1·40	·44	19	12	67·2	31	28·8	2	1	...
"	Jedburgh (Sunnyside)	1·28	—	·51	·51	19	16	67·0	17	29·0	5	3	...
XIV.	Old Cumnock	2·19	—	·21	1·15	19	12	71·0	17a	31·0	22	2	...
XV.	Lochgilhead (Kilmory)	1·61	—	1·15	·37	10	13	...	...	...	...	...	...
"	Oban (Craigvarren)	·93	...	...	·22	20	8	67·5	26	32·8	21	0	...
"	Mull (Quinish)	1·39	...	...	·29	18	13	...	...	...	...	...	...
XVI.	Loch Leven Sluices	·90	—	1·39	·70	20	...	...	...	...	...	...	...
"	Arbroath	1·33	—	·44	·31	19	11	66·0	15	34·0	2, 21	0	...
XVII.	Braemar	1·11	—	1·31	·60	21	13	64·9	25	26·3	2	6	16
"	Aberdeen	1·95	...	...	·68	21	16	67·0	8	31·0	20	2	...
XVIII.	Lochbroom	3·16	...	...	·97	21	17	...	...	...	...	...	...
"	Culloden	·95	—	·83	...	...	...	67·0	16	43·0	31	0	9
XIX.	Dunrobin .....	...	...	...	...	...	...	...	...	...	...	...	...
"	Kirkwall (Swanbister)	1·87	...	...	·79	21	19	58·7	25	33·4	20	0	...
XX.	Cork (Blackrock)	·95	—	1·21	·25	31	13	75·0	25	36·0	1	0	...
"	Dromore Castle	2·02	...	...	·50	19	11	76·0	13	35·0	1	0	...
"	Waterford (Brook Lodge) ..	·89	...	...	·35	31	10	68·0	25	31·0	1	1	...
"	O'Briensbridge (Ross)	1·25	...	...	·57	19	10	68·0	29	32·0	1, 2	2	...
XXI.	Carlow (Browne's Hill)	1·10	—	1·02	·46	19	10	...	...	...	...	...	...
"	Dublin (Fitz William Square)	·88	—	·84	·52	19	10	66·6	25	36·2	1	0	7
XXII.	Ballinasloe	1·89	—	·52	·70	19	11	66·0	25	30·0	1	1	...
XXIII.	Waringstown	1·47	—	·64	·49	19	9	75·0	6	32·0	3	1	6
"	Londonderry (Creggan Res.) ..	3·11	...	...	·95	19	12	...	...	...	...	...	...
"	Omagh (Edenfel)	1·96	—	·39	·78	19	13	66·0	...	34·0	...	0	3

α And 31.

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

METEOROLOGICAL NOTES ON MAY, 1887.

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.

STRATHFIELD TURGISS.—On the whole the temperature of the first part of the month was of an unseasonable character, with a continuance of harsh and cold N.E. winds and storms and short spells of great heat. In the middle of the month the nights were very cold. The close of the month was much more genial. House martin seen on 2nd, swift on 13th, orange tip butterfly on 31st. Gale on 19th and 20th, T and H on 20th, T, L, and H on 21st.

ADDINGTON.—A cold, backward month, but with very little frost. The number of days on which a northerly wind was registered at 9 a.m. (28) was much in excess of any previous record for May. The warmest night was the 12th, with min. temp. 49°. H on 20th and 21st, high wind on 20th, T on 21st.

CULFORD.—Unusually cold and sunless; wind very high on 19th, doing considerable damage to fruit blossom.

LANGTON HERRING.—Rainfall slightly above the average. Mean temp. at 9 a.m. 2°·1 below the average of 15 years; the fifth month in succession with temp. below the average, and the first May in 16 years in which the highest min. has been below 50°. On the night of the 19th there was a great storm, which is very unusual for May. T on 21st; solar halos on 5 days.

BODMIN.—Mean temp. 52°·5.

STROUD.—N.W. gale with H showers on 20th; T and L on 21st, T nearly all day on 26th.

WOOLSTASTON.—The first half of the month was cold, dry, and very backward, the latter part was wet. Mean temp. 48°·0. Very violent H storms occurred on 20th and 21st, doing immense damage to fruit trees in blossom.

ORLETON.—The mean temp. at 9 a.m. was lower than that of any other May for the last 26 years, except in 1879 and 1885. Nevertheless there were only three frosty nights, although the wind blew steadily from N. and E. with only a variation to the southward for a few hours on two days, for the sky was generally covered with clouds at night. There was very little sunshine or clear sky. The first half of the month was very dry, but in the latter half there was wet mist or small R almost every day. Pressure was generally high and steady. A great wind occurred on 20th and 21st, with showers of H and R, but there was no L or T during the month. Solar halos on 10th and 23rd. Plums and damsons in full bloom about 8th, and cherries on 12th.

LEICESTER.—Another very cold month; wind N. or N.E. on 22 days.

BOSTON.—Very cold throughout, with prevalence of N.E. winds and frosty nights. Vegetation was three weeks late, and neither May Laburnum nor Lilac were in flower at the end of the month. Cuckoo on 4th.

MANCHESTER.—Temperature was low and vegetation backward owing to the prevalence of cold E. winds. A severe storm of wind, R and sleet occurred on the 19th and 20th.

HULL.—The month was unsettled and cold.

WALES.

HAVERFORDWEST.—The month was characterized by deficiency of R and by absence of frost, except a few nights of very slight white frost. Vegetation looked much better at the close than could reasonably have been expected after such a drought and such a moderate amount of sunshine, with N.E. wind. A great storm of wind, very destructive in its effects on vegetation, occurred on the night of the 19th. Chesnut trees fully exposed presented the appearance of blasted trees on the following morning, potatoes suffered, and the whitethorn, where exposed, lost all its leaves; happily the apple blossoms were not in an advanced state, those that were exposed perished. The oak leafed from 14 to 21 days in advance of the ash.

LLANDUDNO.—The month was exceptionally dry, contrasting with a May of exceptional wetness last year. It was also exceptionally cold, and that notwithstanding a fair amount of bright sunshine. Cyclonic conditions prevailed from the 19th to the 21st inclusive, with heavy R on the 19th, and a gale of considerable force from the N.W. beginning in the afternoon of the 20th, and ending in the evening of the 21st. During the rest of the month the condition of the atmosphere was mostly anti-cyclonic, associated with rather keen polar winds. The mean temp, ($49^{\circ}\cdot 5$) was 3° , the mean daily range ($10^{\circ}\cdot 2$) 4° , and the monthly range ($27^{\circ}\cdot 8$) $5^{\circ}\cdot 4$ below the average. Relative humidity (75), slightly below the average. Vegetation was very backward, and the May flower, which ought to have appeared about the beginning of the month was not seen anywhere till quite near the end.

SCOTLAND.

CARGEN.—S on hills on 20th ; H on 19th.

JEDBURGH.—Very cold and ungenial ; wind mostly E., N., or N.E. ; still, owing to the heat of the sun, vegetation progressed wonderfully. The fruit blossom was remarkably luxuriant, and, as its development was much retarded by cold weather in April, the slight frosts of this month did not materially injure it. The border hills were all white on the 20th ; H showers on 20th, 21st and 22nd. Cuckoo on 16th ; cornrake on 18th.

OBAN.—The driest month for several years, consequently the crops were very backward, especially hay. The temperature was above the average ; it increased daily to 16th ; then followed the usual cold period, with S and H on 20th, succeeded by a very warm fine period lasting to the end of the month.

ABERDEEN.—Fine seasonable weather, as a whole. Rainfall about the average.

LOCHBROOM.—On the whole a very fine month. Its beginning, middle, and end were very fine, indeed at times most lovely ; but from the 18th to the 23rd, very wild weather prevailed, more like winter than summer. There were S and sleet in the valleys, and deep fresh S covered the hills and heights, even at the close.

CULLODEN.—Long dry periods occurred during the month, with stormy and cold E. winds.

IRELAND.

BLACKROCK.—With the exception of three slight showers the weather was fine and mostly bright, with a few warm days, to the 17th, then showery to the end with S and H on the 20th. Vegetation was backward, and R much wanted at the close. Mean temp. ($53^{\circ}\cdot 9$) $0^{\circ}\cdot 7$ below the average of 11 years.

WATERFORD.—The driest May since 1876, and the total R from January 1st the smallest in any year since 1860, when observations commenced. H on 20th and 21st.

O'BRIENSBRIDGE.—Brilliant sunshine prevailed for the greater part of the month, with cool N. and N.E. winds, but no serious frost. Vegetation was slow, and all flowering shrubs were late in blooming, whitethorn opening on 28th.

DUBLIN.—A generally fine, dry, but rather dull month with high pressure, and a remarkable preponderance of polar winds. As in April, the precipitation was limited to ten days, and was usually in the form of cold showers. There were no electrical disturbances. Mean temp. slightly below the average. Lunar corona on 7th ; solar halos on 5th and 7th ; slight fog on 3rd ; S or sleet on 20th and 21st ; high winds on 5 days, attaining the force of a gale on 19th and 20th.